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NAB91

Facility design special report

Engineering conference p. 26

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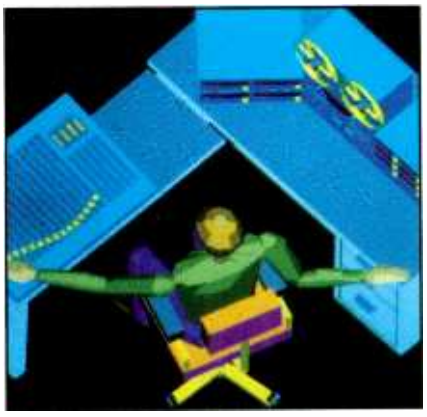

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FACILITY DESIGN SPECIAL REPORT:

Building new production and broadcast facilities is costly and challenging. It is also crucial that today's studios meet the ever-increasing demand for high-quality signals and production capability from today's audiences and clients. In today's competitive market, there is no room for second best. This special report illustrates some of the successful techniques used in several top-notch audio and video production facilities. In addition, detailed information on how advance planning with 3-D CAD and knowledge of new legal requirements on wiring could save your station from legal action and expensive employee absences.

DEPARTMENTS

FEATURES:

ON THE COVER

Building a new facility requires careful planning because at today's costs, there is no room for error. Shown on the cover in blueprint form is a section of the Crawford/Post recording studio, designed by Walters-Storyk Design Group. (Cover credit: Kim Bracken, *BE* graphic designer.)

It's time for new directions in television audio.

Television audio has been changing even faster than the rest of the industry. It's time to take a fresh look at the requirements of today's television station—and to find more effective methods of meeting them.

That's precisely what the designers at PR&E have done. The result, our new STX, is ready for your most challenging on-air and production assignments. Three mainframe sizes are available, each with up to four stereo submaster modules, eight mix-minus buses, four aux buses, and three stereo outputs.

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News

By Dawn Hightower, senior associate editor

HDTV alliances continue

On Jan. 31, the Massachusetts Institute of Technology (MIT) and General Instrument (GI) announced the formation of the "American Television Alliance," a union seeking the successful "all-digital" system for over-the-air broadcast of HDTV in the United States. MIT and GI were previously individual proponents among six before the Federal Communications Commission's (FCC) testing process, which began earlier this year. Contacts from these companies and others in the industry have indicated proponents lack either funding or technology, and merging often solves both problems.

In early 1990, North American Philips and RCA (Thomson) similarly merged their advanced TV research efforts, combining work-in-progress at the David Sarnoff Research Center in Princeton, NJ, and NBC. That venture is known as the Advanced Television Research Consortium (ATRC), and holds two slots in the FCC testing program, for one analog and one digital scheme.

Industry analyst Dale Cripps sees the MIT/GI link as a magnetic center that may next attract the Zenith/AT&T group, and then possibly, the ATRC. Talks have already taken place, and there are technical similarities among all system designs. There has been no mention of Japanese involvement.

The question remains whether recent digital video advancement and this MIT/GI merger puts the United States in the HDTV lead. On this subject, Cripps noted there is insufficient data to provide confidence that any digital channel coding will work in the U.S. terrestrial environment, and joined the chorus of experts who say that digital terrestrial field testing needs to be done with the Advanced Television Testing Committee (ATTC) process. He also observed that although European and Japanese companies are moving forward with digital research, their major ATV commercialization efforts are analog.

The American semiconductor companies should be most interested in this research because it is a distinct advantage for them to focus on one system. A consortium would give them more incentive to become involved in research and experimental development, which could result in an outstanding contribution to the technical base of the United States. This would also have an international asset because the ATRC includes French and Dutch interests.

ATV system debuts in San Francisco

The advanced TV system SuperNTSC got its first trial under real world conditions early this year over Bay Area TV stations KPIX (channel 5) and KGO (channel 7) and Viacom Cablevision.

San Francisco was the first location in a series of demonstrations planned for five cities.

The SuperNTSC system, developed by Faroudja Research Enterprises of Sunnyvale, CA, significantly improves color TV pictures, particularly on large sets and projection televisions.

According to Yves Faroudja, president of Faroudja Research, SuperNTSC is compatible with existing U.S. TV standards, and could be in consumers' homes in less than two years at a much lower cost.

During the demonstration period, Faroudja said TV programs will be encoded in SuperNTSC and transmitted over broadcast stations and cable to prove that the technology works with the equipment and televisions now in use.

GI demonstrates DigiCipher transmission system

General Instrument's VideoCipher Division has begun live, over-satellite demonstrations of its DigiCipher all-digital video compression and transmission system that delivers multiple NTSC TV signals over a single satellite transponder or through a standard 6MHz broadcast or cable channel.

The first demonstrations were held at the Satellite Broadcasting and Communications trade show at the Bally Grand Hotel in Las Vegas.

The DigiCipher system has the capability to transmit up to 10 channels of high-quality film and video per satellite transponder, without requiring any change in receive dish size. The same DigiCipher NTSC technology also can transmit up to five channels per 6MHz cable or broadcast channel.

For the demonstration, DigiCipher-compressed signals were uplinked from

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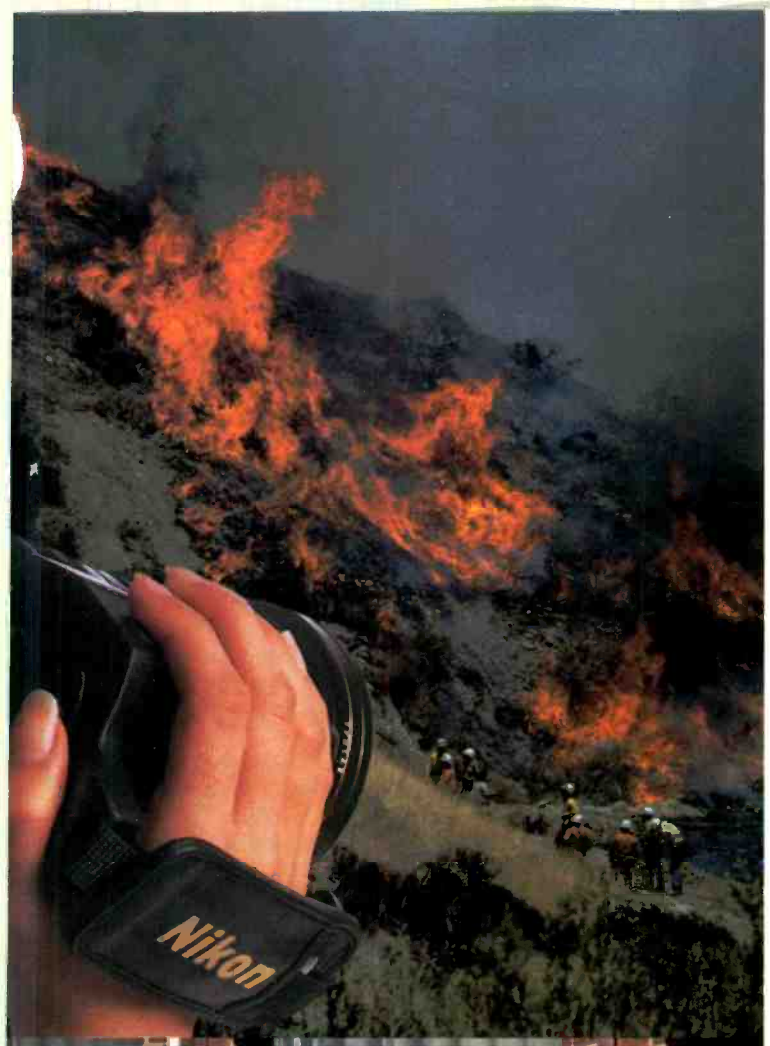

Introducing The Nikon S19x8B

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In the world of ENG/EFP, disasters aren't planned. So you've got to plan ahead. After all, the biggest disaster is being on the scene but too far back to get the shot. That's why Nikon went to great lengths to create the S19x8B Lens for CCD cameras.

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See us at NAB Booth #6455

Vegas: home, sweet home

As the world's broadcasters converge upon Las Vegas, there remains great concern about the industry's future. Can terrestrial broadcasting succeed in an era when DBS, DAB, CATV, CD, CDV, CDI, VCR and a host of other acronyms compete with us for our audience? Can broadcasters meet the quality challenge of such new technologies as digital, laser video and audio products? Finally, can we still bring to the American public programming that captures its interest — at competitive costs?

Answers to these and similar questions are difficult to provide, and the industry continues to search for them. The one common meeting place to conduct this search is the yearly NAB convention.

Although most conventions move around the country, Las Vegas has become the home for our show. Even though it has occasionally been relocated, no convention-goer I've ever met wanted it to leave Vegas.

Maybe it's because we've become accustomed to the dry, sunny climate. Or perhaps we like the fact that it has been designed from the ground up for entertainment. Las Vegas is easy to get around in, and its accommodations are convenient and inexpensive.

Even so, this is not enough to make the non-show portion of any convention a worthwhile event. This is where Las Vegas really shines, both literally and figuratively. It is a city known for its brazen approach to fun. Where else can you combine so much glamour, glitz, gambling and gusto into such a convenient package? Such a wide variety of entertainment is hard to find elsewhere. But despite the obvious entertainment factors, I think there is another reason we look forward to returning to Las Vegas.

Las Vegas is a location that we've come to identify with prosperity for our industry. During the heyday of rapid industry growth, increasing revenues and exciting new product announcements, Vegas became synonymous with success. Broadcast technology leap-frogged almost every year. The yearly convention in Las Vegas became a technological haven for stations as they rushed to adopt the latest innovations. Though the technological aspect of broadcasting became more confusing, Las Vegas as an industry home became a constant.

Now this has changed. Broadcasters are looking for stability in an unstable world. We don't want anymore confusion, we want direction. We want assurance that the future holds promise.

Maybe this is why the show's return to Las Vegas seems particularly appropriate. In this time of confusion, doubt and economic hardship, Las Vegas, our home, is comforting. It gives us a sense of stability, unity and hope. And right now, hope is something broadcasters desperately need.

You may not read this much into something so simple as a place, but I'm sure that many broadcasters feel the same way as I do. We know Las Vegas, we've been there many times. Most important, Las Vegas was our common ground when times were good. We went to Vegas knowing that technology could solve most of our problems. New ideas and products often meant new revenue. We came believing that no matter what happened during the year, solutions to our problems could be found on the convention floor and in the session rooms.

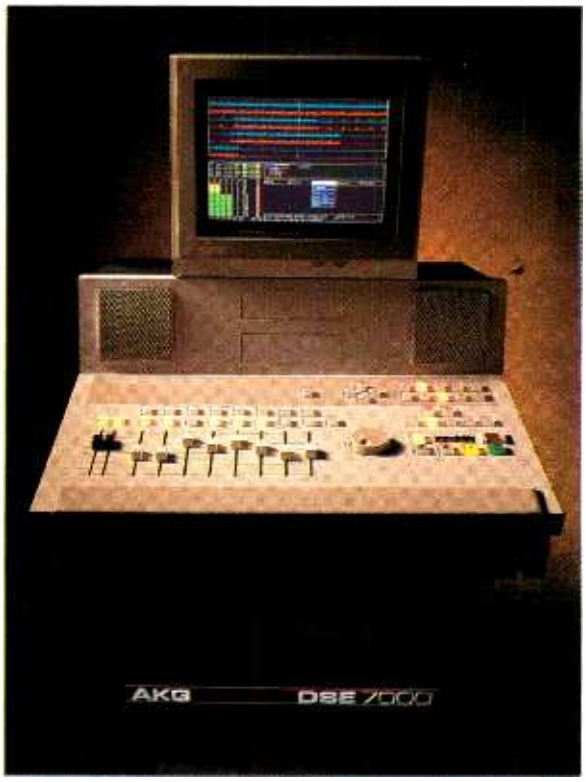
This year, as we return to the familiar desert sands, we will once again be looking for solutions to the challenges before us. The answers may lie, as before, on the convention floor and in the seminar rooms. As we return to our roots, we come with a certain belief that, as in the past, the future will be brighter.

Brad Dick

Brad Dick,
editor

HE SAID, 

"You can write almost anything you want about this machine and put my name under it." SO WE DID.



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FCC liberalizes time leasing

By Harry C. Martin

The FCC is permitting radio stations to lease up to 24 hours per day of programming time on competing stations. These agreements permitting such "time brokerage" or "affiliation" arrangements, however, must provide an effective means of ensuring that the affiliate/time provider maintains control over its facility and complies with all other commission rules.

Regulatory changes

In 1989, the commission removed time-brokerage agreements from the reach of its "cross-interest" policy, which previously had prohibited licensees from purchasing a significant amount of time on competing stations. The new rulings on time brokerage, released last December, indicate that the agency now will permit program time-leasing arrangements between stations in the same market as long as the licensee making its time available to another station "maintains control over its programming."

To maintain such control, the affiliate must:

1. Retain the right to reject programs it considers are not in the public interest.
2. Retain the right to cut into the leasing station's programming in emergency situations or when public interest warrants it.
3. Maintain and staff a main studio within the station's principle community area.
4. Cover local community issues for its issues/programs list.
5. Maintain its public inspection file.
6. Broadcast station identifications.

If these criteria are met, and some reasonable amount of the affiliate station's broadcast time is reserved for the presentation of issue-responsive programming, the remaining hours can be sold to another station.

Some approved arrangements

In one of its December decisions, the commission approved a contract that bound the affiliate station to carry 12 hours per day, and permitted it to carry up to 24 hours per day, of programming provided by the originating station. In another case, the FCC approved an arrangement under which the affiliate reserved only the hours from midnight to 4 a.m. for its own programs. The commission also permitted the providing station to use its own transmitter operator at the affiliate's control point, and to establish a remote-control point within the originating station's community of license (for example, at its own studio).

Possible problems

Although the commission's recent decisions appear to be a loophole in the anti-duopoly rule, the newly-approved arrangements do pose significant dangers. FCC licensees must be able to demonstrate that they control and are responsible for the operation of their own facilities.

Thus, even a station leasing significant portions of its time to another must continue to pay its own bills, keep some semblance of an independent staff, and exercise control over its programming, regardless of its origin. An agreement that abdicates control through a program time lease would subject the lessor and lessee to FCC sanctions. In situations in which the licensee retains the right to interrupt and pre-empt the leasing station's programming might cause problems if these prerogatives are never or seldom exercised.

Other FCC rules also may be violated by an overzealous affiliate. For instance, a licensee failing to maintain a studio with a "meaningful management and staff presence" would be in violation of the main studio rule as well as the licensee control requirement. Also, a station that does not maintain its own logs and records demonstrating the presentation of issue-responsive programming would be in violation of the public file rule. If challenged, it would likely lose its license at renewal time.

Antitrust considerations

Another area of concern is the use of combination discount advertising rates and joint sales practices in connection with selling multiple programming services. Though in 1986 the FCC eliminated its regulations prohibiting combination rates and joint sales practices among competing stations, the agency reminded its licensees that they still must comply with antitrust laws.

Although antitrust concerns arise most frequently where joint action between independently-owned entities is concerned, separate programming services under common ownership that exercise significant market power within a certain economic market can run afoul of the antitrust laws based solely on unilateral, independent conduct. If by offering a combination advertising rate two or more commonly-owned businesses are able to dictate prices in the market, or exclude other stations or advertising media from competing in that market, the commonly-owned businesses run a substantial risk of violating antitrust laws. Control of 35% or more of the advertising market is the benchmark that indicates the potential for anti-competitive conduct by one entity.

Problems also might arise if spots on the affiliate station can be bought only with spots that will run on the primary station.

FOB active against violators

In January, a Virginia daytime AM station was fined $7,900 for operating beyond its authorized sign-off time. It had been operating in the directional mode by remote control without obtaining remote-control authorization from the FCC, and had failed to stop operating by remote control within three hours after a malfunction in its remote-control system. Also, the station had no means of controlling its transmitter power or turning the transmitter off in the event of an emergency. In addition, it had inoperative EBS equipment and there were no indications that EBS tests had ever been conducted. Other violations included failure to post the station license, failure to designate a chief operator, failure to observe tower lights at least once each 24 hours, failure to report a tower light beacon outage to the FAA and failure to maintain a complete public inspection file.

The Field Operations Bureau (FOB) publishes an information bulletin (FO bulletin No. 18) that provides a check list for compliance with these and other FCC operating requirements. The bulletin is available from any of the commission's regional field offices.

Martin is a partner with the legal firm of Reddy, Begley & Martin, Washington, DC.

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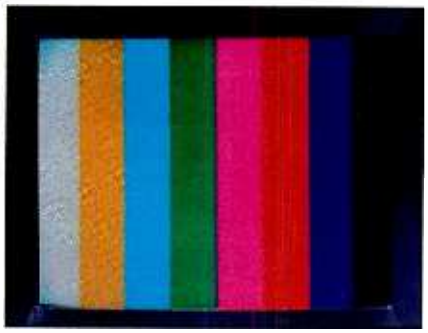
Part 3

Strictly TV



Good video from start to finish

By Andrew Suk

Waveform monitors and vectorscopes provide us with a means of measuring a video image with great precision. Engineers use this equipment on a regular basis to measure such things as rise times, pulse widths, non-linear distortions and other critical components in the TV system.

Good video starts with the original image.

Equally important, however, is the use of this equipment by non-engineers — the new hires, the "1099ers," and even some producers and directors who need to understand routine monitoring of signal levels to ensure the highest-quality product. This is important because getting signals right at the start avoids later problems that will have to be dealt with throughout the operations chain. The following are some pointers engineers might share with their less technical production workers.

Start to finish

Good video starts with the original image. This is easy in studio production because the environment is controlled, and you have access to all of the needed waveform monitors and vectorscopes.

But out of the confines of the studio, how are you going to ensure that you are gathering good images? On a single-camera field shoot, the convenience of a waveform monitor is no longer available. To compensate for this, most camera manufacturers have included auto iris and video-level monitoring circuits, most often called "zebra bars." Auto iris keeps the peak video levels below 100% and zebra bars produce diagonal striping in the view finder over sections with peak white or higher video levels.

But auto iris can be fooled by highlights in the image. The camera will set the highlights to 100IRE, and this will artificially lower the rest of the image. So when auto iris is inappropriate, use the zebra bars. Adjust the lens aperture to allow the zebra bars to just turn on when the camera sees a bright white image, such as sky and reflective highlights. This will ensure a proper video level.

The most unfortunate aspect of the zebra bars is their "off" switch. There is no way of knowing that the video levels are correct using the view finder alone. Without some video-monitoring circuit or waveform-monitoring device, the chance of coming back to the studio with video at the correct level is a crap shoot at best.

Unity level

After the tape returns to the studio, check the levels prior to editing. Now is the time to make any minor compensations. Be sure the record levels are properly set. Edit your video, and adjust the video levels as required. If you will be dubbing the finished product to other tapes for distribution, check those levels before, during and after recording.

This may seem more complicated than it really is. Most tape machines have a unity level position on their level controls.

Make two rules. First, if for some reason you have to change a level control, always put it back when you're done. Second, always verify that the control is in the unity position before you record.

Sometimes this coincides with a physical detent or "click" position in the center of the control's range. The engineering department should have these set to record and playback at the same level and phase as the original video. Once set, there should be little reason to move the control from the unity position.

If your system does not use unity level controls, change it so that it does. If your system does use them, make two rules. First, if for some reason you have to change a level control, always put it back after you are finished. Second, always make sure that the control is in the unity position before you record.

One of the biggest mistakes an operator can make is to evaluate an image using a picture monitor alone.

"The monitor looked OK..."

One of the worst mistakes an operator can make is to evaluate an image using a picture monitor alone. Remember that a picture monitor is an extremely forgiving instrument. You can adjust the brightness, contrast and even the hue to manipulate your picture. This is the primary reason you should never judge the video level of a given source by how bright it looks on the monitor. Video levels should be set only by looking at the waveform monitor. If you rely on the monitor, you may get quite a different image when the video-processing equipment and the transmitter get through with the signal.

There is nothing magical about recording good video. Take the time to look at the signal with the proper measuring tools. Check to see that your video meets the industry standards for proper luminance, chroma and sync. If the video signal does not meet these established parameters, or if the equipment fails to perform as expected, call an engineer. The engineers will appreciate you for knowing what good video should look like, and be grateful that you recognized a problem quickly and asked for their help.

Suk is director of engineering, Cordillera Communications, Nampa, IN.

Probably not. But the new Shure VP64 microphone could go on with show, after show, after show.

The new Shure VP64 is good news for broadcasters — and their audiences.

In short, it delivers all the qualities you demand for a broadcast microphone — and then some. A high-energy neodymium magnet in the VP64 maximizes signal-to-noise ratio. Result: your on-the-scene reports cut through background clutter to make sure your audience gets the message. What's more, the frequency response is tailored for unbeatable speech clarity and crispness, while all but eliminating boominess and low frequency background noise.

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If You Were Dropped 6 Feet, Head First, Would You Still Be Able To Cover The Story?

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Part 1

re:Radio

An adventure in tower detuning

By John Battison, P.E.

Recently, an AM/LPTV broadcaster was granted a license for a new FM station. This article will show how a new antenna was fashioned into the existing site.

The original station at this facility was an AM daytimer with a simple cardioid 2-tower pattern. But no directional antenna is simple in the long run, and engineers who approach antenna systems with "simple" attitudes often learn a difficult lesson when an array is put on the air. Though the development of the pattern is simple, its implementation is not. An infinite number of things can go wrong to produce undesired, or unexpected, radiations.

Some background

Before the introduction of the standard pattern, it was not unusual for AM directional antenna system designers to use 50kW arrays that had only a few millivolts in their nulls. The FCC approved these low nulls by the expedient of *maximum expected operating values* (MEOVs). Commission consultants used a factor based on their experience to dictate that no more than a specified maximum value would be radiated in these low nulls. The FCC granted licenses to facilities on the condition that their proof-of-performance figures did not exceed these cited values.

These MEOVs are caused by unexpected radiations from objects, such as guy wires, wire fences, old metal windmill towers, tin cowsheds and from minor aberrations in calculations performed on the manual comptometers that predated computers. But with computerized mathematics and easily calculated antenna patterns, the technical facts of life caught up with broadcast engineering. The commission accepted what its engineers had been telling it for years, and construction permit (CP) applications were required to specify a standard pattern based on reality. So no matter what information was provided in the application, the final antenna pattern represented a standard that any engineer who had a uniform, built-in MEOV could duplicate. Now, let's go back to the tower array in this story.

Battison, *BE's* consultant on antennas and radiation, owns John H. Battison and Associates, a consulting engineering company in Loudonville, near Columbus, OH.

The facility operated with a LPTV antenna on its south (AM) tower, and a LPTV transmitter in a small building at the base of the tower. After the LPTV antenna was installed, a partial proof was performed following FCC requirements. A new license was issued for the added antenna.

Later, when a FM CP was granted, a taller tower was to be erected for greater FM antenna height. Because it made sense also to move the LPTV antenna higher, a CP was obtained to do this.

AM issues

There was no problem in adjusting the pattern to operate with one tall and one short tower. An improvement in AM coverage could not be produced because of a present freeze; and in any case, based on existing rules, the 0.5mV/m contour was hemmed in. Skywave was also not an issue.

Also, to dismantle the old tower would involve going non-directional at 125W for several weeks or months while the new tower was built and the proof was performed. The construction work also would severely damage the rather old ground system, and it cost too much to replace it. In addition, the actual process of obtaining a CP for a new AM antenna system from the FCC would also tie up progress for perhaps a year, and the station wanted to use the new FM (and higher LPTV) as soon as possible.

As a precaution, a clearance was obtained from the FAA for a new LPTV tower separate from the AM array. When the FM CP was granted (it had been in hearings for three years), another CP was obtained to move the FM antenna to the LPTV tower.

As far as the FM and LPTV were concerned, the path was clear for a new and separate tall tower. The existing 2-tower array was left in its present condition, and another tower was constructed next to it. This tower, in fact, already existed even though it had been retired and was lying on the ground. It had been donated to the station by a local ham group that wanted to place repeater antennas on its superior height. By using the grounded tower for the FM and LPTV services, the ham operation and any other services that needed a high antenna would not encounter technical problems in getting across the base insulator of an operating AM tower. This also allowed changes to be made in antenna configuration on the new tower without prior FCC approval.

Making it happen

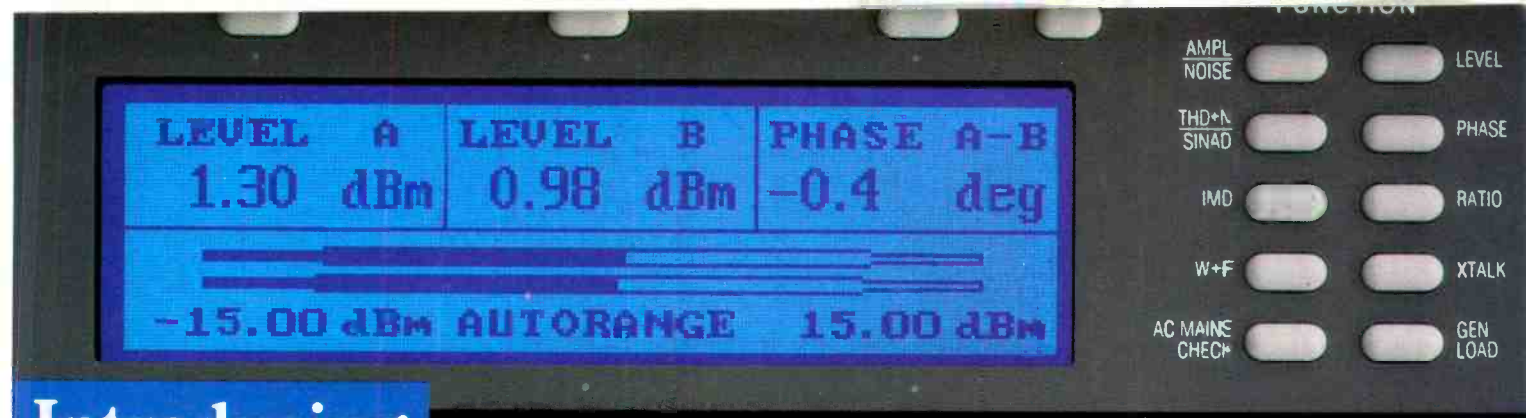
A few other problems required consideration. The existing array was a little short-spaced, which produced a slightly higher mutual impedance than the optimum. Meanwhile, according to LPTV minor change rules, the antenna site could not be moved more than 600 feet. Property boundaries also imposed restrictions.

Although the fields involved were quite small, non-conductive guy cables were used on all the new tower guys. This would be a little more expensive than steel guys, but when the cost of the insulators required by the steel guys was considered (and the labor for their insertion), the overall price difference was small. Because some guys had to pass between the existing two towers, this decision seemed even more prudent.

The new tower also needed painting and lighting. While out of service, all of its old attachments had been removed, and its joints and corroded connections had been cleaned. The leg-joining areas were also located and cleaned to provide adequate surfaces for bonding during erection.

It was not necessary to install a new broadcast-type ground system for the new tower, but proper grounding was required. Eight 10-foot copper-clad grounding rods were driven into the ground around the tower base and connected with copper strap. Because the tower base was outside of the radius of the existing tower's ground system, 2-inch copper strap was planned to run from the tower's base to the existing copper strap between the two old towers. But the old strap was not available, so a new one was run between them. This strap tied the new tower and the existing ground system together and eliminated at least one source of trouble.

By now the reader should be asking, "What will be the effect of the new tower on the existing AM pattern?" Tune in again next month for the answer.



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SBE increases certification fees

By Bob Van Buhler

At the January SBE executive committee meeting in Washington, officers and committee members took a detailed look at the financial status of the Harold E. Ennes Foundation and the society itself. All of these areas were examined to determine how they might become more efficient and effective operations. The investigation produced one major change: The certification committee recommended that the testing fees be increased to help offset the program's costs. This recommendation was passed by the executive committee, but will not become effective until after the SBE National Convention, October 3-7, in Houston.

Several months ago, the certification committee began a review of its testing program. It was particularly concerned about its operating cost. An operational audit showed that the certification program was not producing sufficient revenue to support its costs. Although these costs, mainly staff and postage expenses, have risen significantly, the overall fee structure has remained unchanged since the program began.

The SBE has funded the program at a loss for several years as a service to its members and to the industry. SBE certification is an established program and a generally-accepted criteria for technician evaluation. In addition, more and more employment ads seen in major trade publications list SBE certification as "required" or "desirable." Committee members felt that the program was important enough to its users that they would be willing to help support it. Therefore, the committee determined that certification fees should be increased to eliminate the financial losses incurred by its operation.

The advantage of having these programs support themselves is that it frees society resources for other less profitable programs and member services. Professional and industry-based organizations, such as SBE, have determined that programs and services, such as certification testing, should generate sufficient revenue to offset program costs. These fee changes will allow additional member services to be developed.

The following fee structure will be effective for all certification tests taken after the national convention in Houston:

- *Broadcast Technologist* $35
- *Broadcast Engineer* $50
- *Senior Broadcast Engineer* $75
- *SBE Professional Broadcast Engineer* $100

Certification testing fees and SBE dues are often tax deductible. In addition, independent national surveys have consistently shown that certified technicians make more money and often have better employment positions.

Because the higher fees will not become effective until after the convention, all members have ample opportunity to take the exams at the current rates. Members should also tell their general managers that they should attend the Houston convention because it will be cheaper to take the test there.

SBE certification is also open to non-SBE members. For information and study guides, contact a member of your local SBE chapter. You can also contact the SBE office at 317-842-0836 for assistance.

Call for papers

It's time for authors to submit abstracts for papers to be presented at the 1991 SBE National Convention. If you are interested in presenting a technical paper at the conference, you must submit a written abstract outlining the paper by April 1. Only written abstracts will be accepted. The approved camera-ready manuscripts must be submitted to SBE by June 30. Accepted papers will appear in the annual conference *Proceedings*, which will be distributed at the convention.

See the Johnson Space Center

Special tours of the Johnson Space Center in Houston have been arranged for attendees. Convention-goers will have the chance to get a glimpse behind the scenes at one of the world's most high-tech facilities. The tour, which requires a small transportation fee, will include visits to the Houston space control center and the space simulator. The tours will be conducted at convenient intervals so attendees will still have plenty of time to attend the technical conferences and tour the exhibit hall. Don't miss this important and fun event.

SBE board to meet in Houston

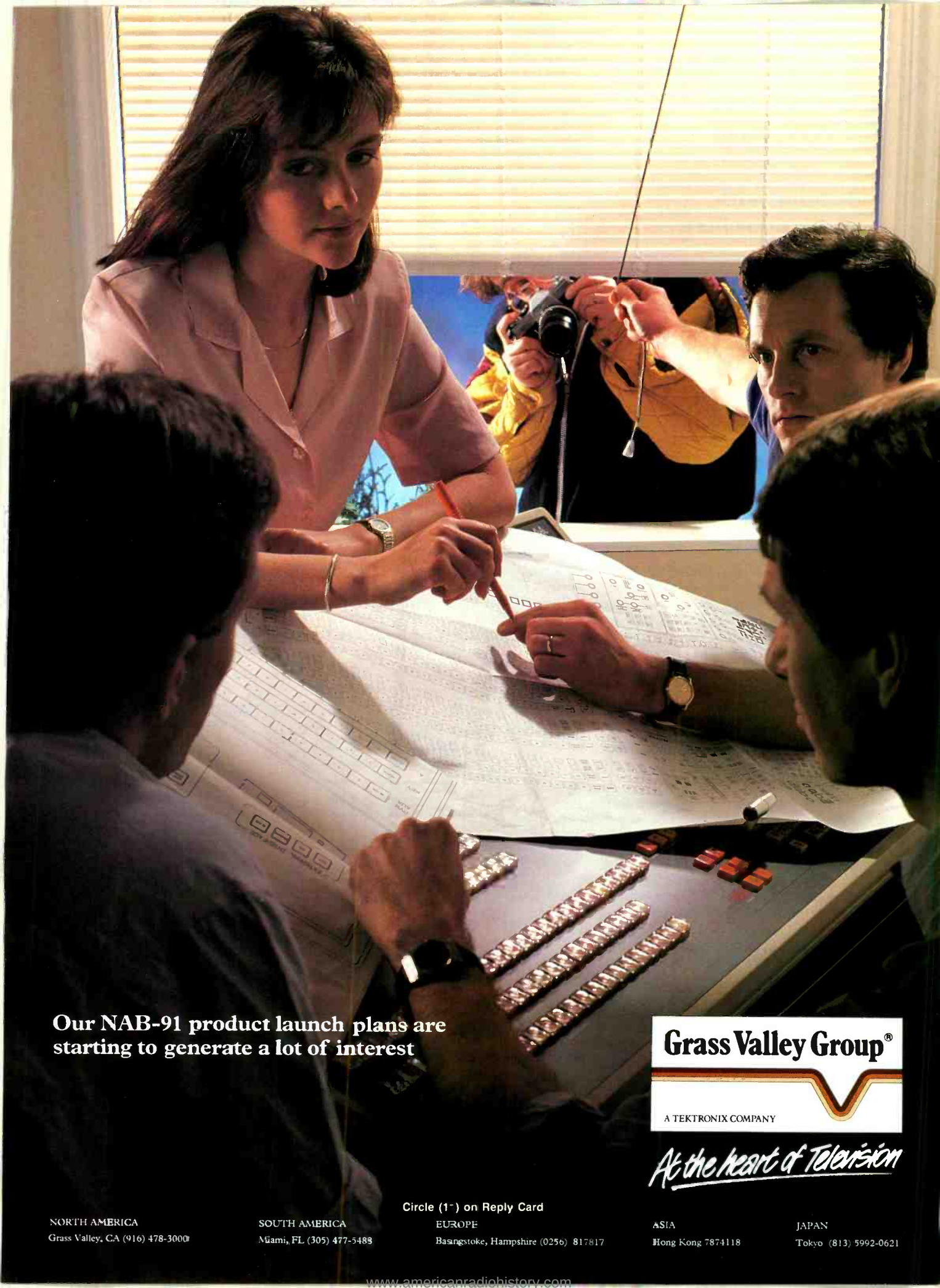
The SBE's officers and directors have spent considerable time and resources researching and developing an overall strategic plan for the society. Their plan will be completed at the board meeting this month in Houston. SBE president Brad Dick says that providing input and making decisions on strategic plans are the duties and purpose of the society's directors. Micro-management of the society's operation is the duty of the officers and national office staff. "The real challenge of the board member," says Dick, "is to live up to the ultimate responsibility of setting long-range goals and policy. It's the board member's job to ensure the success and survival of the society by fulfilling this role. The destinations are provided by the membership and the course is set by the directors. The map is the strategic plan, and the elected officers steer the course with the help of national office staff and committees." Any suggestions for the society should be written out and submitted to the SBE office in Indianapolis.

Board vacancies filled

The SBE board of directors has appointed two members to the board. The new directors, Terry Baun and Marvin Born, will fill the vacancies that were created in 1990. Baun of Milwaukee, a former SBE board member, was appointed to complete an open one-year term. He is the president of Criterion Broadcast Services, a Wisconsin-based broadcast contract engineering company. He is also a certified SBE professional broadcast engineer and a senior member of the society. Born, vice president of engineering for the WBNS stations, was appointed to fill an unexpired 2-year term. He is a certified SBE professional broadcast engineer and a senior member of SBE.

Continued on page 35

Van Buhler is manager of engineering at KNIX-FM/KCWW-AM, Phoenix.



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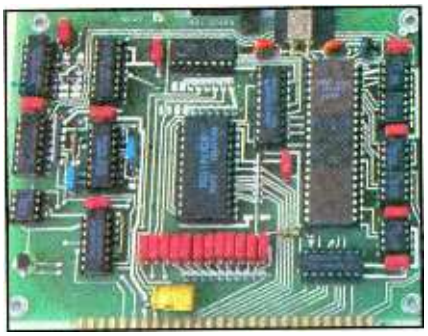

Building with microcontrollers

By Gerry Kaufhold II

An EPROM is a non-volatile memory that can hold program information for microcontroller-based projects. This column will show how to interface a Z-8681 microcontroller to a 2k-by-8 EPROM. (See Figure 1.)

Various configurations of Z-8s and EPROMs use different pins for different signals. This column will identify signal names only. You can map the design onto whatever configuration of Z-8, latch and EPROM you choose. The documentation for each chip will provide the correct pin-outs.

Control signals

Recall from last month that microcontroller port 1 is multiplexed to handle data and addresses. The system works by first loading the address bits into an external latch that holds them. The port can then transfer data into or out of the addressed-latched memory location. Four control signals regulate this process — address strobe (/AS), read/write (R/W), data strobe (/DS) and data memory.

The address strobe is an active low signal that latches address bits from port 1 into the external latch. The address strobe from the Z-8 connects to the clock (CK) input of the 74LS374 Octal D-type flip-flop. When address strobe makes its transition from low to high, it latches whatever inputs appear on the data inputs of the 74LS374. The output enable (OE) signal of the 74LS374 is tied LOW. This ensures that the latch data outputs always drive the address inputs of the M-2716 EPROM.

The data strobe is an active low signal that controls the actual output of data from the external memory. Data strobe from the Z-8 connects to the output enable pin of the EPROM. When data strobe goes low, the contents of the EPROM's addressed memory location leave the EPROM and are read into the Z-8.

Read/write is active low for writing to external memory, and active high when reading from external memory. Read/write from the Z-8 connects to the EPROM chip select (CS) input. This line will be high during memory reads from the EPROM. Refer to the data sheet of the specific EPROM. If the chip select input is not active high during reads, place an inverter between the Z-8 read/write line and the EPROM chip select pin.

The Z-8 signal, which is called data memory, is not used for reading EPROMs. Data memory signal will only be used if the application requires external RAM. A later project will cover this topic.

Port 1 — latch and EPROM

Port 1, bits 0 through 7 connect directly to the latch and the EPROM. Connect port 1, bit 0 to data input 0 of the latch. Connect port 1, bit 1 to data input 1 of the latch, and so forth.

There are 11 address select inputs to the EPROM. Connect port 1, bit 0 to address select 0 (AS0) of the EPROM. Connect port 1, bit 1 to address select 1 (AS1) of the EPROM, and so on.

Make sure that these lines are connected properly. If the lines between port 1 and the latch cross, the circuit will decode incorrect addresses. If port 1 and the EPROM are miswired, the Z-8 will read incorrect data.

Port 0 — extra address lines

Port 0, bits 0, 1 and 2 connect to EPROM address select inputs A-8, A-9 and A-10. Port 0, bit 3, will be left open for now. If the project required another 2k of EPROM memory, this bit would serve as the chip select signal.

Next month, I will continue this project by adding an RS-232 interface to connect an external terminal or personal computer to the Z-8.

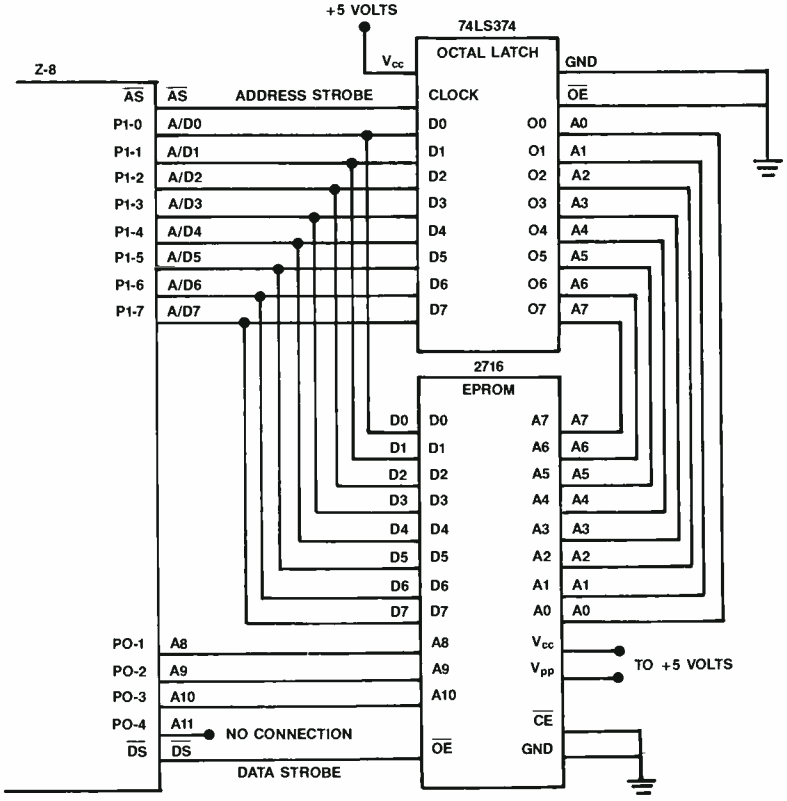

Figure 1. Schematic diagram for interconnecting Z-8 microcontroller, the address latch and EPROM.

Kaufhold is a market development engineer for SGS-Thomson Microelectronics, Phoenix.

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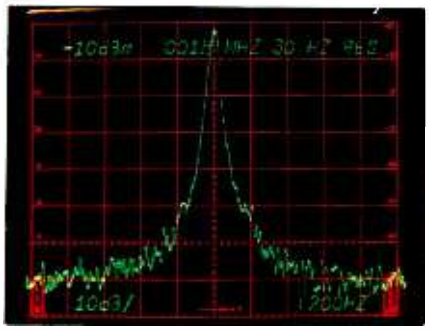
Part 1

Troubleshooting



DAT maintenance

Operating and maintenance tips

By Richard Maddox

As digital audiotape (DAT) begins making inroads to production rooms and broadcast stations, engineers are faced with servicing not only a new format, but a new technology. The format offers significant quality advantages, but it does so at the price of increased complexity.

This is the first of a 6-part series that will examine DAT from a servicing standpoint. Through this series, you will learn how to recognize and repair the most common (and some unusual) DAT failures. Be sure to save the entire series for your maintenance files.

Rotary digital audiotape (RDAT) was first intended as a consumer digital audio format, but has since captured the fancy of professionals as an inexpensive way to get into digital audio recording.

Of course, the term "inexpensive" is relative. A basic consumer unit can be had for well under $1,000, but the cost of obtaining DAT test tapes, test fixtures and service manuals must also be considered. Specialized tools and test gear are also required, and a stock of spare parts must be built.

Digital audio, even in a quasi-pro format such as DAT, doesn't come cheap. In the next few issues, this column will cover the hidden side of DAT — maintenance and service — to more fully inform the prospective purchaser or current user. Some highlights will include routine maintenance procedures, test gear, scope displays, head replacement, mechanical and electronic adjustments, troubleshooting, and replacement part intervals and costs.

Gearing up for DAT

When it comes to DAT machines, the maintenance budget and service schedules are more similar to those of VCRs than to audiocassette and reel-to-reel machines. The same goes for DAT test procedures and test gear.

Troubleshooting DAT can be almost impossible without a complete set of technical manuals and substitution boards. So many surface-mounted VLSI chips are tied together that even manufacturers' service centers don't bother troubleshooting some DAT boards.

Fortunately, the most common DAT problems are caused by mechanical problems rather than electronic ones. But without spare test boards, or a functioning second machine to compare symptoms with (or to "borrow from"), many futile hours can be spent trying mechanical and electronic alignments.

DAT maintenance

Regularly scheduled cleaning and maintenance on most DAT recorders requires that the top cover be removed to gain access to the transport area. One manufacturer recommends head-drum cleaning after every 10 hours of use. Field experience has shown that regular cleaning once or twice a month is sufficient for decks that are used approximately three hours a day.

Commercial cleaning tapes are available but, as VCR owners know, rotary head-drum cleaning tapes are a poor substitute for manual cleaning. Use a deerskin or chamois head-cleaning swab dipped in ethyl alcohol or another common head-cleaning chemical.

Like all tape transports, the DAT capstan needs to be cleaned on a regular basis, as do the tape guides. The same type of chamois swab can be used, but avoid letting any solvent drip into the bearings.

Some manufacturers recommend using a non-detergent dish soap to clean the pinch roller. This type of cleaning preserves the lubricants in the rubber. Others recommend the same commercial rubber cleaners that are used on reel-to-reel pinch rollers. Another approach is to change the pinch roller when the head drum is replaced.

If a head drum becomes clogged again right after it is cleaned (dropouts detected in less than a week of steady use), it probably means that the head drum is worn, especially if it has had more than 1,000 hours of use. Some manufacturers have added an elapsed playing-time indicator on their DAT machines to accurately count head wear.

Typical DAT problems

Because DAT machines have only been in the field for about three years, certain long-term problems are just now being addressed or recognized. Many of these are common difficulties that everyone will encounter sooner or later.

- *Eating tapes.* Tapes are usually "eaten" by the machine during loading or unloading. Sluggish guide arms and tapes that have been heavily used are the most common causes.
- *Dropouts.* Muting, dropouts and digital glitches, the most common DAT problems, can be caused by many elements of the DAT machine, including the tape itself. If the dropouts are periodic (every one to two seconds), there is a problem with the RF envelope. This can be caused by a defective RF amp, misaligned tape guides or electronic adjustments that have drifted.

Dropouts can also result when the DAT cassette cover slips forward during recording or playback and hits the supply and take-up reels. Because the DAT transport has a low torque (typically 12g/cm forward torque and 6g/cm back tension), this extra drag will adversely affect transport operation.

- *Caution or transport errors.* The caution light indicates that a tape has stopped moving, or that there is too much moisture inside the machine (which could cause the tape to stick to the head drum). In many cases, tape stoppage can be traced to sticky reel table brakes. Cleaning the reel table and brake pad will sometimes help, although replacing the assembly is a sensible alternative, if a spare is available.

This problem often occurs when a DAT machine is first powered up after sitting in a cold studio overnight. The easy solution is to leave it on all of the time. A deck that has been stored in a cold vehicle and then immediately powered up indoors may also exhibit this symptom because of condensation on the head drum. Always allow DAT hardware adequate time to adjust to ambient temperature before using it.

Next month, we'll look at some of the test equipment and alignment procedures you'll need to service DAT machines. In addition to the typical test devices, you'll need special test tapes, tools and jigs.

Maddox is technical manager at Media Management Associates, Lynnwood, WA.

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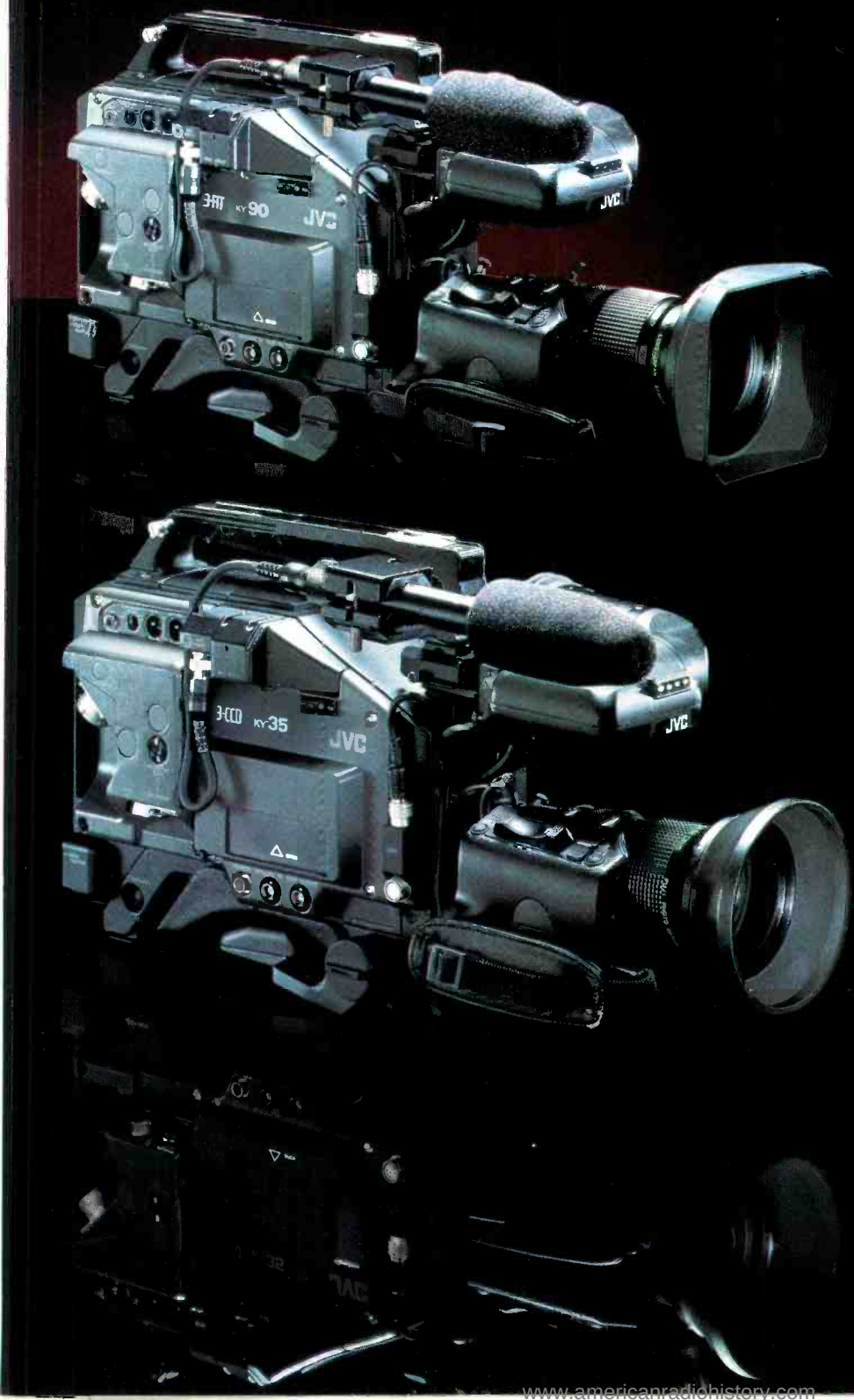

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Management for engineers

How do you rate?

By Art Behal

Does the following scenario seem familiar? It's time for your annual salary review, which hasn't been done in 16 months. You walk into the general manager's office. You are told that the station is happy with the work you're doing and you receive a dollar figure for a raise. You do some quick mental math (or maybe you have a calculator) and see that the percentage increase is just about equal to last year's increase in the cost of living. What does this tell you about how happy the manager was with your work?

The feedback loop is broken

When you ask why the raise wasn't higher, you may be told first about financial pressures on the business. Then you may be told that the engineering department needs to increase its productivity. Finally, you may be told that there are some areas in which you need to improve.

At the end of the meeting, no one is satisfied. Your boss thought you would appreciate the raise, and you walk away feeling that your station wouldn't know good solid engineering from a hole in the ground.

Worst of all, your meager salary increase is cast in stone for the next year, or longer. Even if you feel the manager's criticisms are legitimate, it's too late to do anything about it. Herein lies the basis for this discussion. Why weren't you told about these factors months ago?

The problem involves a mutual lack of proper communication. In this case, you were working toward what you believed were the correct objectives. Unfortunately, your supervisor saw your performance quite differently.

Establish objectives

A legitimate evaluation begins with objective performance criteria. You and your GM need to sit down before the beginning of the appraisal period and decide on the standards against which you will be judged. To have legitimacy, the standards must be measurable. It is not enough to say, "Keep off-air time to a minimum." How many minutes are there in a minimum? There must be more specificity, such as "non-scheduled transmitter downtime less than two hours per month" for example, or "99% of station logs reviewed within one week." These criteria are quantifiable.

This approach keeps personal feelings and biases — whether conscious or subconscious — from entering into the year-end assessment. Either you reached these objectives or you didn't. You may even want to establish different levels of performance criteria, such as a "minimum acceptable level," which would be two hours off-air per month and an "outstanding level," which would be one hour per month.

Just as you need feedback from your boss, your subordinates need feedback from you.

You and your GM will have to negotiate the details based on your organization's particular situation. The two of you might consider parameters like your response time to emergencies, how work may be measured differently on weekends or during your vacation time, special projects you will undertake and whether the periodic objectives previously mentioned will have their results averaged across a full year. The language must be unambiguous. Does downtime mean off the air entirely or does it include any operation at less than 90% of authorized power? Or 50%? It is important to decide on these issues at the outset.

Bowling blind

In their book, *The One-Minute Manager*, Kenneth Blanchard and Spencer Johnson compare working without objectives to bowling with a bedsheet hanging in front of the pins. You're not sure where to aim, and once the ball passes the sheet, all you can do is hear the fall of the pins — you can't see whether you knocked them all down. Maybe someone on the other side (your manager) will call out, "You got two." But more likely, that person will call out, "You missed eight." Unfortunately, you still don't know which two (or eight) you got, or how to adjust your aim so that you can hit more next time.

Having clear objectives is equivalent to removing the sheet. Now you know what is expected of you, where and how to aim for it and what parts of the job remain to be done. This concept is only one of many interesting ideas presented in *The One-Minute Manager*. The paperback book is approximately 100 pages and is an easy read. It's worth picking up at a bookstore or library.

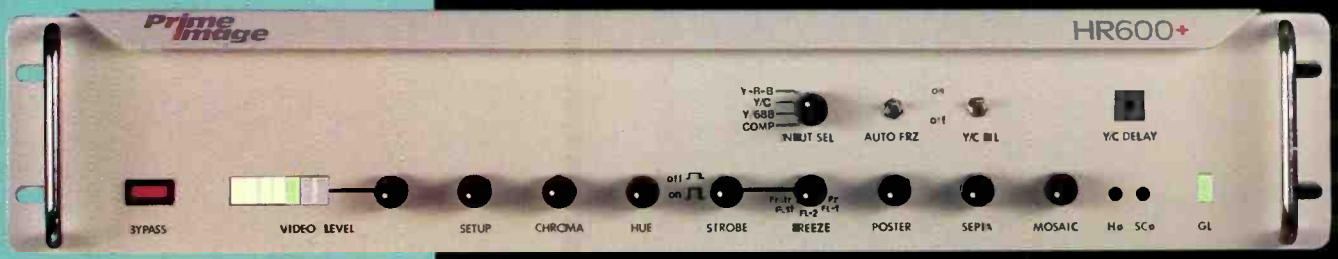
Restoring feedback

No matter how specific and objective your criteria are, you will still need some indications along the way to let you know how you're doing. One good way is to submit a monthly report to the GM detailing your performance as it relates to the established standards. You can see how your performance measures month by month, and you won't have any nasty surprises when you total your progress at the end of the year.

This type of feedback is as important in personnel management as it is in an electronic circuit. Without electronic feedback, an amplifier would run unchecked to its furthest limit. Feedback keeps performance at the proper level. Employees operate the same way — feedback is necessary to keep them working within an acceptable range. And, just as you need feedback on your performance from your boss, remember that your subordinates need the same objective standards and feedback from you.

But having clear targets to shoot for won't guarantee you a big raise, but if you have done your job well, it will certainly give you more ammunition to justify your value to the company at appraisal time. On the other side, it will be much easier for you to rate your subordinates and determine their raises if you use the clear goals you have established for them.

Behal, a former chief engineer, is a manager for New York Telephone, New York.



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DRB news

By the *BE* staff

The world's first digital radio broadcasting (DRB) service has begun operations in Japan. Radio GIGA went on the air from geostationary satellite last November, offering multiple, high-quality stereo audio channels in the 15GHz band. The channels include various music formats and several "ambient" channels, which feature nature sounds for background listening.

Reception requires newly developed hardware, including a 25-inch receive dish and a decoder/receiver that retails for $900. Although broadcasts are currently unscrambled during the service's introductory period, scrambling will be added later this year, when a fee structure starting at $4.60 per month is instituted. The medium-power DBS satellite that is used limits the system to fixed reception only. Another satellite will offer an additional 18 channels of DBS digital radio service to Japan this fall. Several American companies are reportedly among the applicants for those channels.

FTC enters DRB arena

The Federal Trade Commission (FTC) staff has recommended in a brief to the Federal Communications Commission (FCC) that frequency allocations for digital radio should be sold, perhaps at auction. The document contrasts strongly with comments to the FCC from the NAB and others, which favor DRB being treated as a replacement service, and as such, frequencies should be granted to all existing AM and FM radio broadcast licensees on a blanket basis. The FTC brief also contradicts the current FCC licensing policy for new authorizations.

Stating increased benefit to consumers and reduced opportunity for abuse and delay, the FTC recommended a "pure market approach" to the digital radio licensing process, granting the frequencies "to those having the greatest willingness to pay for them." The FTC acknowledged that the FCC is not legally authorized to auction channels at present, yet it still recommended that it do so in this case. FCC officials declined comment on the FTC action, citing it as one of the many diverse proposals and comments being considered in the complex regulatory environment of digital radio.

NAB moves to license Eureka 147

At its meeting in Naples, FL, on Jan. 29, the NAB Radio board of directors unanimously voted to pursue an exclusive North American licensing agreement with the European consortium Eureka Partners for the Eureka 147/DAB system of digital radio broadcasting. If executed, this agreement would give NAB's for-profit subsidiary, NAB Technologies, exclusive rights to license Eureka 147/DAB to any North American broadcaster licensed to provide the service. Royalties on such an agreement would be shared by the Eureka Partners and NAB, and have been valued up to $10 million by NAB officials. However, other industry observers quote a figure two to three times higher.

The Eureka Partners had submitted a letter of intent to NAB expressing its interest in such an agreement. The board action has accepted the letter, which is subject to an "additional technical evaluation" by the NAB's DAB Task Force Technical Advisory Group and other industry engineers. According to Alan Box, president of EZ Communications and chair of the DAB Task Force, no specific technical issues are under scrutiny. Members of the Technical Advisory Group (all of whom are engineers) and other NAB member station engineers will travel to Rennes, France to observe the Eureka system in action.

The NAB Radio Board also stressed the continuing importance of localism in future digital radio systems, and echoed an NAB TV board action opposing the use of UHF TV frequencies for terrestrial DRB, preferring that they be reserved for ATV applications.

Copyright Office receives DRB comments

In response to its Notice of Inquiry on the subject of Digital Audio Broadcast and Cable Services (Docket No. RM 90-6), the U.S. Copyright Office received comments covering a broad spectrum of opinions. The primary issues addressed home taping and artist royalties. Music industry respondents claimed that home taping would increase with DRB, and suggested various methods of extracting appropriate compensation from entities (cable and broadcast) implementing digital transmission systems and from the public. Among these were proposals for congressional institution of performance rights in sound recordings, the inclusion of subcode information with copyrighted digital transmissions, and the prohibition from transmission of two or more selections from the same artist release.

Several broadcasters and the Home Recording Rights Coalition (HRRC) all took positions against the imposition of such restrictions, claiming that digital broadcast will not significantly increase home taping or reduce sales of prerecorded products. The HRRC commented that private non-commercial home taping is legal under fair use clauses of the Copyright Act, and that digital systems will not change listeners' practices from their current analog activities. Citing a Congressional Office of Technology Assessment (OTA) study conducted in October 1989, HRRC indicated that "there is positive evidence that home taping tends to stimulate sales," and concluded that any encryption or "debit card" system would be unnecessarily expensive and invasive. Several respondents also pointed out that previously predicted consequences of harm to the producers of entertainment media by home taping have failed to materialize and, in some cases, just the opposite reaction has occurred.

CDRB announces changes

The Committee for Digital Radio Broadcasting (CDRB) announced at its Winter CES meeting in Las Vegas that Skip Pizzi, technical editor of *Broadcast Engineering* magazine, will fill the post of chair, which was vacated by Paul Donohue, vice president of engineering at Gannett Broadcasting. CDRB also announced that negotiations are under way for a joint effort with the Society of Broadcast Engineers (SBE) to fulfill the committee's purpose of offering a disinterested forum for communication and discussion of DRB issues. This was CDRB's first appearance at CES, and presentations at the meeting encouraged input from the consumer electronics community. At the meeting, representatives

continued on page 214

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BUSINESS AND PROFESSIONAL GROUP

NAB engineering conference preview

By Skip Pizzi,
technical editor

The industry assembles once again in Las Vegas.

The 1991 NAB Convention will be held April 15-18, at the Las Vegas Convention Center (LVCC). The 45th annual Broadcast Engineering Conference will open a day earlier, as usual.

If you haven't been to Las Vegas since NAB '89, expect some changes in the landscape. The LVCC is undergoing renovation, causing a few geographic departures from tradition. See *Broadcast Engineering* magazine's exclusive NAB floor map, which is included in this issue, for details on these changes.

HDTV exhibition

"HDTV World" is a separate HDTV exhibit and conference to be held concurrently in the Las Vegas Hilton Pavilion, adjacent to the convention center. It will follow the regular NAB exhibit hours of 9 a.m. to 6 p.m. Monday through Wednesday, and 9 a.m. to 4 p.m. on Thursday.

The exhibition will include the NHK Technology open house, featuring more than 25 exhibits of research projects, prototypes and products for leading-edge audio and video. (This will be the first United States appearance of this globally popular exhibit.) Also on the floor will be demonstrations by the terrestrial U.S. ATV broadcast standard proponents, and HDTV production equipment exhibits.

Digital radio demo

Of particular interest will be the first U.S. on-air trials of the Eureka 147/DAB proposal for a digital radio broadcasting (DRB) system. A variety of audio and data channels will be broadcast over a single Eureka system signal, on UHF channel 15 (476-482MHz). A standard FM stereo signal (200W ERP) at 94.9MHz will be used for comparison purposes. Both systems' transmitting antennas will be located on the Hilton Center roof. ERP of the Eureka system will provide an equivalent power-per-channel to the FM signal. (At least one local FM station will also be simulcast on the Eureka system.) A "gap-filler" retransmitter will be placed on the roof of the Golden Nugget Hotel in the downtown Las Vegas area, demonstrating the on-channel booster ability of the format.

Listeners will be able to audition the system (and observe the data channel reception) at the Eureka booth on the exhibit floor, and on headphones in a 40-passenger bus that will stop outside the Hilton Pavilion. The bus will run during exhibit hours, and will feature a live announcer guide to the demo, and video monitors with scope displays. Each ride will run 30 minutes. Reservations will be taken at the Eureka booth on a space-available basis. NAB expects to accommodate as many as 5,000 mobile listeners.

Conference papers

A wide variety of current and emerging technologies are featured in the conference schedule. A complete listing of presentations as they stand at press time begins on pg. 28. (See also the related article on the "HDTV World" conference schedule pg. 32.) Most papers will appear in the *Proceedings* of the conference, and all sessions are scheduled to be recorded. Refer to the exhibitor listings and new products listings in this issue to complete your NAB 1991 preparation.

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Engineering conference schedule

Sunday, April 14

Radio sessions

Digital Audio Integration

9:00 a.m.

1. Keynote Presentation, Larry Cervon, *Broadcast Electronics.*
2. "A Tutorial on Recordable Compact Discs," Laura J. Tyson, *Denon America.*
3. "An All-Digital Commercial Insertion System," Greg Dean, *Computer Concepts Corporation.*
4. "Low-Cost Digital Sample-Rate Converters," David Horton and Sangil Park, Ph.D., *Motorola.*
5. "Spectrum-Efficient Digital Audio Technology," Kent Malinowski, *Scientific Atlanta.*
6. "An Integrated Digital System for Broadcast Audio," David J. Evers, *Broadcast Electronics.*
7. "All Digital CD-Quality Studio-to-Transmitter Link," Jamel Hamdani, *Moseley Associates.*
8. "Performance Considerations for Satellite and Terrestrial Digital-Encoded Audio Circuits," William W. Rollins and Kenneth N. Beaupre, *Intraplex.*

AM Systems Engineering and Improvement
1:30 p.m.

1. "FCC AM Regulations Update," FCC representative (TBA).
2. "Modern Methods in Medium-Wave Directional Antenna Feeder System," Ronald D. Rackley, *duTrell, Lundin & Rackley.*
3. "Using Isolation Transformers to Lease AM Tower Space," Thomas King, *Kintronics Laboratories.*
4. "Noise-Free Radio," George Yazell, *Noise Free Radio.*
5. "Implementation of Anti-Skywave Antenna Technology by Extreme Top-Loading of Short Antennas in a Directional Array," Timothy C. Cutforth, P.E., *Vir James P.C.*
6. "Maintaining Your AM Towers: Care and Feeding," Owen Ulmer, *Stainless;* and Bob Sundius, *S.G. Communications/Stainless.*

Television sessions

Video Test and Measurement
9:00 a.m.

1. "Video Test and Measurement Workshop," Margie Craig, *Tektronix.*

Television Engineering — Signal Distribution and Transmission
1:30 p.m.

1. "Complying with the October 1, 1991 STL Deadline," Craig M. Skarpiak, *Andrew.*
2. "Looking 100MHz Ahead: The Need for Bandwidth in Routing Switchers," Keith Bond and Kerry Wheeles, *PESA Industries.*
3. "Multistage Distribution Switching Systems, Close and Beyond," Marc S. Walker, *BTS Broadcast Television Systems.*
4. "A Unique Adaptation of the Traditional Television Vector Display," Mark Everett, *Videotek.*
5. "The Development of Commercial Echo Cancelers for Television," Stephen Herman, *Philips Laboratories.*
6. "The Use of Remote Monitors in Transmitter Operations," R.K. Chrisop, *Harris Broadcast Division.*
7. "Average Power Ratings of Coaxial Transmission Line — An Update," Tony Schmitz, *Dielectric Communications.*
8. "Strip-Line Technology — Fundamentals, History and Applications in High-Power Broadcasting Transmission," Clyde Turner, *LDL Communications;* and Steven Crowley, *duTreil, Lundin and Rackley.*
9. "A Digital Amplitude Modulator Transmitter," Timothy P. Hulick, Ph.D., *Acrodyne Industries.*

Other sessions

Professional Development
10:25 a.m.

1. "Learning to Say No," Judith E.A. Perkinson, *The Calumet Group.*

Monday, April 15

Radio sessions

Audio/Radio Test and Measurement
1:30 p.m.

1. "Audio/Radio Test and Measurement Workshop," Guy Berry, *Potomac Instruments;* and Kent McGuire, *Sound Technology.*

Advances in FM System Design
3:05 p.m.

1. "NRSC FM Subcommittee Report: FM Receiver Studies," Edward Anthony, *Broadcast Electronics.*
2. "Effective Methods for Supplementing Coverage Deficiencies for VHF FM Broadcast Stations," Benjamin M. Dawson, III, P.E. and Thomas M. Eckels, *Hatfield and Dawson.*
3. "Advances in Techniques for Airborne Antenna Pattern Measurements," Harrison J. Klein, P.E., *Hammett & Edison.*
4. "RDS in the United States: An Update and Look into the Future," Gerald M. LeBow, *Sage Alerting Systems.*

Television sessions

Television Production and Post Production
9:00 a.m.

1. "Large Multichannel Wireless Microphone Systems," Joseph Ciaudelli, *Sennheiser Electronic Corporation.*
2. "Trends in Electronic Graphics Equipment," Steven M. Davis, *WPRI-TV.*
3. "Character Animation — The Merging of Technology and Creativity," Randy Trullinger, *Ampex Recording Systems.*
4. "Emerging Issues in Still-Storage, Distribution and Management," Michel Proux, *Leitch Video of America.*
5. "Design Considerations for Today's Still-Store Systems," Robert Pank, *Quantel.*
6. "The Advantages of Digital Non-Linear Editing in the Post-Production Process," William J. Warner, *Avid Technology.*
7. "The Conversion to Digital Video Editing at CBS," Donna Faltitschek, *CBS.*

Television Automation
1:30 p.m.

1. "Computer Technology Applied to Off-Site Remote Transmitter Operation," Gary C. Schmidt, *Broadcast Software.*
2. "The Use of Ethernet in Broadcast Facility Process Control," Robert W. Odell, *Utah Scientific.*
3. "Network Automation," Mike Fuqua and Suresh Gursahany, *IBM.*
4. "Advances in Cart Machine Control Systems," Raymond Baldock, *Odetics Broadcast.*
5. "Smart Carts: Improving Station Efficiency Without Breaking the Bank," William F. Carpenter, *Ampex Recording Systems.*
6. "A Critical Look at Camera Robotics," David Philips, *KPIX.*
7. "Robotics—The Capitol Hill Project," Darcy Antonellis and Dobrimir Borovecki, *CBS.*
8. "An Innovative, Intelligent Remote-Control System," Sergio Moreno, *Schmid Telecommunication.*

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Other sessions

International Technical Updates and Agendas
9:00 a.m.

1. "How CCIR's 1990-1995 Agenda Will Affect U.S. Broadcasters," Walda Roseman, *FCC.*
2. "DAB in the CCIR — An Overview of the International Technical Basis for Digital Audio Broadcasting," William Meintel, *Datel.*
3. "WARC 1992: Whose Spectrum Ox Will be Gored?" Jule E. Rones, Consultant.

Broadcast Auxiliary and Satellite Systems
9:00 a.m.

1. "An Automated News and Public Affairs Radio Network Via Satellite," William Spurlin, *The Christian Science Monitor.*
2. "State-of-the-Art Technology in Microwave ENG Transmitters and Receivers," John B. Payne, III, Ph.D., *NUCOMM.*
3. "Concepts of Scrambling Technology," Stan Moote, *Leitch Video of America.*
4. "Low-Cost Video Uplink for Broadcasters," Anthony Campbell, *Andrew.*
5. "Audio Communications in a Satellite News-Gathering Vehicle," Daryl Hunter and James Brink, *GTE Spacenet.*

Emergency Broadcast System Improvement
11:15 a.m.

Panel (TBA).

Tuesday, April 16

Radio sessions

FM Modulation Monitor Forum: What the FCC Expects (R)
9:15 a.m.

Panelists: Charles Halbrick, *QEI*; Arno Meyer, *Belar Electronics Laboratories*; Eric Small, *Modulation Sciences*; Joe Wu, *TFT*; FCC representative (TBA).

Digital Audio Broadcasting — System Concepts
2:30 p.m.

1. "Systems Concepts for the Delivery of Digital Sound Broadcasting," Gerald Chouinard, *Communications Research Center;* and Francois Conway, *CBC.*
2. "Communications Systems Engineering for Digital Audio Broadcast," James Wang, Ph.D., and Steve Kuh, *LinCom.*
3. "The NAB Digital Audio Broadcast Spectrum Study," Alan E. Gearing, P.E., *Jules Cohen & Associates, P.C.*
4. "Subjective Evaluation of Audio Data Reduction Encoders," *Swedish Radio/EBU.*
5. "Initial Experiments with DAB in Canada," Francois Conway, *CBC.*

Television sessions

UHF Transmission
2:30 p.m.

1. "All-Band VHF and UHF Antennas," Dr. Vittorio Raviola, *SIRA.*
2. "High-Power Solid-State Amplifier for a VHF/UHF Band Transmitter Using BLVG2 Transistor," Martin Koppen, *Philips Components.*
3. "Status Report on High-Efficiency UHF TV Transmitters," J.B. Pickard, *Harris.*
4. "Air-Cooled Common Amplification TV Transmitter at 1,200kW: UHF Breakthrough," Nat S. Ostroff, *Comark Communications.*

Digital Video and Transmission Systems
9:00 a.m.

1. "The Migration Path from Analog to Digital," J. Robert Mullins, *Utah Scientific.*
2. "A Pragmatic Approach to Digital Pandemonium," Thomas R. Goldberg, *Ampex Recording Systems.*
3. "Digital Video Compression Techniques for Math Haters," Robert L. Miller, *The Grass Valley Group.*
4. "SPECTRE — Digital Television to U.K. Homes in the Existing UHF," A. Mason, J. Gledhill and B. Tait, *Independent Broadcasting Authority.*

Other sessions

Broadcast/Aeronautical Compatibility
9:15 a.m.

1. "Broadcast/Aeronautical Compatibility Issues and Status," Ralph Justus, *National Association of Broadcasters.*
2. "Update on FAA EMI Processing," William P. Suffa, P.E., *Lahm, Suffa & Cavell.*
3. "FAA Perspectives on Protecting the National Airspace," David F. Morse and Jerry Markey, *FAA.*
4. Panel discussion.

FM/TV Antenna and Transmission Lines
11:05 a.m.

1. "FM/TV Antenna and Transmission Line Workshop," Dean Sargent, *D.W. Sargent Broadcast Service.*

Contract Engineers Workshop
11:05 a.m.

Panelists: John Bisset, *Multiphase Consulting*; Pete Boyce, Consultant; Grady Moates, *Loud and Clean*; Mike Patton, *Mike Patton & Associates.*

Wednesday, April 17

Radio sessions

FM Systems Engineering and Improvement
9:00 a.m.

1. "FCC Regulations Update," FCC representative (TBA).
2. "The Technical Future of FM Radio," Thomas B. Keller, *Broadcast Technology Partners.*
3. "Effects of Limited Bandwidth Transmission Paths in FM on Audio and SCA/RDS Performance," Charles W. Kelly, Jr., *Broadcast Electronics.*
4. "An 'N + 1' Compatible FM Exciter," C.W. Collins, *Harris.*
5. "High-Power, Multi-User Booster System for the San Francisco Bay Area," Bill Ruck, *KFOG/KNBR.*
6. "A New Design in Multi-User FM Antennas," Eric Dye, *Jampro Antennas.*

Digital Audio Broadcasting — Methods and Systems
1:30 p.m.

1. "Evolution of the EU-147 System," *Eureka Partners/EBU.*
2. "Modulation and Coding for DAB Using Multifrequency Modulation," Paul H. Moose, Ph.D., and John W. Wozencraft, *Mercury Digital Communications.*
3. "Compatible Digital Audio Broadcast System," John E. Leonard, Jr. and Glen A. Myers, Ph.D., *Kintel Technologies.*
4. "Multipath Cancellation Techniques for Digital Audio Broadcasting," Edward A. Schober, P.E., *Radiotechniques Engineering Corporation* and William J. Spurlin, *Christian Science Monitor.*
5. "The RadioSat System," Gary K. Noreen, *Radio Satellite Corporation.*
6. Panel discussion.

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Other sessions

Computer Applications for Broadcast Engineers
10:55 a.m.

1. "Introduction to Computers for Broadcast Engineers," Thomas Osenkowsky, *WLAD Radio.*
2. "Computerized Documentation: An Engineer's Foe or Friend?" Walter Black, Ph.D., *Video Design Pro.*

Safety and Environmental Concerns
1:30 p.m.

1. "PCB Enforcement Practices of the EPA," Roland K. Kump, *General Electric Company.*
2. "Utility Paralleling Emergency Power Generator Reduces Transmitter Operating Costs," Harvey Arnold and Wayne Estabrooks, *University of North Carolina Center for Public Television.*
3. "What the 1989 San Francisco Earthquake Taught Us About Preparedness," Peter Hammar, *Hammar Communications.*
4. "Studio Power Quality and Grounding Design Concepts," William A. McVey, Jr., P.E., *PSA Consulting Engineers.*
5. "Computer Analysis of On-Tower RFR Exposures," William F. Hammett, P.E., *Hammett and Edison.*
6. "Building an Urban Multiple-Station Broadcast Tower for Reduced Downward Radiation and Enhanced Coverage," Larry M. Holtz, *KSGO/KGON.*

Thursday, April 18

Radio sessions

Audio System Design and Measurement
9:00 a.m.

1. "Fast Response and Distortion Testing of Broadcast Audio," Richard C. Cabot, *Audio Precision.*
2. "The Future of Analog Audio Cartridges," William Franklin, *Fidelipac Broadcast Tape Products.*
3. "The Digital Cart Machine," Robert Easton, *360 Systems.*
4. "Audio Processing for Radio in the Digital Domain," William Gillman, *Gentner Electronics.*
5. "Applications for Digital Audiotape Machines Within Radio Broadcasting," Mel Lambert, *Media and Marketing.*
6. "A World's First Studio Acoustic Design," Brian McGettigan, *Radio New Zealand, Engineering.*

Television sessions

Interactive Television
9:00 a.m.

1. "Interactive Television Technologies: An Overview," Diana Gagnon, Ph.D., Consultant.
2. "The TV Answer Interactive Television System," Fernando Morales, Harold L. Kassens and Howard T. Head, *TV Answer.*
3. "The Interactive Network Control Unit," Robert Brown, Ph.D., *Interactive Network.*
4. "I-Net Interactive Television," Louis Martinez, *Radio Telecom and Technology.*
5. "ACTV Cable Television," Leonard Schaier, *ACTV.*

1991 HDTV World Conference Schedule Overview

Monday, April 15

8:30—9:00 a.m.

Opening Ceremony

9:00 a.m.—12:00 noon

- **The Continuing Evolution of Television:** *A Brave New World*
  An international look at where television has been, where it is now, and where it is heading, from technical and economic perspectives.

2:00 p.m.—5:00 p.m.

- **The Transition to HDTV:** *Changing the World*
  Considerations of transitional scenarios to high definition, including audio, data and closed-captioning issues, with emphasis on affordability.

2:00 p.m.—5:00 p.m.

- **Programming in HDTV (I):** *A World of Its Own*
  A collection of international HDTV programs will be screened.

Tuesday, April 16

9:00 a.m.—11:40 a.m.

- **Enhanced Television Systems:** *Toward a Wide Screen World*
  Technical updates on several NTSC and PAL format improvements.

9:00 a.m.—12:00 noon

- **Programming in HDTV (II):** *A World of Its Own*
  More HDTV programs from around the world.

10:45 a.m.—12:00 noon

- **1991 HDTV Assessment:** *The World Today*
  A panel of industry experts discuss recent technology and regulations affecting HDTV.

2:00 p.m.—5:00 p.m.

- **HDTV's First Markets:** *A World of Possibilities*
  Non-broadcast applications of HDTV, including those in the industrial, medical, museum, aerospace and cinema trades.

2:00 p.m.—4:15 p.m.

- **HDTV Global Issues:** *HDTV Around the World*
  International broadcast standards and their relationships to regional standards activities.

Wednesday, April 17

9:00 a.m.—12:00 noon

- **ATV Transmission Proponents for North America:** *The World is Watching*
  Presentations by each of the proposed terrestrial U.S. HDTV broadcast formats.

1:00 p.m.—3:00 p.m.

- **Testing the ATV Systems:** *Is there a World of Difference?*
  The challenges faced by those who must evaluate proposed ATV systems.

1:30 p.m.—5:00 p.m.

- **Alternate HDTV Delivery Methods:** *Worlds Apart?*
  Cable, fiber, DBS and electronic cinema possibilities for HDTV delivery.

3:15 p.m.—5:00 p.m.

- **RF Spectrum for Terrestrial HDTV:** *It's a Crowded World*
  Spectrum requirements of HDTV broadcasting, and proposals for allocations.

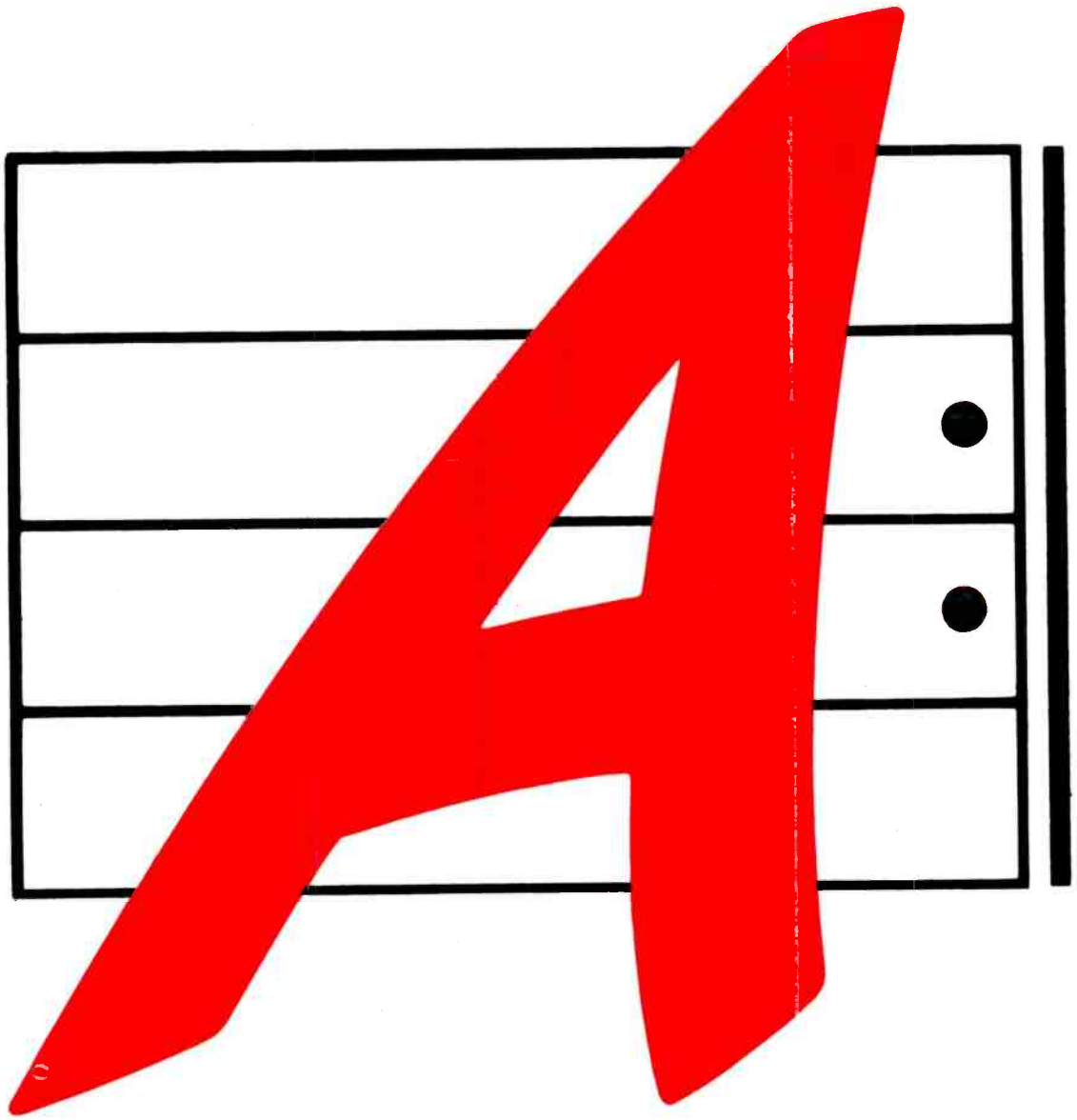
Thursday, April 18

9:00 a.m.—12:00 noon

- **New HDTV Technology and Systems:** *Setting the World on Fire*
  The frontiers of current technology in production and transmission of HDTV.

9:00 a.m.—11:00 a.m.

- **HDTV Display Technology:** *Windows on the World*
  New directions in CRT and projection viewing of HDTV.



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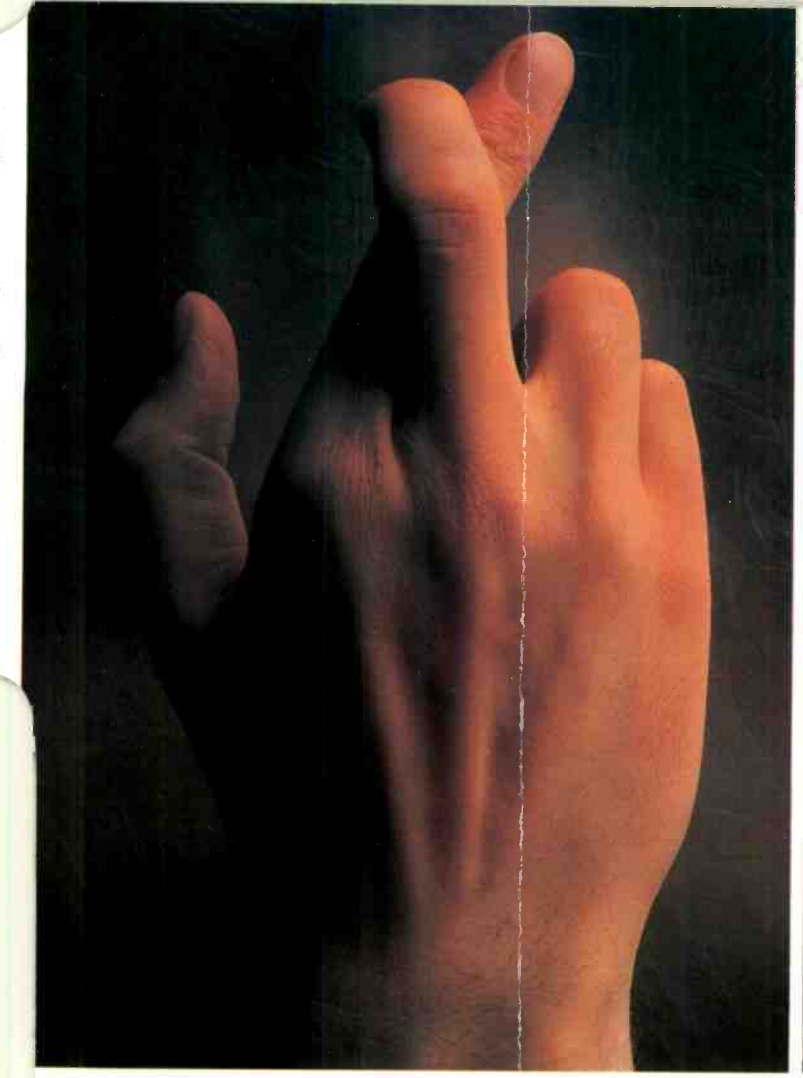

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How do you judge a standards converter – on paper or on performance?

For professional broadcast engineers there can only be one answer: hands-on experience.

That's why Snell & Wilcox has been given such a massive thumbs up by all the world's major broadcasters. They already use more Snell & Wilcox standards converters than any other brand.

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There is of course one major performance specification without which all the others are useless:

Reliability – When you're a Snell & Wilcox user you can relax. In the unlikely event that you ever have a problem – call us up and speak directly to the engineers who designed and built your machine. They will resolve it rapidly and efficiently.

What other manufacturer can offer that reassurance?

But naturally we don't expect you to be convinced just by promises on paper.

The only real way is to judge for yourself.

Our range covers every area from corporate/industrial through to high-end film transfer and all the requirements of broadcast including HDTV. Whatever your need, call us to arrange a demonstration.

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SBE

SBE Update continued from page 14

New SBE chapters formed

Three new SBE chapters have been formed in the last three months. Two of these chapters are located in the United States and the other one is located in the Philippines.

The new Knoxville, TN, chapter has 20 registered members, but had 35 people in attendance at its last meeting. The chairman is Ed Martin from Kennedy Maxwell Productions. If you live in this area and are interested in joining, call Martin at 615-970-2192.

The second new U.S. chapter, which has 17 members, is based in southern Idaho. It is chaired by Peter B. Hoekzema, who works in Boise at KTVB-TV. If you want information on becoming a member, he can be reached at 208-375-7277.

Because travel is difficult during the winter months, Hoekzema says his chapter will rely on computers for much of its communication. The entire society will be looking forward to a report on how well this new process works.

The new international chapter, which has 20 members, is based in Manila, Philippines. Its chapter chairman is Arcadio M. Carandang. He can be reached at Molave Broadcast, No. 202 Centrum 2 Building, 150 Valero St., Salcedo Village, Makati, Metro Manila, Philippines, 1200.

Newly-elected chapter chairman, Arcadio Carandang, is congratulated by chapter members and SBE board member Chuck Kelly.

The Manila chapter has been in development for almost a year. SBE board member Chuck Kelly, because of his international travel, was instrumental in organizing the chapter and shepherding it through the qualification process.

Each of these chapters should be congratulated on their entry into the SBE. Let's all be supportive of their efforts.

If you would like to know more about starting a chapter in your area, call the SBE national Indianapolis office at 317-842-0836. The staff can provide materials and guidance on how to complete the qualification process.

BE conference update

Have you ever wanted to present a paper before a major engineering conference? Do you have an important issue that needs to be addressed? Have you discovered some type of new technology or a way to improve your engineering department that you would like to share with others?

If so, you should consider presenting a paper at the 1991 SBE National Convention and *Broadcast Engineering* Conference in Houston, Oct. 3-5.

Several important topics have already been suggested. They are listed in Table 1. If you would like to address one of these topics, you should contact the technical review committee by April 1.

Next, you must prepare a one-page abstract on your topic and send it by April 1 to the SBE office, P.O. Box 46220, Indianapolis, IN, 46220. Phone calls and letters of application will not be accepted. Selected papers from the conference will be printed in the SBE *Proceedings*.

PROPOSED SUBJECT TOPICS

- Automation in broadcasting
- Using personal computers in broadcasting
- Planning for camera robotics
- Integrating multiplay cart machines for on-air use
- Remote transmitter control
- Training operations personnel on automation systems
- High-definition television, production
- High-definition television, transmission
- New technology for radio and television
- Digital radio broadcasting
- Field experience with NRSC-standards equipment
- Digital audio and video recording technology
- Using MIDI for audio production
- Applying fiber-optic technology in broadcasting
- Enhancing the NTSC signal
- FM translators and boosters
- New approaches to radio ENG
- Using cellular telephones for broadcasting
- Making money with SCA
- Broadcast transmitter maintenance
- Troubleshooting transmission lines and waveguides
- Antenna system maintenance and troubleshooting
- ENG technology and the Gulf War

Table 1. *These topics have been developed by the conference committee to help potential presenters understand the wide range of options that are available. Although the list is not inclusive, preference may be given to papers addressing these issues.*

News
Continued from page 4
the VideoCipher division's headquarters in San Diego, and transmitted over the SBS-6 satellite. The signals were received in Las Vegas and cabled into the exhibition hall where a prototype DigiCipher satellite receiver processed the material and displayed it on a direct-view monitor.

NAB names DAB advisory group

The NAB has selected a 12-member technical advisory group to serve as an engineering resource for the NAB digital audio and satellite sound broadcasting task force. The task force is studying the potential uses of digital audio broadcasting (DAB), a new radio technology that can deliver CD-quality sound over the air.

Members of the advisory group are: chairman Don Wilkinson, vice president, director of engineering, Fisher Broadcasting, Seattle, WA; Bud Aiello, director of engineering, EZ Communications, Fairfax, VA; Paul Donahue, director of engineering, Gannett Radio, Los Angeles, CA; Bob Donnelly, general manager, Satellite Systems, Radio Division, Capital Cities/ABC Broadcast Group, New York; Terry Grieger, vice president, director of engineering, Emmis Broadcasting, Burbank, CA; Donald Lockett, director of engineering, National Public Radio, Washington, DC; Tony Masiello, director, technical operations, Radio Division, CBS, New York; Charles Morgan, vice president, director of engineering, Susquehanna Radio, York, PA; Tom Montgomery, director of engineering, Federated Media, Elkhart, IN; Milford Smith, vice president, engineering, Greater Media, East Brunswick, NJ; Dave Murray, chief engineer, WWNZ/WSSP, Orlando, FL; and Dennis Snyder, chief engineer, WJOY/WOKO, Burlington, VT.

Panel to develop standards for RBDS technology

A panel of America's broadcasters and receiver manufacturers has announced that it plans to select and develop a single standard for a new technology that would allow radio listeners to tune in their favorite radio stations by format and receive electronic ticker-like displays on their radio receivers.

The new technology, called radio broadcast data system (RBDS), operates using subcarrier radio frequencies. Subcarrier frequencies are part of the larger radio signal used by broadcast stations.

With RBDS technology, radio listeners could potentially scan stations by format, rather than by frequency or channel numbers. In addition, station logos, numbers, and even electronic ads, can be displayed at the radio station's option. Another possible feature would interrupt a CD, cassette or digital audiotape, if the listener would like to hear a traffic update, or if the station breaks in to report an emergency.

RBDS also may have paging capabilities and, for car drivers listening to network programming, it can automatically change stations to pick up the same broadcast from the station with the strongest signal.

NAB recommends filters to prevent interference

The Federal Aviation Administration (FAA) should require the installation of add-on filters to correct interference-prone aeronautical receivers, the NAB has told the FAA.

NAB said the problem between broadcast and avionic frequencies is largely due to the susceptibility of *some* aeronautical receivers to pick up broadcast signals from outside the normal aviation frequency bands. The FAA has proposed new standards, which primarily affect broadcasters, to determine threshold levels of electromagnetic interference to aviation frequencies.

As a first step, NAB recommended the FAA endorse the use of protective filters for avionic equipment, before moving on a separate track to craft rules which may have the unintended impact of hurting broadcasters and other spectrum users.

Broadcasters have said the issue is not air space vs. airwaves, but rather their coexistence. NAB said the FAA has advanced proposals that are "technically flawed and discriminatory" against broadcasters and other spectrum users. NAB noted its view was widely shared by dozens of other parties that filed comments with the FAA in January 1991.

The FAA has argued that FM stations and other spectrum users are at the root of some interference problems near airports, and this threatens their safe operation. But NAB has challenged this assertion by reporting that FM interference has never been documented at airports to the extent claimed by the FAA.

In fact, a 1989 investigation by the FAA acknowledges that the most serious flaws rest with certain aeronautical receivers. NAB said these performance flaws create the bulk of the interference problems, and should be the primary focus of FAA scrutiny.

NAB battles FCC spectrum proposal

The NAB has opposed one portion of a radio spectrum proposal for personal communications services (PCS). NAB argued that the proposed new service's use of the 1,990-2,110MHz band would displace the TV stations that use it for mobile news gathering and program transmission.

In comments to the FCC, NAB said large numbers of TV broadcasters already use the 1,990-2,110MHz spectrum band, and noted that in most parts of the country "congestion is considerable." It said that the FCC has proposed other spectrum bands for PCS services, and forcing broadcasters who have made a significant investment in transmission and reception equipment to relocate "could result in severe operational and financial burdens."

In addition to its comments, NAB submitted two industry reports that measured the level of congestion in the TV auxiliary bands. One report, which surveyed industry officials who coordinate TV frequency use, reported that 64 of 67 officials said auxiliary usage of the 1,990-2,110MHz band "is most heavily used" in their local areas.

NAB said that congestion among TV broadcasters has been so great in recent years that many TV stations have chosen to relocate to other auxiliary bands voluntarily. However, NAB said it believed most broadcasters would continue to use the 2GHz auxiliary band because of the substantial investment in equipment and the high cost of replacement or conversion.

BIRTV to be held in China

Beijing International Radio & TV Broadcasting Equipment Exhibition '91 (BIRTV) is scheduled for Sept. 6-10 at the new China World Trade Center in Beijing.

China's broadcasting industry has been expanding as a result of the national economy's growth and the improvement in its standard of living in the past 40 years. China now has more than 500 broadcast sta-

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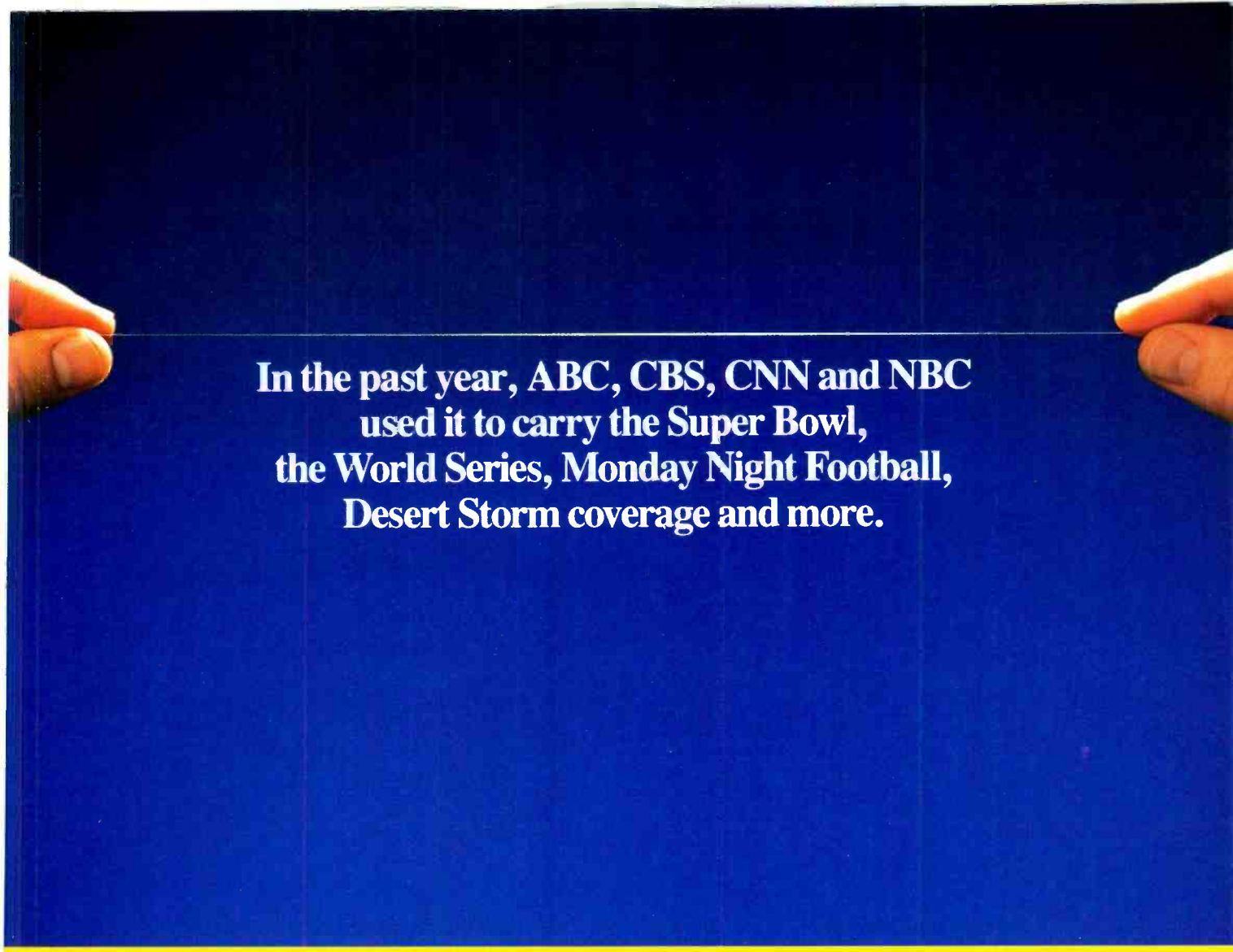

In the past year, ABC, CBS, CNN and NBC used it to carry the Super Bowl, the World Series, Monday Night Football, Desert Storm coverage and more.

Vyvx NVN, the first nationwide switched fiber-optic television transmission network.

Broadcast quality fiber-optic television transmission is no longer a futuristic technology. It's here. It's established. It's proven. Just ask the major broadcast and cable networks who use it for transmitting news, sports and other programming.

For more and more broadcasters each day, fiber optics offers an affordable, secure, reliable, and high-quality means of delivering television signals.

Vyvx NVN operates the country's only nationwide switched fiber-optic television transmission network. Our growing system currently serves the top 50 U.S. TV markets and is able to route your programming instantly and on demand.

Engineered for reliability and quality.

Signal purity is an unmatched feature of fiber optics, making it free from uplink interference and electrical impedance. Unlike satellite transmission, fiber can't be affected by solar flares or rain attenuation. And unlike other terrestrial systems, it's impervious to water and other liquids.

Our 11,000-mile fiber-optic network is the most secure with key segments inside decommissioned steel pipeline and along pipeline and railroad rights of way.

Easy to access and economical to use.

Access to our network is easy via analog last-mile facilities obtained at your request. We also provide the codecs.

The point is, fiber-optic television transmission is no longer an emerging technology. Broadcasters are already relying on it and Vyvx NVN for their most critical transmission needs.

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For more about the Vyvx NVN switched fiber-optic television network, call 1-800-324-8686.

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Facility design special report

Competing with new entertainment and information services requires a commitment to building top-quality studios.

Have you ever considered what other services may be competing for your audiences' time? Consider these facts:

- More than 54% of U.S. households have cable.
- More than 70% of all U.S. households have a VCR.
- From 1983-1989, the number of CD players sold leaped from 35,000 to almost seven million
- More than 286 million blank videocassettes were sold last year.
- Approximately 200 million prerecorded videocassettes were sold last year.

How's that for choices? The American public has more entertainment and information choices than ever before. Just as important, those choices are often delivered via mediums, which provide quality that equals or exceeds that of many radio and TV stations.

The bad news is that broadcasters have never faced such a formidable challenge from competing mediums. The good news is that stations now have available to them the technological solutions to help them equal that challenge.

In this special report, we will look at some of the technological keys to building facilities that will stand the test of competition in an increasingly complex media environment.

- "Cable Considerations for Broadcast Wiring". 110
  Selecting cable used to be easy, it was simply a matter of electrical considerations. That's no longer the case. Changes in the National Electrical Code and local regulations may now determine the type of wiring you can use in your facility. This article outlines the non-technical issues you must address when selecting electrical cable.

- "Revising the FM Band Rules". 118
  Have you ever wondered why it can take so long to get your FCC license application approved? That process can be fraught with confusion and delay, especially if you don't understand the process. This article provides a behind-the-scenes look at the many stages of review and approval an application must pass.

Courtesy of Prime Ticket

Brad Dick

Brad Dick, editor

Applying ergonomics to studio design

By Dr. Walter Black

Build your broadcast facility with comfort in mind through proper ergonomic design.

Er-go-nom-ics [ergo- + economics]: an applied science concerned with the characteristics of people that need to be considered when designing and arranging the things that people use in order that people and things will interact most efficiently and safely. (Webster's Third New International Dictionary.)

Productivity in the broadcast industry is directly related to the increasingly complicated equipment and control systems that are used. The equipment must not only accommodate thought and work patterns, but also physiological needs. The key to improving productivity (and human comfort) is in the careful design of facilities and operating surfaces — what is now called *ergonomics*.

Ergonomics is the study of human physiology and work space design. If broadcasters are to continue to reap the benefits of improved productivity, engineers must take the lead in applying ergonomic analysis to studio design. This article will examine several ergonomic problems in broadcast studio design and recommend design alternatives.

Several important issues must be addressed early in the studio design process. *Repetitive motion injuries* (RMIs) are no longer seen only in the typing pool or at computer terminals. Many broadcast equipment consoles that are improperly configured can contribute to RMI problems. In addition, the studio designer must address fatigue, vision and control/reach problems.

Each of these areas will be examined in an effort to find alternative design techniques. Through 3-D CAD drawings and renderings, you will be able to see the problems as well as some solutions.

Black is president, Video Design Pro, Las Cruces, New Mexico.

History of ergonomics

The profession of ergonomics began in the 1950s in the military and aerospace fields. Aviation controls that were designed for function were often found to be contradictory to the physiology and psychology of pilots. New cockpits were designed so pilots could monitor displays and manipulate controls more quickly and easily. Performance improved, and errors (which can sometimes be fatal in aviation) were reduced.

Ergonomics eventually found a niche in the civilian world, particularly after the establishment of the Occupational Safety and Health Administration (OSHA). Court cases also emphasized the need for greater ergonomic consideration. The families of three North Central Airlines pilots killed in a 1968 crash were awarded $3.5 million when the court cited poor ergonomic placement of the flight director test button as a primary cause of the accident. More recently, the accident at the Three Mile Island nuclear plant was partially blamed on poor ergonomic design of the control-room displays and controls — the operators could not discover the nature of the accident until it had advanced to a dangerous point. Ergonomic concerns are now considered important for safety, health, worker satisfaction and improved efficiency.

Continued on page 44

"We're extremely pleased with our Ikegami HK-353 cameras...so are our customers."

– Stan Abadie, Chief Engineer, WLAE-TV

When WLAE-TV, New Orleans, operated by the Catholic Archdiocese, went looking for a studio chip camera to handle their unique production requirements, they came to Ikegami.

Many of their on-air personalities are priests, who typically wear black shirts, black jackets with white collars. "Dealing with shades of black with white collars is a true test of a video camera," stated Stan Abadie, Chief Engineer, adding that "Ikegami's HK-353's have been more than up to the task. The crews have found them extremely easy to use. They're giving us extremely high performance."

Ikegami's economical studio chip camera, the HK-353 features three 2/3" IT chips each delivering 400,000 pixels, a resolution of 700 TVL, a S/N ratio of 62 dB and is operational with triax or multicore cable.

Local insurance companies and banks that use the facilities at WLAE for commercial production are equally impressed.

"Our production customers and our in-house people have all been very happy with the results we're getting from the HK-353's," states Abadie. "We wanted the best studio camera possible. We had to choose Ikegami."

For further information on the HK-353 Studio Chip Camera contact your Regional Ikegami Sales Office.

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Panasonic

MEMO

Date: January 23, 1991

To: Head of Technical Planning

From: Director of Facility Marketing

Re: Next Generation DAT Recorders

Charlie,

What's the bottom line on these next generation SV-3900 Pro DAT decks from Panasonic? We heard them at NAB and AES Shows -- outstanding audio quality! I'd like your input on their technical features and functions.

With its serial control capabilities, this machine may be limited only by our imaginations.

Pete

From the desk of
Charlie Johnson

ES BUS
&
P2 PROTOCOLS

- STANDARD 9-PIN SERIAL INTERFACE.
- HANDLES UP TO 32 DECKS ON ES BUS.
- INDUSTRY STANDARD PROTOCOLS.
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- ANY DECK DISPLAY ON REMOTE.
- PROGRAMMABLE FOR GO-TO ABSOLUTE TIME.

LET'S RETHINK THE P.O. FOR THE TIME CODE DAT. WE CAN GET 4 SV-3900'S FOR THE SAME PRICE!

SV-3900

Digital Audio Tape Deck

DAT
Digital Audio Tape

rs. Full ES-Bus and P2 serial control proto
Parallel hardwire interface of transport functio
s. Front panel error rate display.
Switch selectable SCMS status.

SH-MK390 Remote Controller

- Network control of single/multiple SV-390(decks.
- Shuttle wheel with ±0.5 to ±3x speed in Pause Mode, plus ±3 to ±15 in Play Mode for flexible cuing.

PNO, Counter, Absolute, Program Time displays.
Start/Skip ID Write/Erase, Renumber, Fade in/out.
Direct access of PNO's for random access cuing.
Flexible Program Play Sequences.
Auto Changeover Function Keys for record/replay.
uto Start Function Keys for dubbing/editing.

BENEFITS

- CENTRALIZED CONTROL OF MASTERING DECKS.
- RANDOM ACCESS MUSIC & EFFECTS LIBRARIES.
- AUTOMATED MUSIC/COMMERCIALS REPLAY.
- COMPUTERIZED SATELLITE NETWORK BROADCASTING/RECORDING.
- COMMERCIAL DAT DUPLICATION.
- AUDIO PLAYBACK FOR INSTALLED SOUND SYSTEMS.

DAT ENSURES MEDIA COMPATIBILITY WITH OUR CUSTOMERS.

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Continued from page 40

Control/reach problems

The computer-generated figures shown in this article were created in a few minutes. It would have taken hours, days or even weeks to perform the same analysis by hand or in 2-D CAD.

Note in Figure 1 that the console operator must reach the non-remote carts on the right, while adjusting the mixer levels on the far left. One engineer candidly admitted that demonstrating on this type of system left him sprawled on the floor. Repositioning the carts or adding remote controls could eliminate this problem.

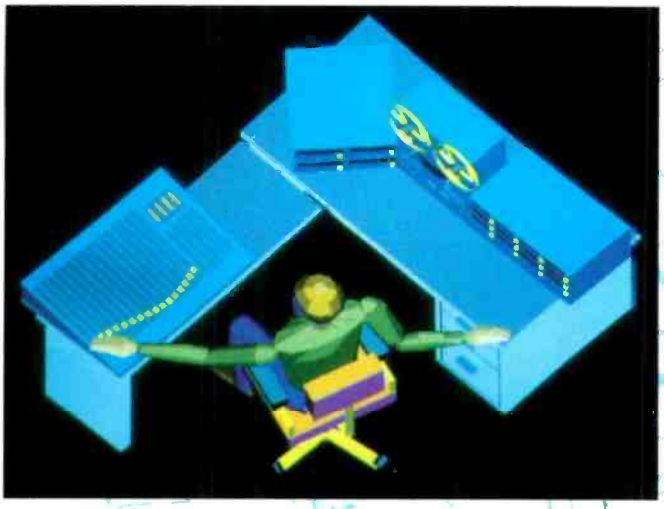


Figure 1. *Improper placement of equipment requiring simultaneous operation can cause overextension.*

Two similar control-access problems are shown in Figures 2 and 3. In Figure 2, the operator is running a 72-input mixer. A similar condition exists in Figure 3, with an operator making quick changes on a large video production switcher.

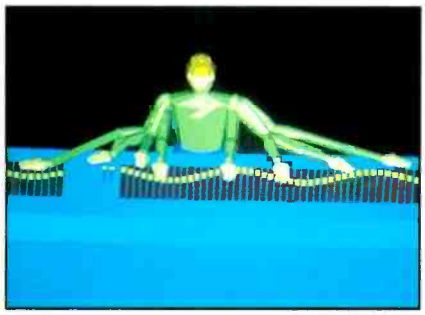


Figure 2. *This example shows too many controls requiring the attention of a single operator.*

Controls that require arms to be elevated above heart level for long periods are also problematic. This may result in circulatory difficulty and fatigue. Ergonomic redesign would greatly improve ease of use by operators and reduce fatigue-related errors.

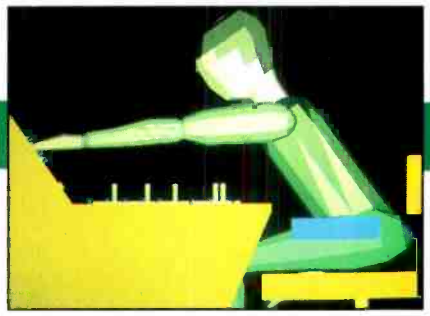


Figure 3. *Note the difficulty in making quick changes on a large video production switcher.*

Visual problems

The human eyes' useful field of vision is approximately the same as a 16mm lens on a video camera. (See Figure 4.) It is fairly narrow, as demonstrated in Figure 5. The human eye can perceive motion in wide peripheral vision, but cannot process data in that zone. (See Figure 6.) This is easily demonstrated and corrected through ergonomic testing and modeling.

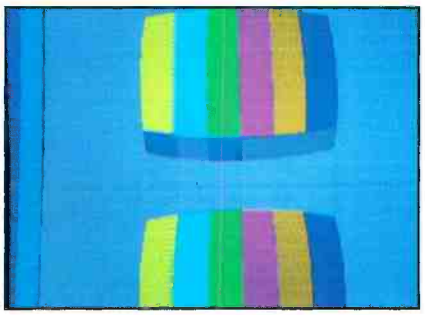


Figure 4. *Normal active viewing area of the eyes.*

Monitors that are used most frequently should be located between 0° and 30° below horizontal eye level, and 35° left or right of center. (See Figure 5.) Preferably, they should be approximately three feet from the viewer, which is the resting focus of the eye. Placing monitors in these locations will help minimize eyestrain and reduce the potentially harmful effects of VDT radiation.

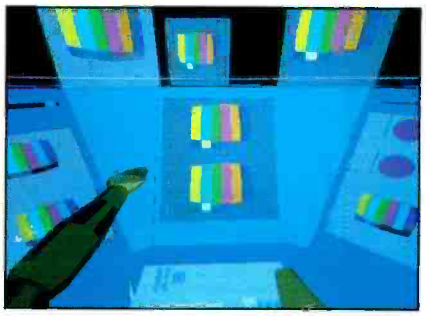


Figure 5. *The peripheral view of the eyes is far greater than in Figure 4, but the eye cannot process data in the peripheral area.*

Engineers must take the lead in applying ergonomic analysis to studio design.

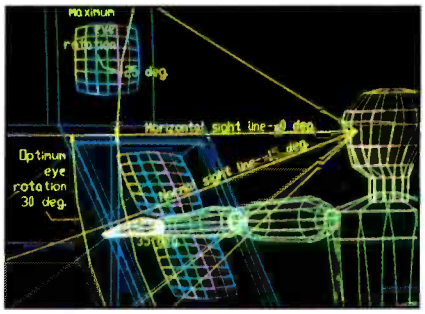
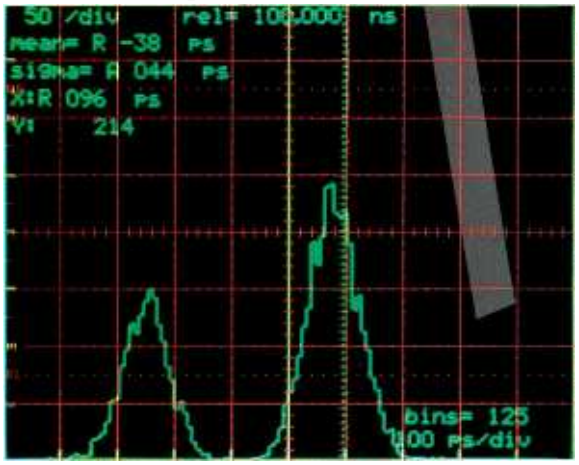


Figure 6. *Normal viewing angle located between 0° and 30° below horizontal eye level, and 35° left or right of center (equivalent to view in Figure 4).*

One popular design is the monitor wall. (See Figure 7.) At first glance, this should ease the field-of-vision problem. However, the human eye can only focus on one object effectively. The plethora of screens at six to 10 feet away causes eyestrain, errors and disorientation. The eye becomes strained from focusing on multiple small objects sequentially and seeing constant motion in the peripheral vision area.

A picture is worth a thousand points in a time interval measurement.

SR620 Output



HP5370B Output

100.038 ns

The SR620 brings graphic statistical analysis to time interval and frequency measurements. The SR620 shows you more than just the mean and standard deviation - multimode frequency distributions or systematic drift for example. Histograms or time variation plots are displayed on any X-Y oscilloscope, complete with Autoscale, Zoom, and Cursor functions. Hardcopy to plotters or printers is as easy as pushing a button.

Of course, the SR620 does everything else you'd expect from a high resolution universal counter, such as frequency, period, time interval, pulse width, rise / falltime, and phase measurements. The SR620 offers 25 ps single-shot time and 11 digit frequency resolution and complete statistical analysis, all for a fraction of the cost of comparable instruments.

For the whole picture, call SRS and ask about the SR620.

SR620 $4500

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- 25 ps rms single shot resolution
- 1.3 GHz maximum frequency
- 10^{-9} Hz frequency resolution
- Sample size from 1 to 1 million
- Frequency, period, time interval, phase, pulse width, rise and fall time
- Statistics - mean, standard deviation, min max, and Allan variance
- Analyzer display on any X-Y oscilloscope
- Hardcopy to printer or plotter
- GPIB and RS232 interfaces
- Optional oven timebase

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Figure 7. The monitor wall causes eyestrain, because eyes must focus on distant objects while at the same time having constant motion in the peripheral vision area.

Glare caused by room lighting is also problematic. (See Figure 8.) Anti-glare screens work well on bright monitors, but are useless on peak program meters, liquid crystal displays or graticule waveform monitors and vectorscopes.

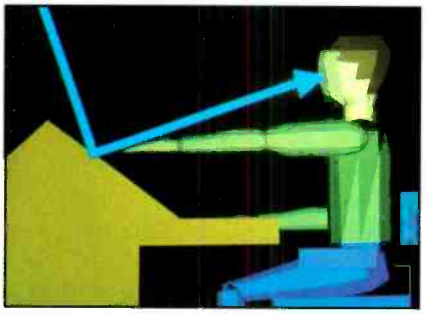

Figure 8. Glare caused by poor planning of overhead lighting and shallow angle of console.

Repetitive motion injuries

RMIs, such as Carpal-Tunnel Syndrome, are the most frequent cause of workmen's compensation claims. RMIs usually result in debilitating pain, surgery, therapy and extended leave. Many victims must change careers to prevent recurrence. Carpal-Tunnel Syndrome is often associated with keyboard use over extended periods. The ligaments and tendons of the hand pass through a channel in the wrist known as the carpal tunnel. During keyboard use, dorsiflexion (moving the hand upward) and ulnar deviation (turning the hand in the direction of the little finger) result in the clustering of the tendons and ligaments at the edge of the carpal tunnel. (See Figure 9.) Repeated flexing of the fingers with the wrist in these positions rubs the connective tissues against the bone of the tunnel and against each other. As the tissues swell, the friction increases and aggravates the radial artery and median nerve. The resulting injury is debilitating, chronic and difficult to treat

Frequently-used monitors should be located between 0° and 30° below horizontal eye level and 35° left or right of center.

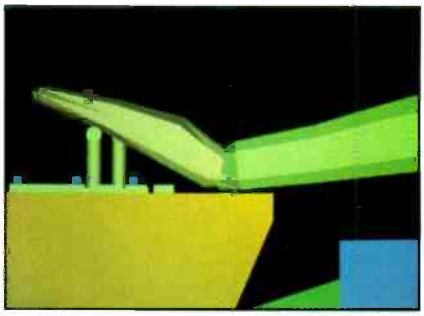

Figure 9. An operation requiring dorsiflexion, which leads to Carpal-Tunnel Syndrome.

The best preventives include wrist rests and better hand positions, as shown in Figure 10. Chairs and desks with adjustable heights and regular breaks for exercise or alternative work are also important. In the broadcast studio, multiple keyboards compound hand-positioning problems, because limited space forces the user to contort the wrists drastically in order to operate them. (See Figure 11.)

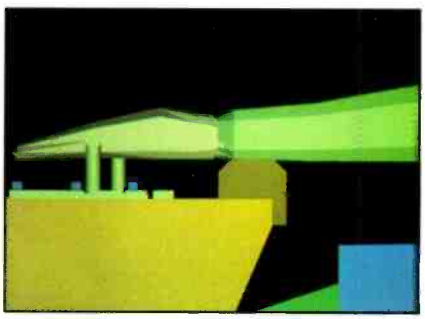

Figure 10. A wrist rest designed to allow operation without significant dorsiflexion should be at least 5cm wide. Arm position should be level.

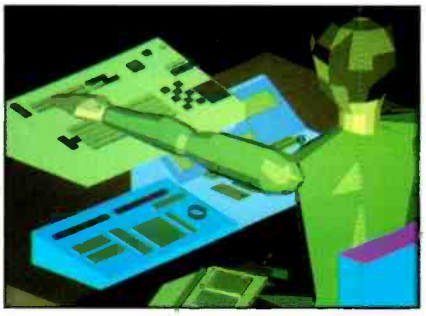

Figure 11. Multiple keyboards compound hand-positioning problems.

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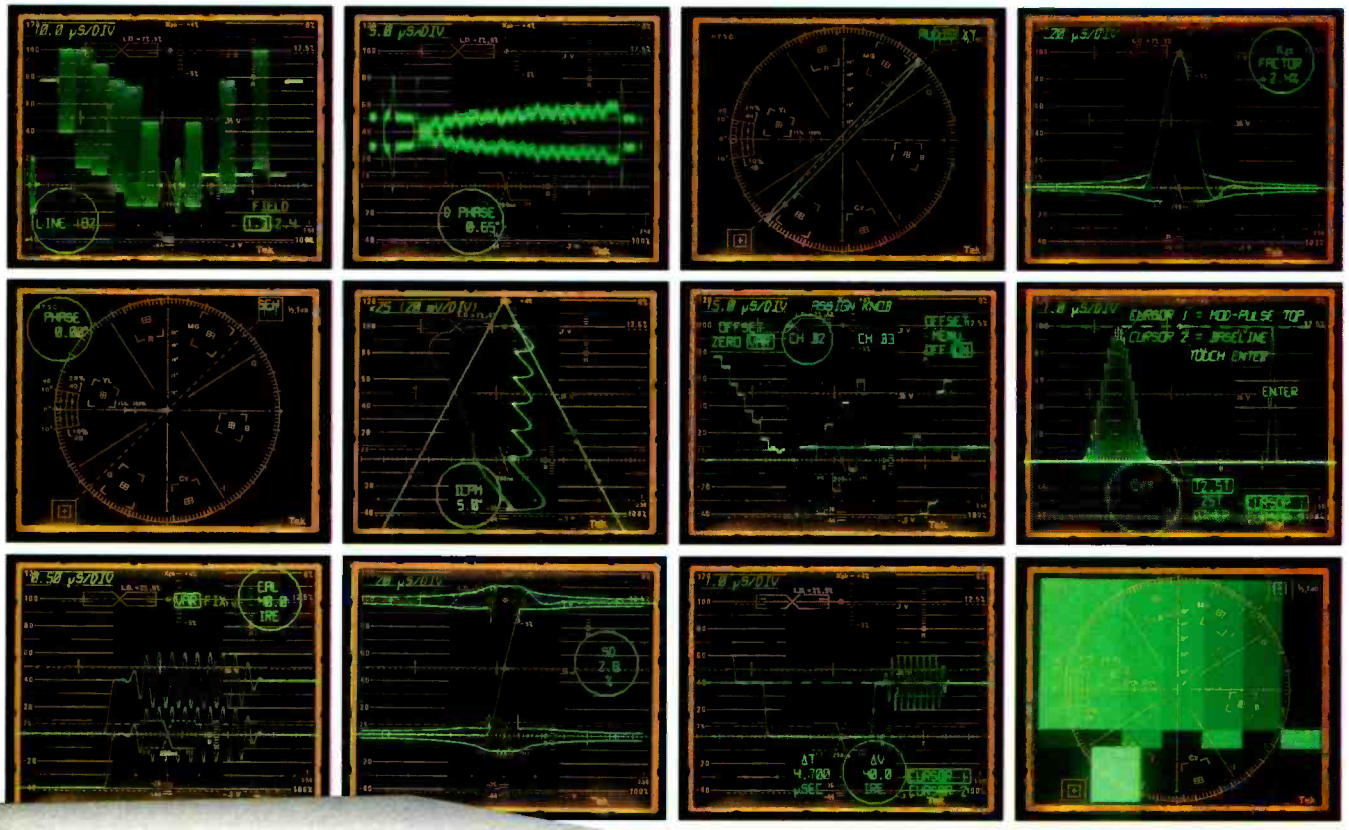

Even at first glance, you can see that the Tek 1780R is in a class by itself. Only the 1780R offers full-bandwidth analog measurement capabilities with separate, complementary waveform and vector displays. Component and composite capabilities are provided through four video inputs and a front-panel probe

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Neck-related motion injuries, which result from constant neck motion in order to see the screens, are also becoming a problem. (See Figure 6.) Related problems are "CAD neck," which is constant bobbing of the head and neck toward the keyboard, and "trackball thumb," which results from constant flexing of the thumb in awkward positions.

Selecting equipment ergonomically

When buying a car, a test drive is imperative, but being able to take a trip in it would be more useful. The same is true for equipment. Sitting at the audio mixer and checking the fader response is important, but it is not enough. An analysis of human factors, such as size and quality of wrist rests (most broadcast rests are designed for aesthetics rather than ergonomics), height of audio mixers and field-of-view analysis, is critical. (See Figure 12.) It is also important to analyze what happens when individuals of different heights sit at the mixer.

The purchase of equipment racks and consoles, whether stock or custom, requires careful consideration. The console shown in Figure 13 is too high for comfortable arm/hand positioning. If the desk is lowered, the upper rack spaces on the base console become useless, as shown in Figure 14.

These problems don't exist with the console shown in Figure 15. This console has adequate wrist supports and good desk/arm height.

Consider the glare of overhead lights. The console shown in Figure 8 is sloped

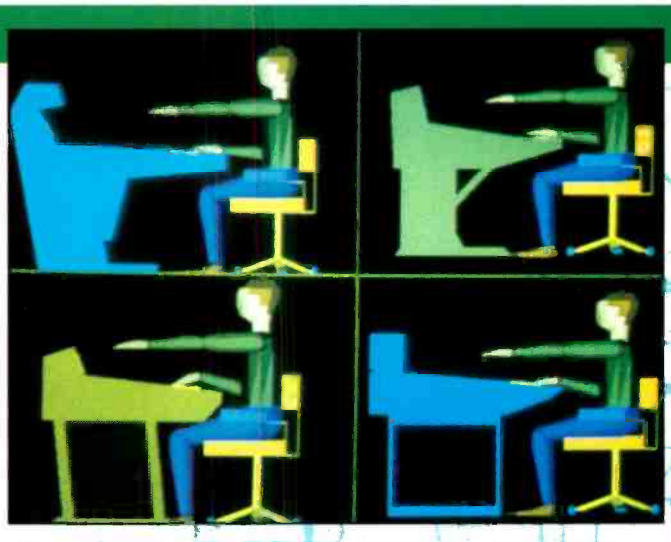

Figure 12. *CAD allows you to experiment with different brands of consoles, testing for clearance and arm/hand/eye positions.*

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back so steeply that the glare from lights would make it unacceptable for most monitoring applications. It also would be difficult to reach the reels of a VTR or ATR placed in this console.

Selecting equipment to mount on tabletops must be done carefully. Many switchers, mixers and keyboard controllers are so thick that users must choose between sitting with their legs under the table and leaning over, or standing to operate it. (See Figure 16.) If the controller is raised, the arm will be too high for comfortable use. (See Figure 13.)

Figure 13. A console with a high desk forces the user to spread arms out, which forces wrist positions to angle toward the little finger (ulnar deviation).

In the studio, multiple keyboards compound hand-positioning problems.

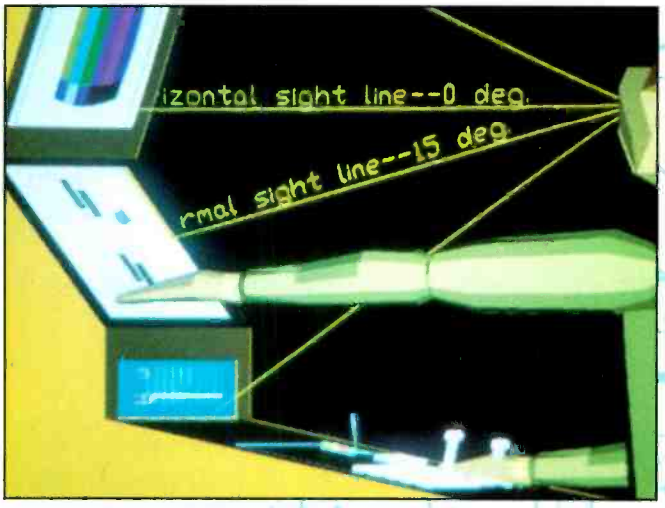

Figure 14. A lower desk is more comfortable, but rack spaces above the desk cannot be easily seen or used.

Ergonomic economics

Ergonomics is the analysis of people and their work spaces and machines — the merging of technology to increase productivity and well-being. You wouldn't dream of buying a new car with 1950 bench seats instead of ergonomically-designed bucket seats. However, broadcast engineers often fail to have rack drawings completed, which examine the human/machine compatibility. The assumption is that engineers are not responsible for people problems, they are responsible only for the quality of signal output. Besides, ergonomic design is too expensive (they say). But the real issues are how much does poor design cost and how much does good design save?

Poor design costs millions

Repetitive motion injuries, caused by continuous straining action of the wrist (Carpal-Tunnel Syndrome), back, neck, arms and legs, have superseded all other workmen's compensation claims. Reasons for this include:

- Increased mechanization and computerization.
- The sedentary nature of the work.
- Litigious revenge aimed toward owners and designers of the work space.

The result is millions of dollars paid in workmen's compensation and lawsuits — even in the broadcast industry. One broadcaster from a large station admitted recently that he had five employees on extended paid leave because of RMIs.

In addition to losing money, broadcasters lose the services of talented people. But more than talent, can employers bear the guilt of seeing employees suffer great pain from a poorly designed work space?

Government legislation

San Francisco work space legislation is an example of a new trend — legislative ergonomics. The key provisions of the law can be argued as potentially redundant, questionable or inadequate. Even so, the cost of this new legislation will range from $2,000 to $4,000 per professional employee over 24 months. This is quite an expense in a time of economic slowdown.

Involve employees in design

Any changes in the workplace can be a source of tension, especially in the

Equipment placement and installation

A 3-D analysis can reduce critical cable installation problems (see Figure 17), conflicting space problems (see Figure 18) and reel problems (see Figure 19). The same technique can simplify fire safety, exit and handicap access.

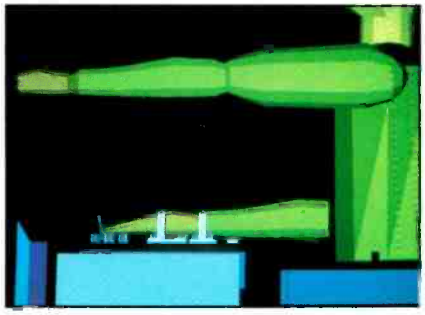

Figure 15. This console has good height for this user.

room/work layout. Continued tension may lead to greater injuries. Tension can be lessened by involving management and operators. Operators can give valuable insight into daily operations that could otherwise be missed. Happy, satisfied and involved employees are less argumentative and more productive.

Ergonomic consultants reduce problems

Although 80% of ergonomic design is common sense, the remaining 20% requires analysis by a trained ergonomics specialist. In addition to preplanning, it is advisable for the consultant to verify the design during and after it is installed.

Ignoring a consultant can be worse than not having one.

Design modeling saves on redesign

Although 3-D computer modeling of facilities can take more time during preplanning, it will save considerable time during installation and remodeling. Engineers who use computer modeling claim fewer change orders and better productivity.

Modeling is also an excellent documentation (protection) for a compensation hearing or trial. If an engineer demonstrates that careful ergonomic analysis was performed, it is easier to win the case — or at least reduce the consequences.

However, be willing to make changes. Ignoring a consultant can be worse than not having one, especially if a lawsuit develops. A good consultant can balance cost of changes with customer and user satisfaction.

The costs of ergonomics

Design costs time and money, yet it is far less costly than compensation, lawsuit judgments or the pain caused by poor design. Proper design saves time and money during installation, change orders and remodeling. It also enhances productivity, satisfaction and careers — perhaps even your own.

Ergonomic work planning

One of the best ways to reduce fatigue and injuries on the job is to plan for regular breaks, exercise and provide alternative job rotation. Ray Kroc required all employees at McDonalds' headquarters to have an exercise and/or meditation break every morning and afternoon. The best exercise is probably a brisk walk, because it exercises the whole muscular system and doesn't require special equipment (although sunshine helps).

Breaks should be regular — at least every hour in sedentary jobs. Even a brisk walk to the water fountain or restroom helps, as do simple aerobic exercises standing beside the desk.

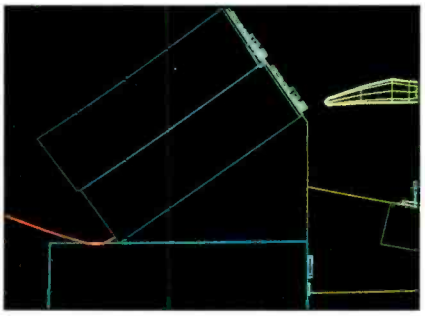

Figure 17. A cable-clearance check using a CAD program.

RMIs have superseded all other workmen's compensation claims.

Finally, 3-D animations can identify problems that would normally be found only during installation. Ducts might be too low, or the design might have unsafe rack protrusions.

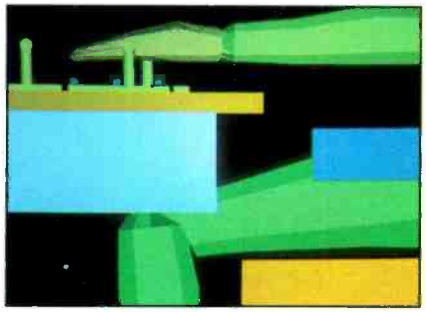

Figure 16. The thickness of this control panel makes it almost impossible to place on a table. Lowering it cuts into the operator's leg, while raising it causes ulnar deviation.

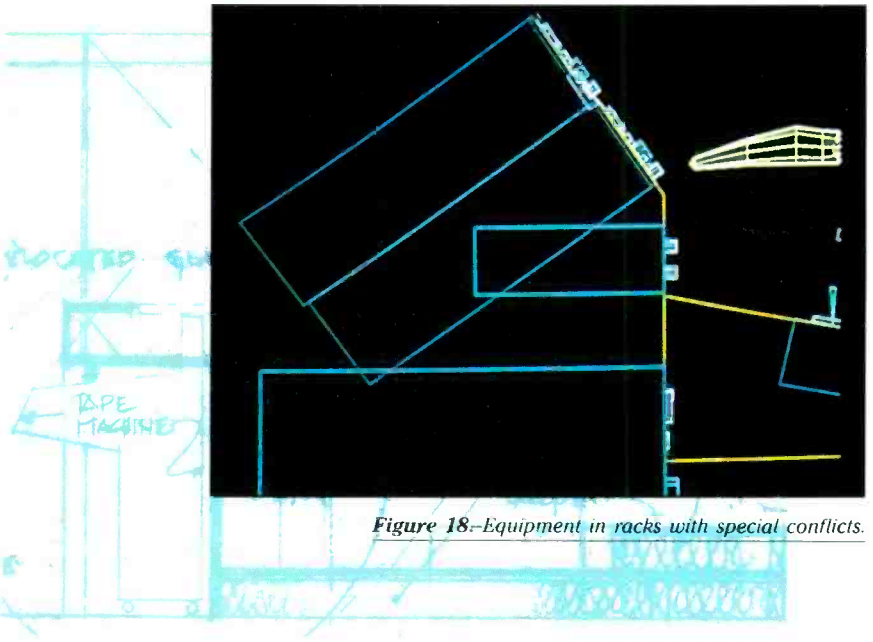

Figure 18. Equipment in racks with special conflicts.

Continued on page 54

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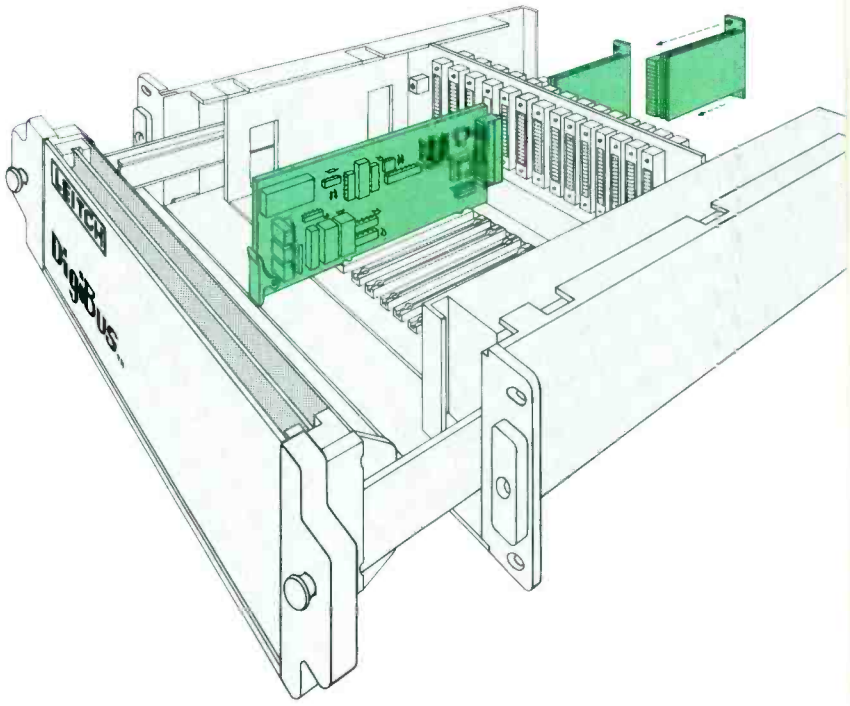

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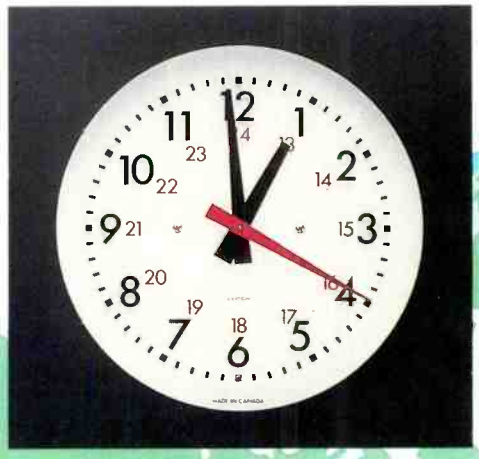

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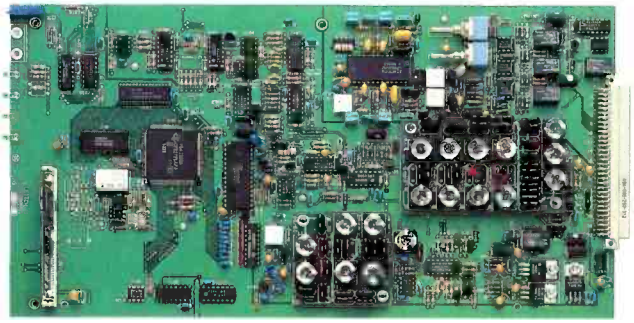

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Continued from page 51

Alternative work assignments lessen boredom and allow employees to exercise different sets of muscles. Emptying the trash, cleaning the monitors or making coffee can provide a much-needed alternative to keyboard entry.

The benefits

Ergonomic design has many benefits, including increased productivity and user satisfaction; decreased errors, injuries and accidents; and fewer workmen's compensation claims. (Remind your general manager of these benefits early in the studio design process when you ask for funding for this type of study.)

The long-term benefits are practically immeasurable, and they are certain to outweigh the initial costs of ergonomic design or redesign. If for no other reason than simple economics, you should strive to improve system designs via ergonomics.

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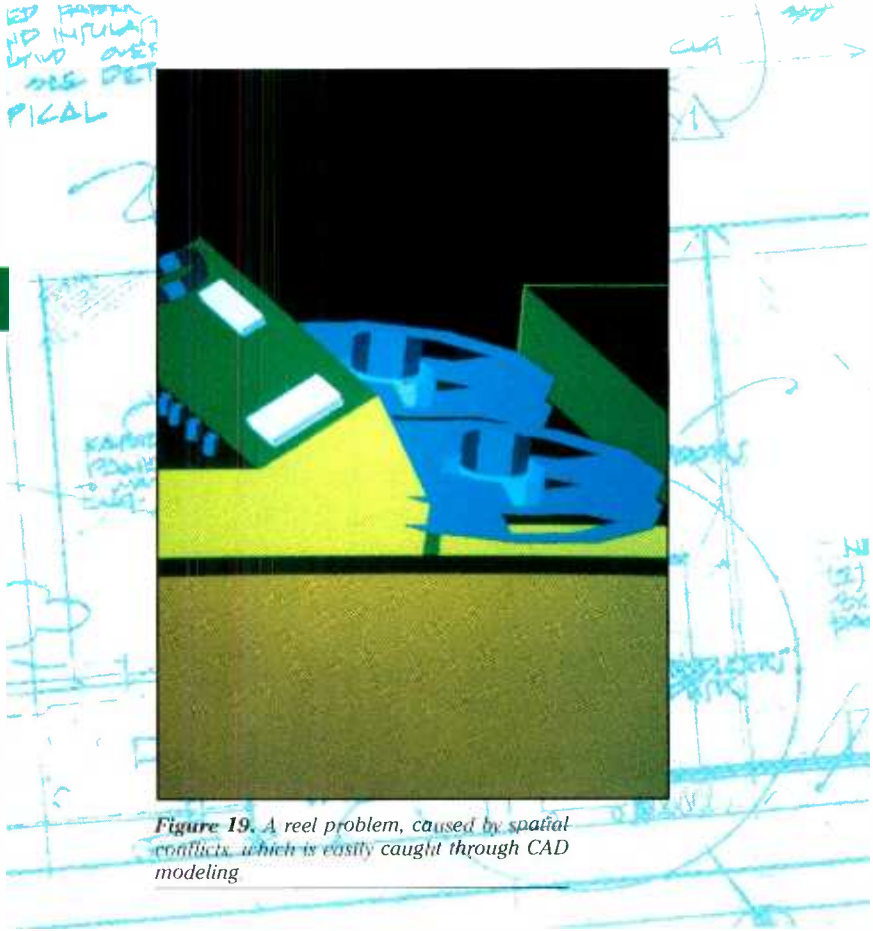

Figure 19. A reel problem, caused by spatial conflicts, which is easily caught through CAD modeling

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High-end control rooms

By John Storyk

A perspective on monitor system design and installation.

If the past 20 years — "the age of the independent audio recording studio" — have shown us anything, they have shown us exactly how many different versions this environment can have. During this period (starting in 1969 with Jimi Hendrix's Electric Ladyland Studios in New York), I have created more than 350 professional audio recording/control rooms with high-end monitoring systems. Each installation was slightly different from the next. This article presents some of these differences and, more importantly, some of these similarities.

Proper acoustic treatment for control rooms can be attractive. Today, designers can choose from a wide variety of materials, which can result in high-performance and good looks. Shown here is a suite at the Platinum Post facility in Winter Park, FL. (Courtesy of Walters/Storyk Design Group.)

Storyk is principal designer, Walters-Storyk Design Group, New York, NY.

Acoustics — particularly internal room acoustics, as this science pertains to the professional audio-monitoring environment — is only part of the total design thinking in the professional studio control room of the '90s.

The acoustic goal

It is important to agree on some acoustic standard (or more appropriately, a family of standards) for the control-room environment. Experts agree that sound can be "dissected" into three domains: *time*, *energy* and *frequency*. These three terms have given rise to the industry's newest (and extremely popular) acronym, *TEF*.

In the past ten years, new measuring equipment using time-delay spectrometry has enabled complex real time acoustic measurements in all three domains simultaneously (not withstanding certain limitations at lower frequencies). Now being able to measure the time domain with great accuracy, users of high-end audio-monitoring environments are coming

Continued on page 60

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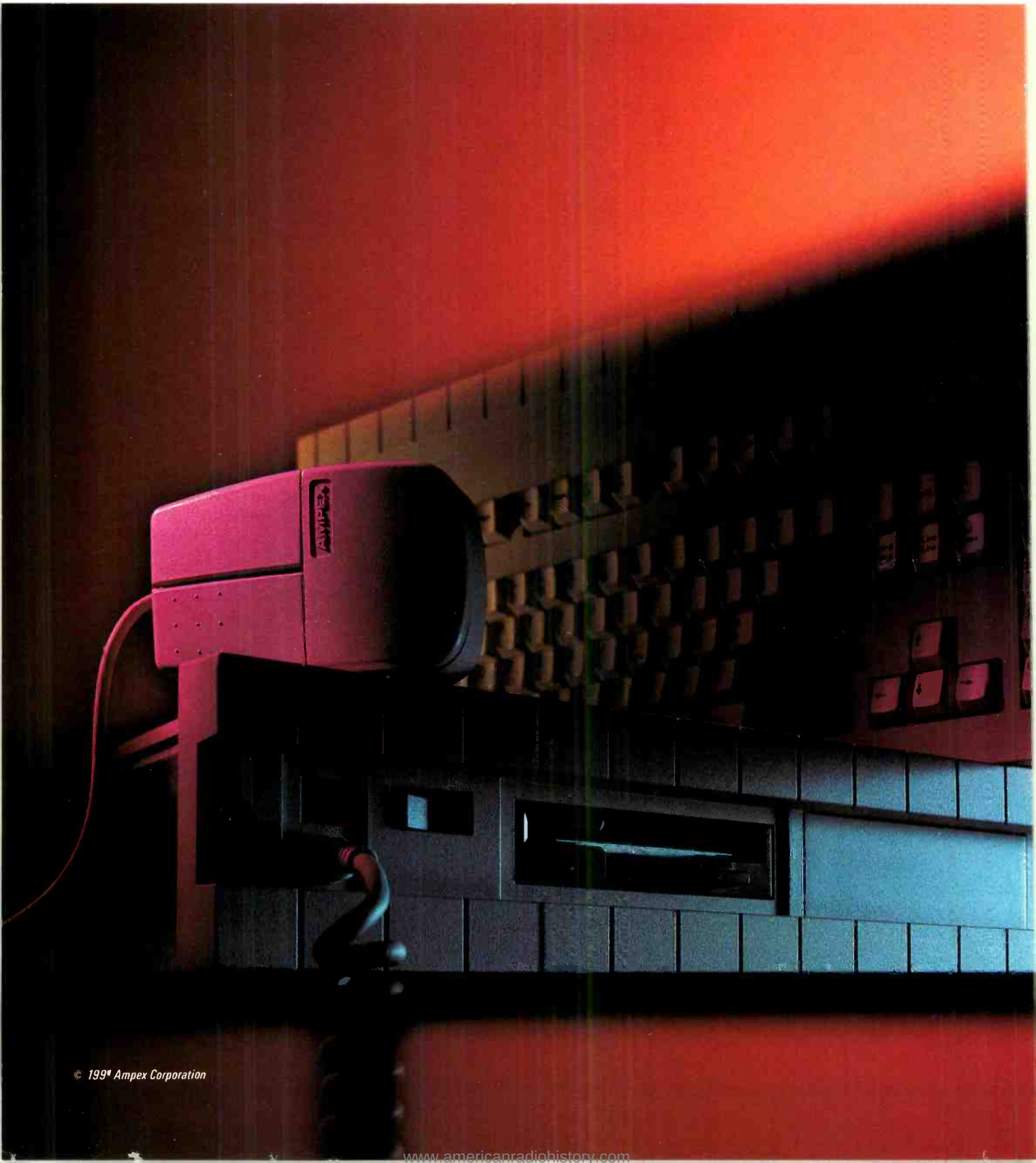

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Continued from page 56

closer to a family of standards for these relatively small rooms. I submit the following acoustic standards:

1. Frequency-energy relationships should be as flat as possible. Standards are on the order of ±2dB throughout the usable audio range (40Hz—15kHz) measured at 1/3-octave bandwidths.
2. Reverberation times should be as long as possible before introducing disturbing echo into the room. It is now common to have Rt60 values of 0.3—0.5 seconds for large control rooms (and still have good stereo separation).
3. In the time domain, energy time curves should show a clear separation between direct sound and first-order reflections; then, as even a distribution of secondary reflections as possible — with as few energy anomalies as possible. (This would account for a long, yet acceptable, Rt60.)

The addition of vital *time-energy* standards has given birth to some new and exciting design elements in the high-end audio control room.

Despite the previous criteria, acoustics and the new control-room standards are equal partners to ergonomics and architectural design. (See "Applying Ergonomics to Studio Design," pg. 40.) I have never been involved in a control-room design or retrofit that didn't have user requirements, which *directly* affected the monitoring system and its installation. The clue concerning control rooms lies in the name: They are first and foremost rooms.

Architecture and ergonomics first: the design process

The monitoring system and its corresponding room design are important. However, most control rooms are designed around their use and their ergonomics before the final design of the monitoring system. Here are a few examples:

- *Room size and layout.* A room's size dictates the final monitor system design more than any other single factor. Area (floor plan and exact layout) and subsequent room volume have compounding effects on monitoring. Room layout affects speaker placement. Room geometry has a direct affect on reflection and ray analysis of the room. Layout and geometry are often developed as a result of equipment positioning, room population requirements, air-conditioning duct locations, lighting positions and other physical factors.

Volume is usually a direct result of the floor plan requirements and available height. Control-room volume is room area multiplied by room height. Rt60 calculations (Rt60 = 0.049 volume/total room absorption) show that reverberation is directly proportional to a room's volume. In virtually every instance, the larger a control room's floor area, the larger its volume and the greater its Rt60. Such room and monitor environment designs require more diffusion, more complex geometry and room configurations.

The implications quickly compound, such as architectural programming, where existing room shell size and control-room ergonomics account for nearly all of the design parameters. Acoustic standards must be matched to an almost infinite combination of these requirements.

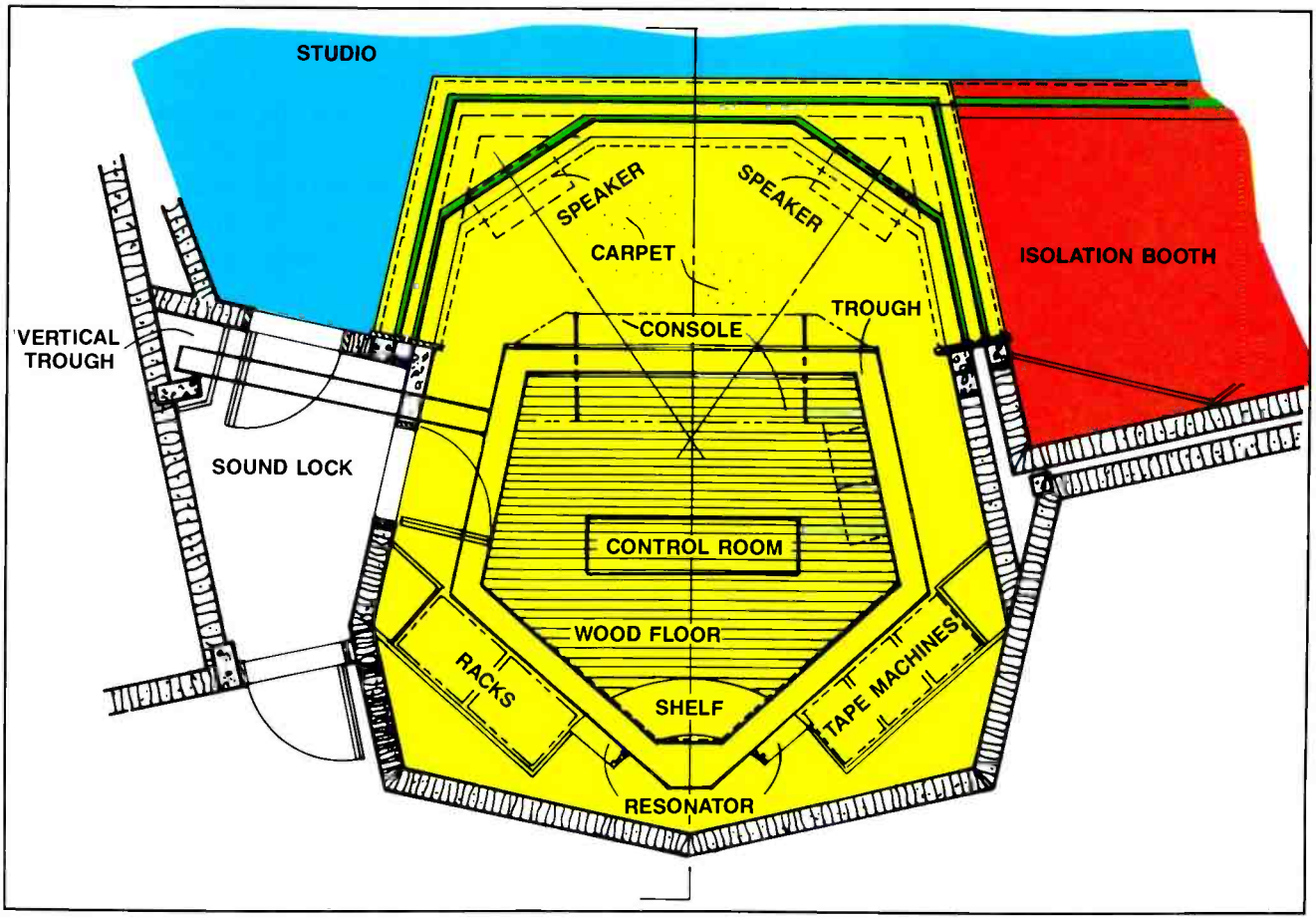

Figure 1. *Floor plan of Fonovision Studios, Bogota, Columbia, showing extremely large front-room glazing. The large expanse was created by the requirement for good visual access into the studio.*

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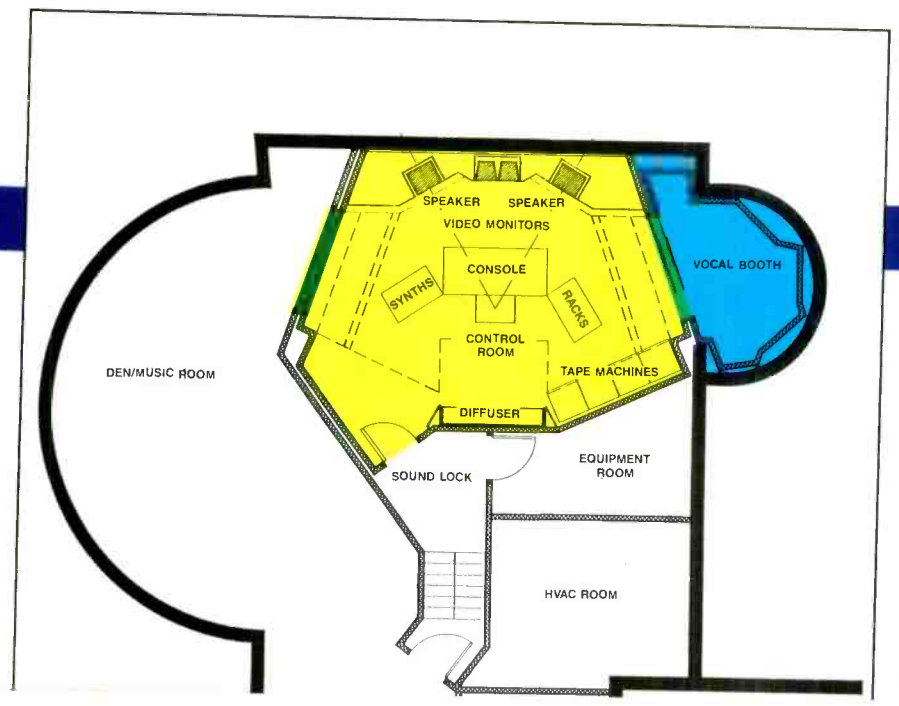


• *Front-room glass.* Most designers will agree that a large glass installation in the front of a control room is most likely a liability. In a large control room with a high Rt60 (with evenly distributed secondary reflections), large front-wall glass is problematic. There is little chance to diffuse or scatter energy off a large flat piece of glass. Also, large glass in the front of a room makes it almost impossible to lower monitors so that first reflections off the ceiling will not conflict with a reflection-free zone. (The obvious design solution for this is to slant the glass downward, together with absorptive treatment in the front of the audio console and front portions of the room's ceiling.)

Again, the decision whether to have large glass (needed to see into the studio) should be a strictly architectural decision, not an acoustic decision. After deciding on this design element, definite acoustic implications take place. For example, no glass in the front of the control room, because there is no need for it.

I suggest that this single *non-acoustic* design decision has one of the largest effects on a monitoring system. In the Full Sail/Platinum Post facility (see Figure 3), there was a need for visual contact into two studios. However, the large glass was not placed in the front of the studio. This enabled ear-level monitor placement.

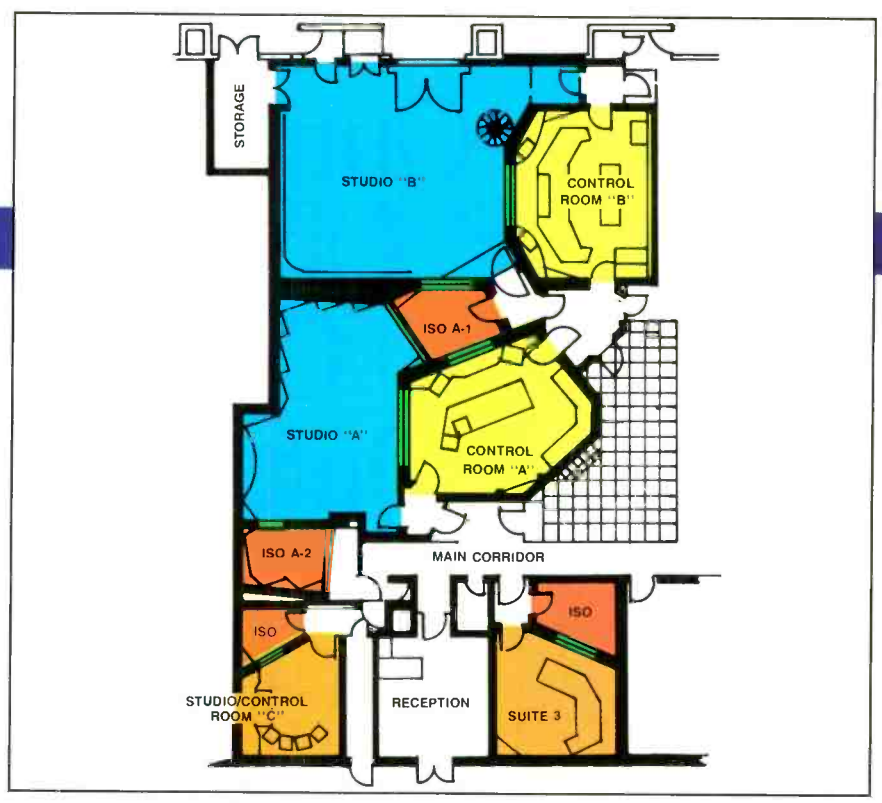
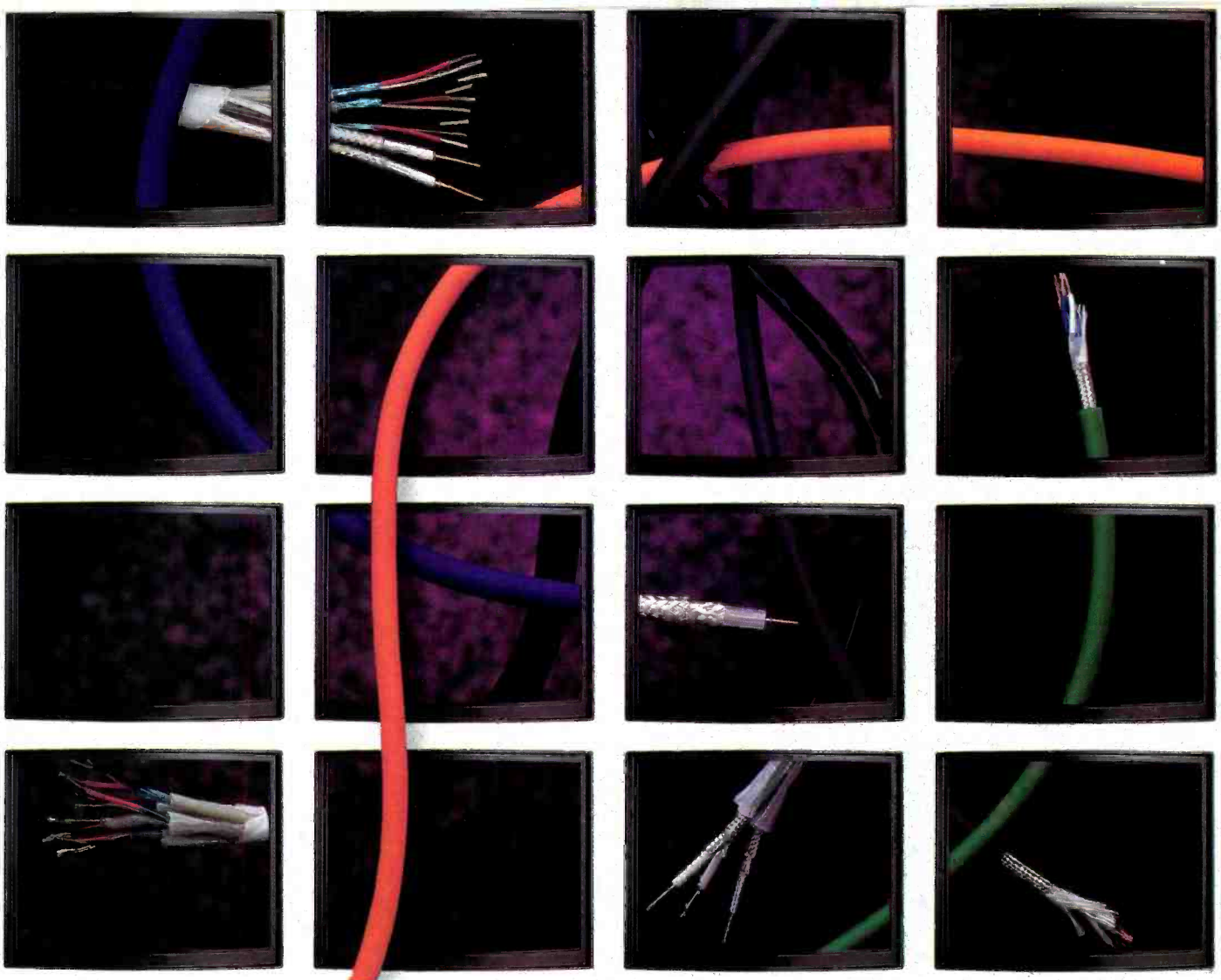


Figure 3. *Floor plan of Full Sail/Platinum Post Studio A. The drawing shows a compromise design solution for large glass area while still providing ear-level front-room monitoring.*

• *Equipment* (other than the speakers). Most high-end control rooms have a great deal of audio equipment in addition to quite a bit of non-audio objects within the space. There are certain exceptions, such as private listen-only studio suites and certain types of off-line video production rooms. However, for the most part, professional audio control rooms have consoles, tape machines, outboard equipment, musical instruments, synthesizers, chairs, couches and extensive shelving.

It is unusual that these elements are thought of last. To the contrary, they are usually a given in the design process. An audio control room's console and tape machines are almost always thought of first, and conceived of as the core of the room.



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(Rooms are often described as "a Neve room, an SSL room or a Sony digital suite.") It is rare that rooms are described in terms of their monitors, despite the importance of the monitoring system.

Selecting a monitor system

In a large control room with a high Rt60, large front-wall glass is problematic.

providing wide coverage across the listening plane (remember large consoles), becomes more difficult with large, single-monitor cabinets. The argument for ear-level monitoring quickly surfaces.

- *Console size.* Console size, as much as

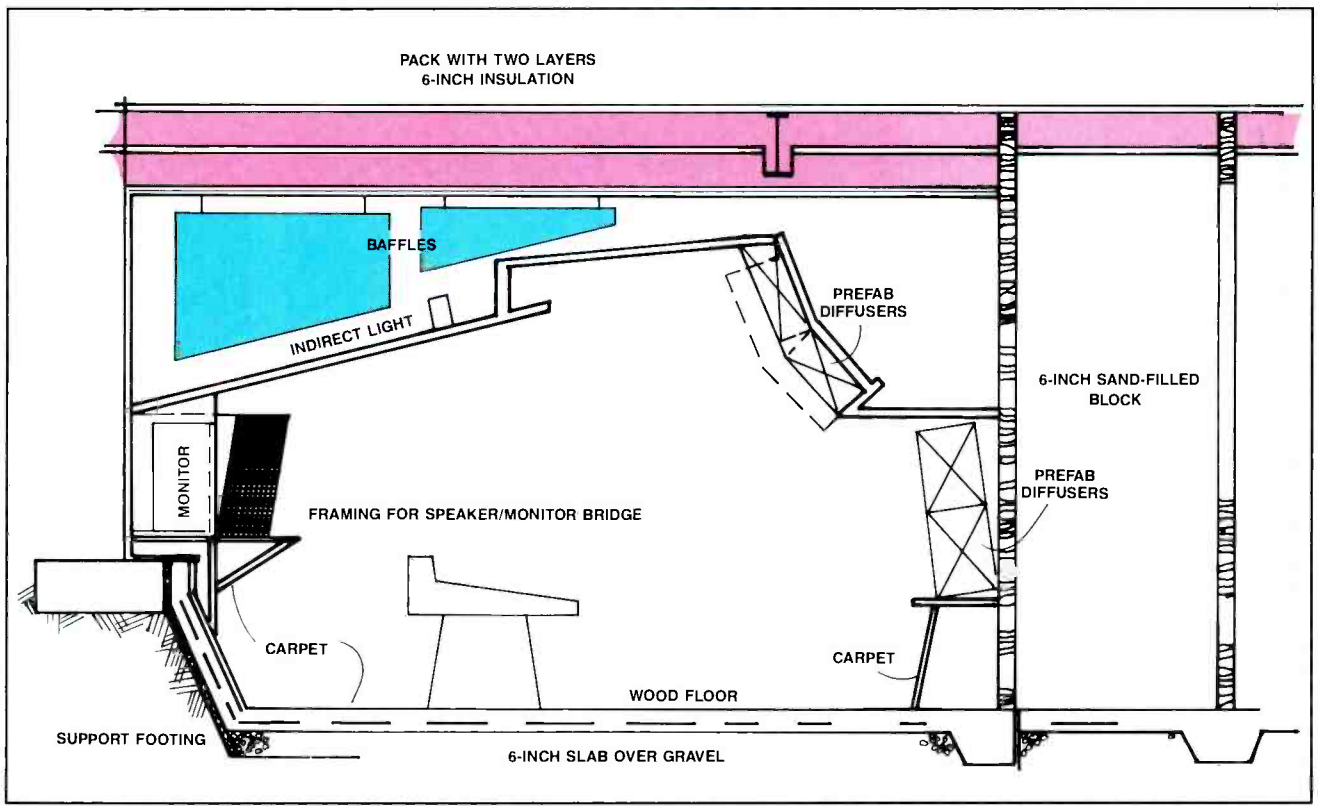

Figure 4. *A section of Whitney Houston's home recording studio. Note the expansive control-room ceiling. Diffusers are located in the rear ceiling and rear wall.*

The combinations of the aforementioned categories of variables are virtually infinite. Variations on these combinations, plus specific user tastes in speaker systems, make final monitor system design and installation as much an art as a science. Although there is no set check list for this process, a guideline for narrowing down the variables might be as follows:

- *Final room volume.* At the end of the room design process, the final room volume probably has as much influence on the monitor selection as anything else. A large room will need a large and powerful system. Rooms larger than 450ft^2 are difficult to service completely with a near field system, and still provide adequate coverage for the room population.

Selection of the amplification system for room monitors, when there is a choice (many large systems come with integrated power sources), is not the subject of this article. Many high-end audio systems are packaged in a single cabinet (disregard for the moment, whether this cabinet is built into the room environment.) Large-system, single-cabinet volumes can easily become 15-20ft^3. Placing such a big enclosure above a large front-room glazing configuration and still maintaining good front-ceiling non-reflection geometry, while

Whitney Houston's studio. Note the large expansive ceiling with special acoustic treatment directly behind the console at the listening and ceiling levels. (See Figure 2 for the floor plan and Figure 4 for the section.)

any single element in the control room, will determine the required horizontal coverage (Cov-h or dispersion) of the monitoring system. The intended use of the room also has influence. In such cases, providing wide Cov-h has required special consideration.

Most monitor system configurations will have a 30-35° dispersion angle (off-room centerline). No agreement has been reached on where the speaker centerlines should intersect — whether front to back in the room, exactly at the listener's position, slightly in front or slightly behind.

Decibel summing would logically have this focusing point slightly in front of the operating position. Moving off-center would result in equal levels as on and off axis responses would offset changing dimensions from the speaker center. Industry practice, however, seems to have speaker focusing slightly behind the mixing position. (I have had more success with the latter.) Ear-level mounting results in

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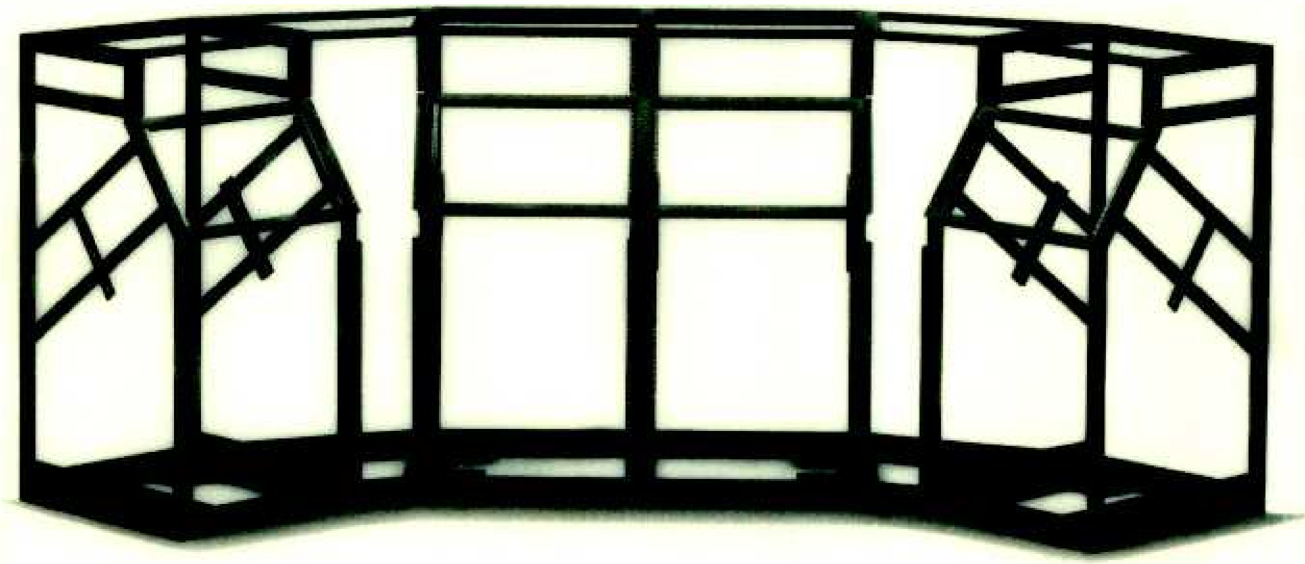

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better horizontal dispersion, and allows the centering to be moved slightly further behind the operator's position.

• *Room-use profile — people.* The issue of increased horizontal dispersion, as well as a deeper reflection-free zone, becomes more critical as the complexity of the room-user profile increases. A small in-house mixing room with a normal room population of only a few people will have much less design impact (for example, dispersion and zone coverage) than a room that might have two or three rear tiers of engineers, clients and producers. Such conditions are common in TV work.

Determination of the high-end listening zone (HELZ) — not just the reflection-free zone — has a great impact on monitor selection, monitor mounting and room de-

View of the Fonovision Studio looking from the isolation booth into the control room on the left and studio A on the right. (See Figure 1 for the floor plan.)

Studio West at Howard Schwartz Recording. The open, clean design allows the studio to be used for multiple purposes. Note the unique ceiling design to control sound reflection and absorption.

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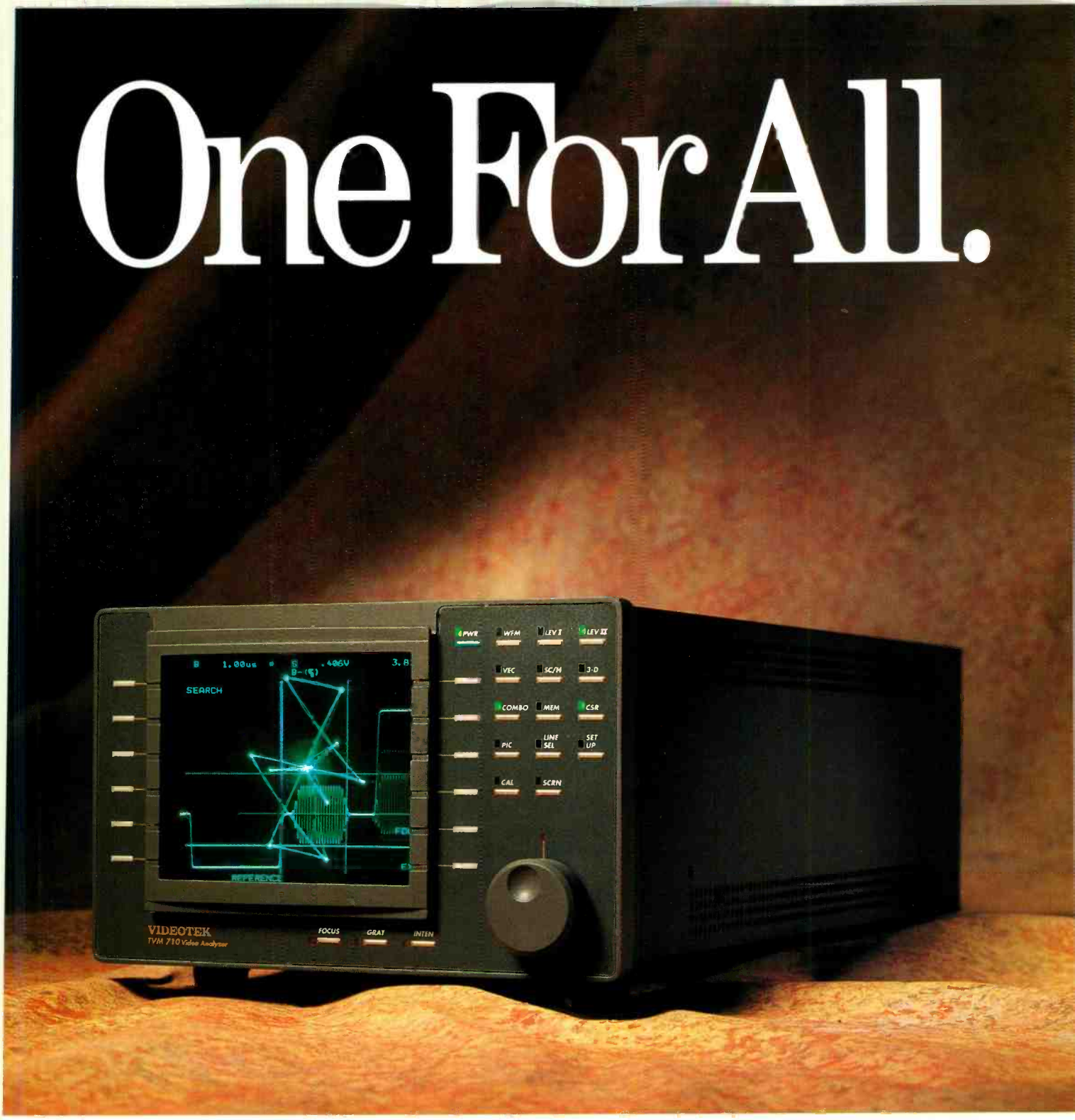

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sign. The deeper this zone needs to be, the wider the room should be. As the room gets deeper, diffusion and *zoned diffusion* become more important. Often, the only way to get even secondary reflections back to the HELZ is through a complex ceiling configuration. (See Figure 4.)

• *Speaker style and taste.* Almost all high-end studio monitor systems sound great, but they definitely don't all sound the same. The differences are usually beyond measurement — certainly beyond any recognized free air measurements. Of the top dozen or so monitoring systems that I have seen in the past five years, free air frequency response throughout the full-frequency response was nearly perfect for every system. Virtually all of these systems are time-aligned for their cabinets.

However, some are better than others. Given the large amount of information

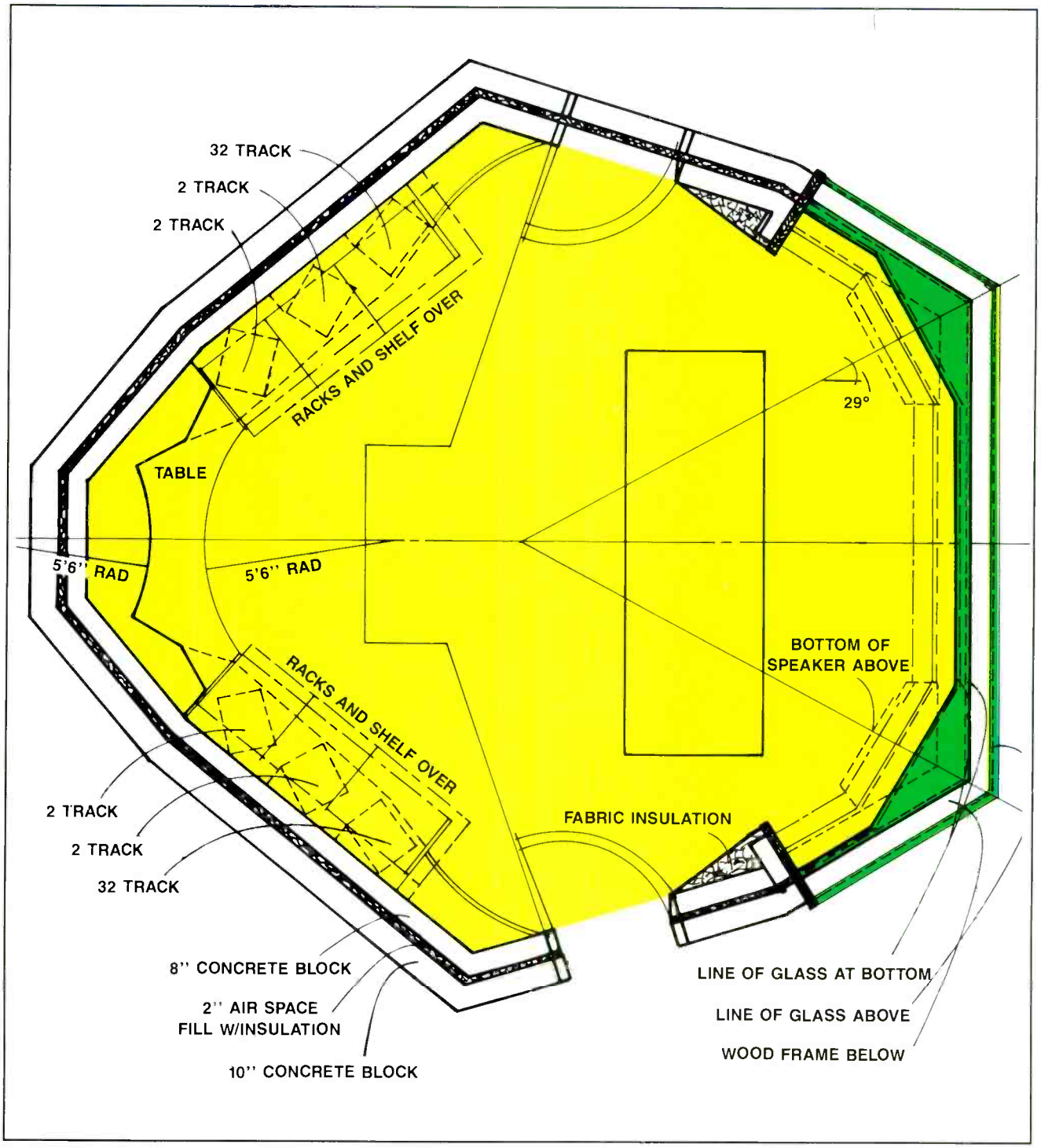
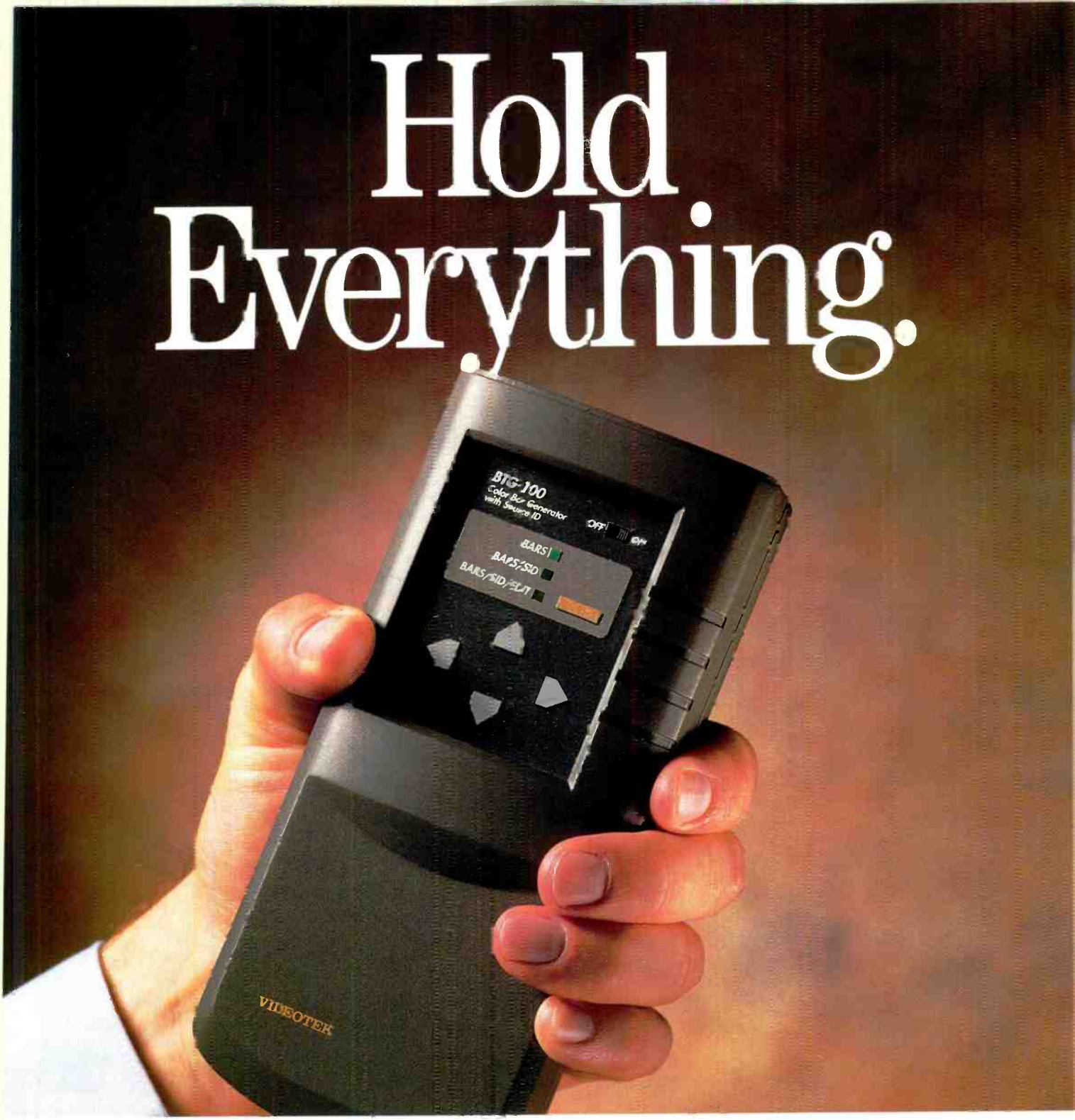


Figure 5. *Typical control-room plan section showing large front glass (not always desirable but an effective approach when required) and rear ceiling scattering elements.*

Hold Everything.



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and data concerning the need for time-alignment or time-coherent monitoring and room design, it's hard to believe that anyone would still select a system and a room design that did not respect the time domain and a speaker with as good a phase response as possible.

Most large studio monitors require some sort of flush mounting. If the control room is small (under 450ft^2) and the entire front surfacing of the room is extremely absorbent at all frequencies (as low as possible), pedestal mounting is probably acceptable. In larger cabinets, rear speaker radiation coming back into the room out of phase (which it almost always will do) can create serious acoustic anomalies.

The bottom line

It's amazing how little acoustic requirements affect speaker selection and mounting. The architectural and programmatical conditions that influence the decision tree for speaker and room design are numerous. Despite the constant manufacturer's bombardment of specifications and data concerning speakers, as well as the flood of room design theories, non-acoustic elements still force most of the decision making. Today, more than ever, I rarely see a high-end professional studio owner start a project locked into a particular speaker.

Ear-level monitor placement with rear-wall and zoned room diffusion are important acoustic tools that should be used as convincingly as possible in control-room environments that are 500ft^2 or larger. Geometry must reflect ergonomic givens, but simultaneously also should create a reflection-free zone as well as a high-end listening zone.

Full Sail/Platinum Studio A with a view looking toward the isolation booth in the right corner. The control room is behind the large glass window on the left. (See Figure 3 for the complete floor plan.)

Splayed front walls, sloped glass, the symmetrical configuration about a room and some other considerations are all standard components of today's high-end control room. (See Figure 5.) Exactly how much of these elements affect the final result is still left a little bit to changing technology, a little bit to art and a little bit to tomorrow's designers.

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Taking advantage of digital video

By Alan J. Wechsler

Engineers who seek to implement digital technology face some roadblocks. To know them is to overcome them.

The D-2 tape format was originally introduced as an updated replacement for aging 1-inch machines in broadcast and post-production facilities. Although the first D-2 machines supported a digital dub capability, this feature was not heavily promoted. Designers apparently thought that the inputs and outputs of D-2 equipment would be NTSC, which would make them plug-compatible with the machines they were meant to replace.

A new composite digital edit suite at Vidcom Post, Burbank, CA. The switcher is to the rear, on the left as you enter the room. The digital effects system is to its right. The edit controller is the black keyboard in the center. The audio console and character generator keyboard are in the foreground.

Wechsler is director of engineering, Vidcom Post, Burbank, CA.

The industry quickly latched on to the digital nature of D-2, because it offered quality signals and cost considerably less than the existing digital format, D-1. Although facilities that use D-2 can certainly reap its digital advantage, the role in which they have placed it severely taxes its capabilities. This, of course, cannot be done without some costs.

This article will offer some suggestions on how to successfully integrate digital video equipment into a working video post-production facility.

Keep it clean

Analog is sensitive, but forgiving. Any transient, ground loop or induced electronic noise introduces an error into the signal. When using a typical waveform monitor, however, it is difficult to see errors much finer than 1IRE or 2IRE. In other words, minor errors are tolerable.

Digital, on the other hand, is as strict as an old-time schoolmaster. It has strong noise immunity, but its rigid nature may create other problems. One of them, for example, is the subtle banding effect that sometimes shows up in graduated images. Although analog systems can reproduce a true ramp between two extremes in lu-

OUTLOOK ON OPTICS

CHOOSING A STUDIO LENS

While the studio places the fewest demands on a broadcast lens, selecting a studio lens requires just as much attention to details such as lens performance, reliability, and technical support.

Studio production lenses differ from field production lenses because they are designed to focus close to the subject, with a Minimum Object Distance (MOD) of less than 3 ft. A typical studio lens, for a ⅔-in. format camera, has a zoom ratio of 15:1 to 20:1 and a focal length of 8 mm to 140 mm. Lenses with wider angles can be used when even more creativity is required. By contrast, field production lenses are designed for long-distance shooting. Their MOD is generally from 7 ft. to 9 ft.

In addition to their close MOD, studio lenses accommodate shots of reasonably wide angles. This enables an entire news set to be captured while positioning the camera close enough to allow the talent to read the teleprompter. The maximum aperture of a studio lens is not too important because studio lighting is well controlled. However, for more sophisticated productions, a faster lens can provide greater depth of field control. A studio lens should zoom and focus quietly so that no noise will be picked up on the sound track.

Accessibility of controls such as back focus, tally on/off, and range extension is also important, especially when using a teleprompter. It is obviously awkward and time-consuming to remove the teleprompter to access a switch.

A 2X range extender is supplied with almost every studio lens. Most zoom lenses are offered with a variety of accessories ranging from manual zoom and focus to full servo zoom and focus with a microprocessor shot box to accommodate pre-set shots.

Fujinon's A20 x 7 studio lens

Reliability and performance, after continued use, are necessary requirements for any lens, and studio lenses are no exception. It is also important to consider the reputation of the lens manufacturer in providing service and technical support, especially on older lenses. After all, a studio lens is a major investment, and you should expect it—and its manufacturer—to serve you well for the life of the lens.

For more information, contact Fujinon at (201) 633-5600, or write Fujinon, 10 High Point Dr., Wayne, New Jersey 07470.

Reliability and performance, after continued use, are necessary requirements for any lens. Studio lenses are no exception.

minance or chrominance, digital assigns to each pixel on the screen one value from a set of predetermined values. This has the potential to produce visual round-off errors that make graduated backgrounds look "stepped." Modern equipment counters this by *dithering* lower order bits, or by using special rounding algorithms. Another approach is to use extra bits for processing a signal, and then round down to eight bits for recording. This digital dis-

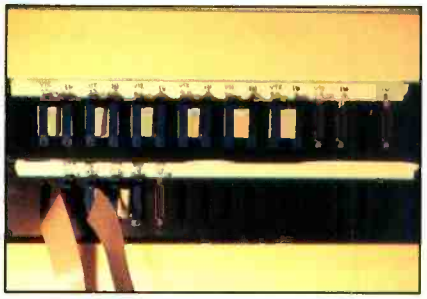
advantage of "stepping," however, can become a distinct advantage when it comes to keying, which will be discussed later.

Another disadvantage of digital is its timing. Bits rarely change from ones to zeros. More commonly, the digital bits in a parallel cable fall out of sync with their neighbors, and are misread at the receiver. Always make sure that the manufacturer's specifications regarding cable length have been followed. This will eliminate some guesswork when a problem occurs.

For short cable runs, ribbon cable and press-on connectors will suffice. It is extremely important, though, that each wire in the cable be of identical length, and that no concealed flaws disturb the signal's interchannel timing. For longer cable runs, it is generally best to purchase cables from reputable suppliers who can test and document them before they ship them.

Different strokes

Digital VTR designers protect signals from errors by incorporating extra bits into the recorded datastream. The DVTR uses these bits to recreate any bits that become corrupted in transmission. Although these measures repair bad data, they cause difficult editing problems because they add an extra layer of complexity between what is on tape and what shows up on the screen.



A digital patchbay made by using ribbon cable and press-on connectors. (Courtesy of Alan Wechsler.)

...the industry quickly latched on to the digital nature of the D-2. Many view it as a comparatively inexpensive way to obtain digital quality signals for considerably less cost.

Dropout, in both analog and digital formats, occurs when the signal disappears for an instant. This momentary loss usually occurs when an electrical transient disturbs the record or playback electronics, or the head temporarily looses contact with the tape (if it impacts a smoke particle, piece of dust or stray hair). Also, the head could be clogged, or the tape could be stretched or wrinkled. Finally, the tape

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might have small areas that lack magnetic material.

Analog systems typically treat dropout by replacing the missing signal with a delayed signal from a previous line. (See Figure 1.) The *dropout compensator* might mask the error well enough to continue to use the tape. But if it doesn't fix the error, a careful editor can replace the defective part of the image by wiping in material from the original tape. It is better to do this than to recreate the edit, especially if the video was part of an extensive effect, even though this procedure will likely cost a generation.

Digital error correctors, on the other hand, detect bad bits and replace them. However, before recording, digital VTRs channel the data into a number of parallel paths. This *smears* the data across the tape. In this way, if a tape has a damaged

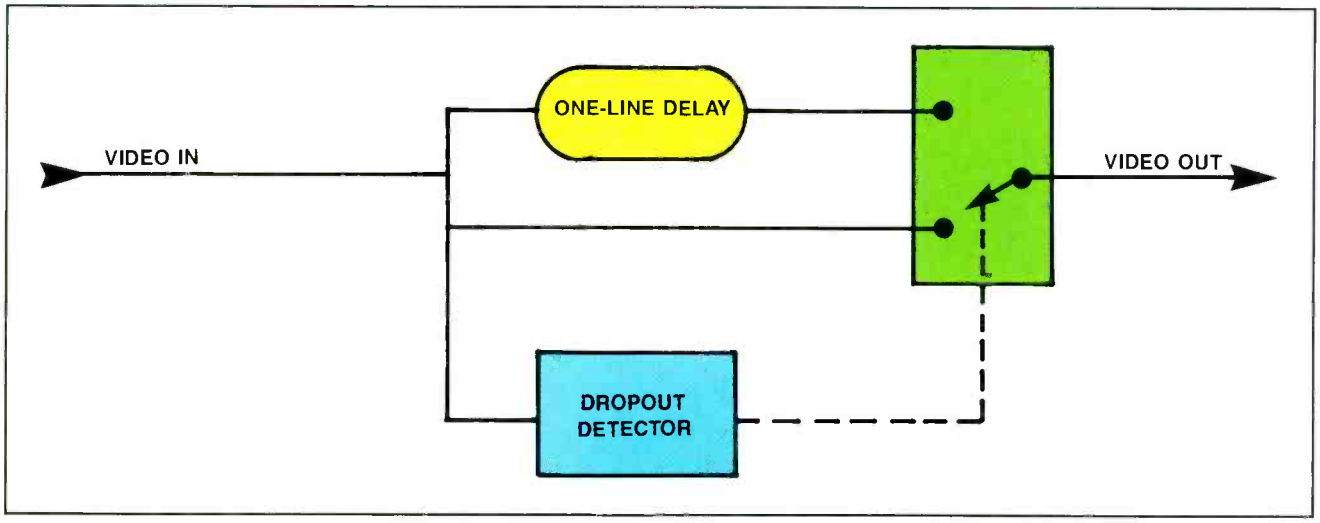

Figure 1. *Simplified block diagram of an analog dropout compensator. The circuit senses the disappearance of video and fills the voids with delayed video from a previous line.*

spot, it slightly degrades parts of the image, as opposed to obliterating a whole one.

The error-correction circuitry will normally restore the image. But, if the *bit error rate* (BER) at a given spot in the tape is too high, the error-correction circuits

the number of acceptable entrance and exit points.

Fortunately, the read-before-write feature of digital recording offers a solution, though it is a hazardous one. Video from the deck plays back through a switcher. The editor then inserts original source vid-

In theory, a video post house should save clients a day of audio sweetening by taking advantage of D-2's four channels of digital audio. In a talk show, for instance, a post house could do a preliminary mix, first setting up left and right, channels 1 and 2, as dialogue and audience partici-

Modern analog one-inch tape machines offer high-quality signals at a low cost of operation.

may not be able to do this. The result is that a whole field or frame may be degraded because the errors have been spread all over.

This is extremely difficult to edit because a simple wipe is no longer an adequate fix. Worse yet, the NTSC *color-frame* sequence consists of four fields that limit

eo in place of the damaged frames. The DVTR rerecords without loosing a generation. Of course, if the edit is not perfect, the master burns.

Analog is touchy, but forgiving. Digital, on the other hand, is as strict as an old-time schoolmaster.

The audio band

Digital recorders today record audio and video on the same track. This has some disadvantages, particularly in D-2, where the audio segments are at the beginning and end of the head track.

pation, respectively. After finishing the mix, it could play those back together on the left channel, and use that as a guide to work applause on 3, and audience *mix and effects* (M&E) on 4. If it works, it can save clients a lot of money, which will bring them back to the house.

Digital composite tape machines were originally designed to replace analog composite VTRs. Innovative facilities use digital to increase the quality of video production.

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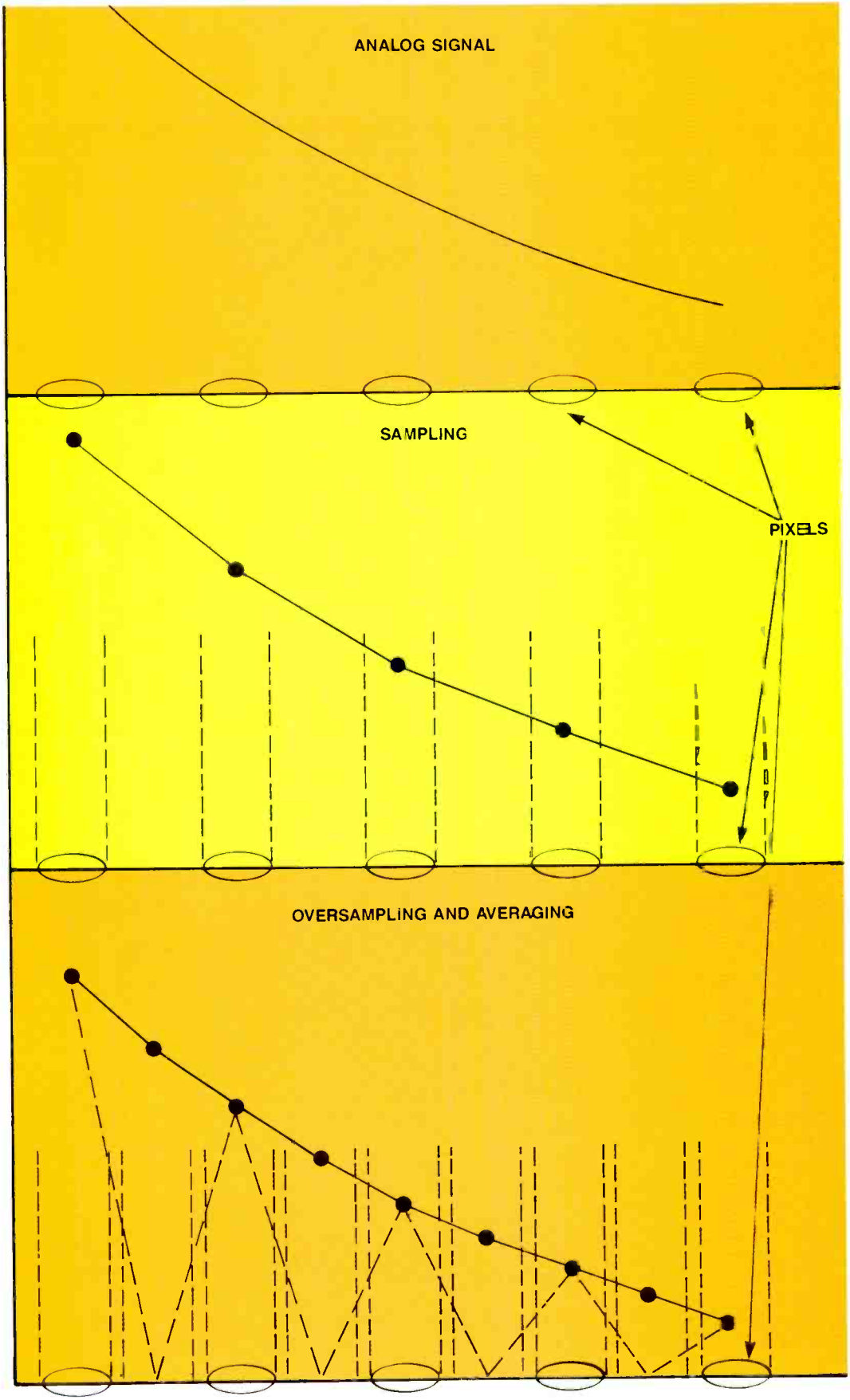

Figure 2. One way to improve the appearance of keys involves taking more samples than are needed (oversampling), and averaging them to create an image that will reproduce properly on the screen. This subpixelization gives video processors a greater degree of control over the signal.

BROADCAST ENGINEERING

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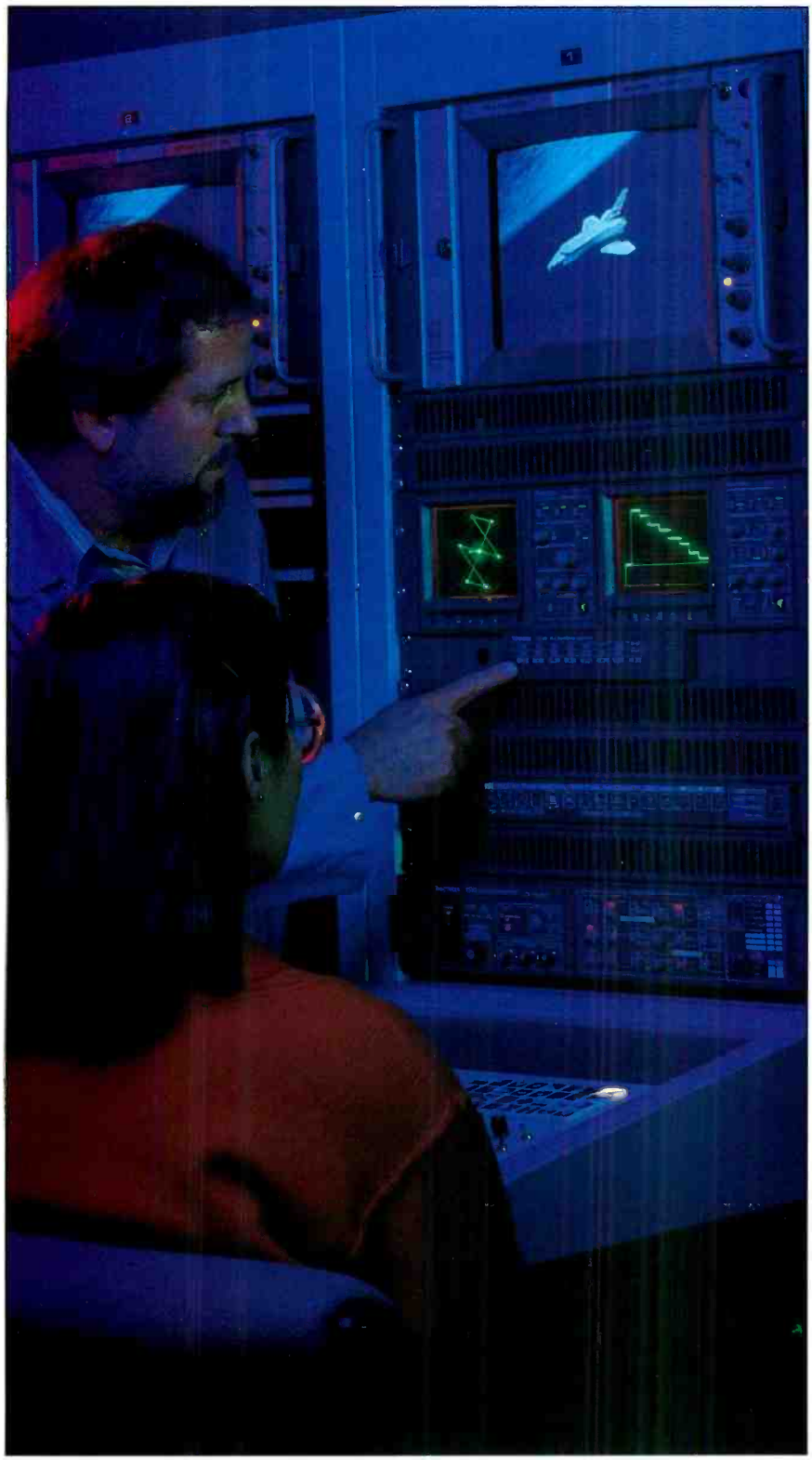
Although the Tektronix commitment to excellence goes back to the founding of the company more than 45 years ago, it is stronger today than ever before. The Tek commitment is backed by the best engineering, marketing and service organization in the business.

Committed to excellence is the driving force behind Tektronix; the phrase means a lot to Tek employees. If a product is designed correctly, built correctly and supported well after the sale, customers will receive the full value they are entitled to expect.

Tektronix has been with its customers a long time. It has earned customer loyalty and respect. A well-designed test instrument is used for many years. It is not at all uncommon for a Tek waveform monitor or generator, for example, to be in



Corporate/industrial video: short time lines, tight budgets, high production values. Tektronix is committed to the corporate market with application-specific products that are accurate, easy to use and cost-effective.

service for 15 to 20 years. Because of such product longevity, the stability and staying power of the company is important. Customers need to know their investment will be backed by a company with a proven track record. Tektronix offers size, stability, a staff of industry experts, and the product performance demanded by customers today.

Listening to customers

Tek's key to success is listening to customers—its business partners—and developing products accordingly. Because engineers are involved in the customer-product interface, the product definition is better and development time is shorter.

A key to the success of the VM700A series video measurement set has been its user interface tailored for customers worldwide.

Tektronix is market-driven through the eyes of skilled, industry-experienced engineers. They are in the field working with customers to determine what end-users want and need.

Many times, a developing product evolves beyond the customer's first request. Applicable technology is brought into the equation, and the cost vs. performance aspects of the task quantified. When all of the individual elements are brought together, a clear picture of the solution can be seen.

For example, customer input led directly to the development of

a new feature in Tek's 1780R video measurement set. Customers found it difficult to make differential gain and phase measurements in the presence of noise. Tek responded with the implementation of a digital recursive filter to improve these measurements under noisy conditions.

The best products do not solve just a single problem; they provide solutions to a varied set of problems.

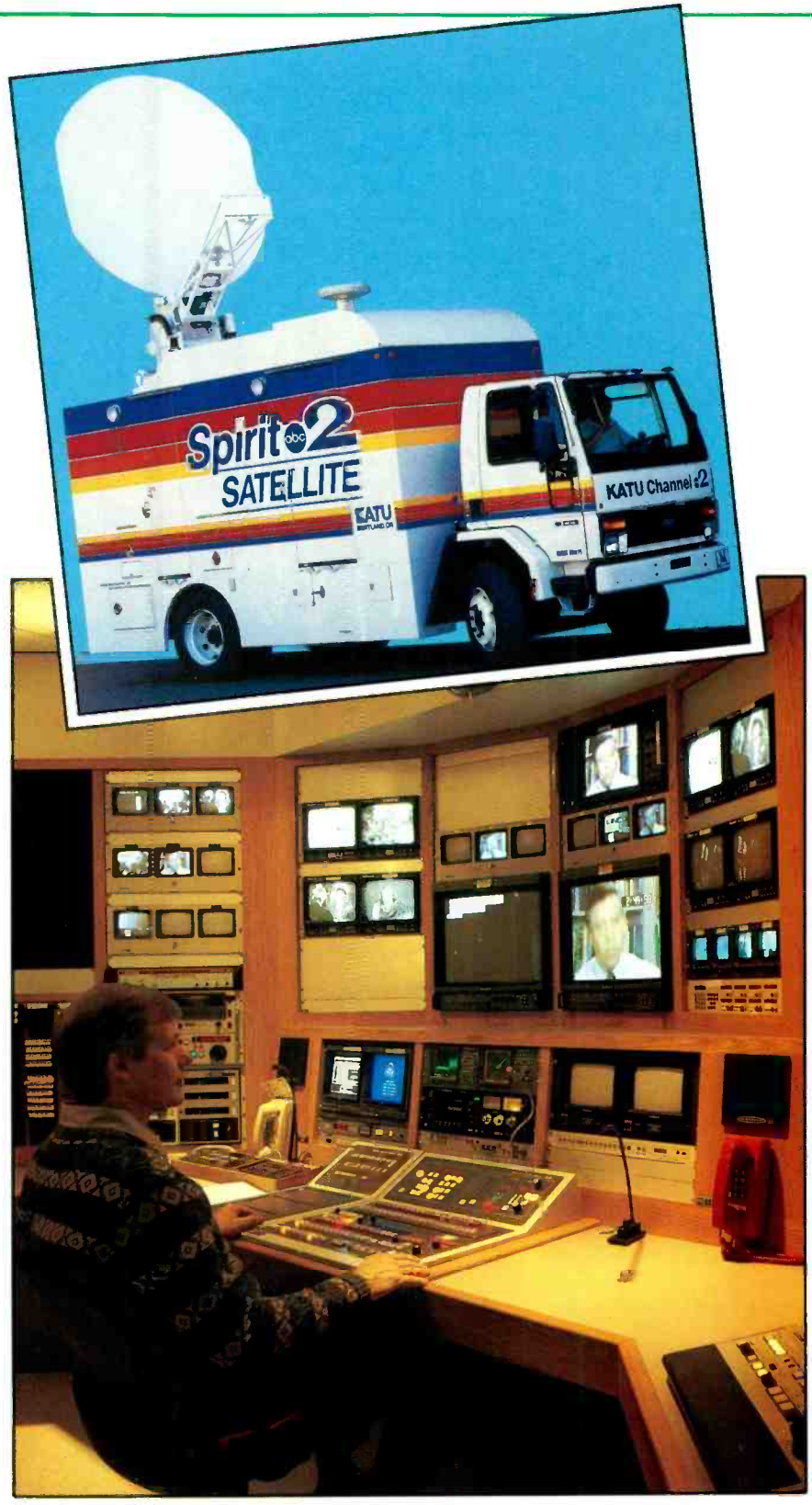
Breaking new price barriers

Top-of-the-line hardware usually has meant top-dollar prices. Not anymore. With new manufacturing techniques and advanced design, first-class products are affordable industry-wide. Furthermore, Tek recognizes that some users simply do not require the most sophisticated features available on a full-feature instrument. In many instances, an optimized version will fill the need.

Tek has tailored its new products to an array of needs. Today, application-specific products at affordable prices offer the best return for the customer.

Tek offers lower cost alternatives throughout its product line. Needs of customers are being met. Simply call a Tek sales engineer for pricing.

With Tek products being used in broadcast, government, industrial, teleproduction, cable and other non-broadcast



(Top) ENG and mobile production: physically demanding, tight quarters, no re-takes. Tektronix is committed to the ENG market with rugged, compact products that solve difficult problems, stand up to the rigors of field use and perform on-cue.

(Bottom) Television broadcasting: on-line all day ... every day, top performance a must, maximum versatility a basic requirement. Tektronix is committed to the television market with advanced instruments that offer unmatched versatility, accuracy and reliability.

Tektronix: Committed to service

The goal of the Television Division Service Department is to form a *partnership* with its customers.

No news is good news

No customer buys a product just to have access to the service department. But if you do need product service, you'll find Tek efficient and dedicated to solving your problem.

Along with providing the best factory service, Tek also focuses on aiding customers who have the capability to do their own service work. Support includes telephone assistance, extensive equipment service training classes, detailed documentation, and ready access to replacement parts, often overnight.

Tek Service fully supports its business partners by doing whatever is necessary to keep the customer in business. Tek strives to repair equipment right the first time, and to provide replacement parts immediately.

Tek Service conducts routine follow-up calls to establish and maintain a dialogue with the end-user. Customer satisfaction surveys are also done on a regular basis to ensure that the expectations of the user are being met.

Here today, here tomorrow

New products are warranted to be free of defects for one year. An exception is the 1780R measurement set, warranted for three years. Tektronix always supports its products long beyond the cessation of production.

Because Tek understands the demands of customers who must be online, all the time, the company provides the following assistance on an ongoing basis:

Service:

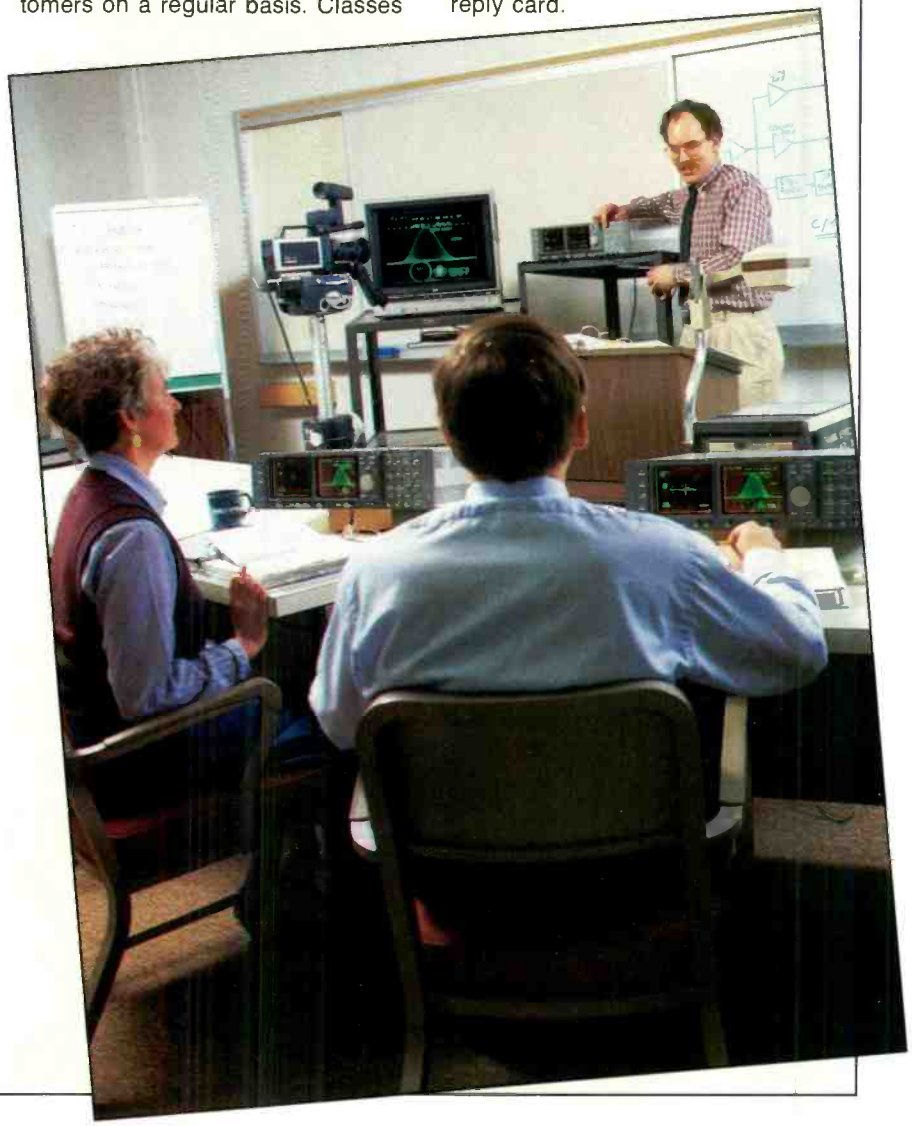
- Tek Service Centers are located in most major cities.
- *Tek Service Notes* publicizes equipment upgrades, modifications and new repair techniques. Fax 1-503-690-6718 to receive copies.
- The 1-800-TEK-WIDE hotline provides emergency service assistance.
- Product manuals are available from your local Tek sales office.

Training:

- Nearly a dozen different service training classes are available to customers on a regular basis. Classes may be scheduled by calling 503-629-1407.

Applications Information and Consultative Services:

- VM700A series video measurement set hotline, 1-503-627-1700, or fax 1-503-627-1707.
- Consultative services are provided by sales engineers.
- Education/applications reference materials can be obtained by using the attached business reply card.



operations, product applications are expanding constantly. Tek works hard to develop products that address each area individually. As products for one market are refined, the technology often is applied to another product as well. This spin-off effect has significant benefits, including faster response to industry needs and greater efficiencies in manufacturing, resulting in lower costs to the buyer.

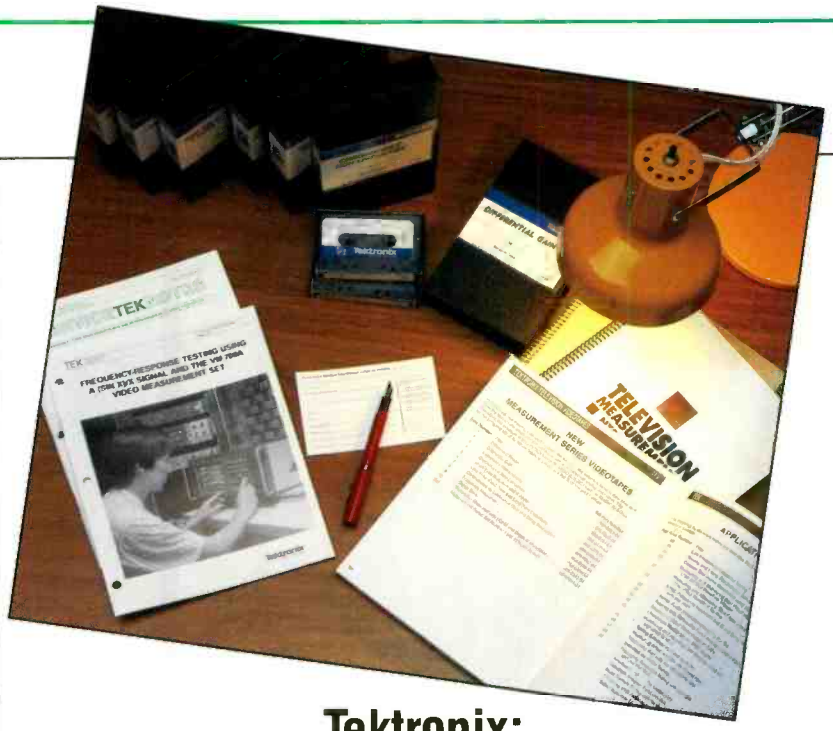
Tek's Television Division recently introduced a new range of products that break traditional price barriers. It is evident that companies with the greatest technical resources are the ones that can best apply new technology to the marketplace. Price is an important item, but quality is expected and delivered in every Tek product.

Today, Tek's application-specific TSG-100 series generators sell for as low as $1,250.

The new TSG-100 family of test signal generators represents a unique approach to product differentiation. Rather than a universal test signal generator, smaller application-specific generators with a limited number of patterns have been developed to match the requirements and budgets of specific customers.

People: The key to success

People are the core of any successful business. The best strategy in the world is worthless without the skilled professionals



Tektronix: Committed to education

Tektronix is proud of its aggressive education and training program for both customers and employees. With the technology of professional video changing dramatically, Tek maintains a competitive edge with ongoing training and education programs. Education is a big commitment; it separates Tek from its competitors.

Customer support ranges from providing technical books and tapes to holding instructional seminars for end-user groups throughout the world. Providing hands-on instruction creates an environment in which users can ask for help and receive it. Educational materials include:

- **Application Notes**. Instructions on measurements using manual or automated instruments, RF, HDTV, component, digital, audio and proprietary instrument features and signals.
- **Books**. TV measurements for the NTSC and PAL transmission systems, and component video.
- **Newsletters**. Correspondence to customers focusing on the following areas:

Tek Video News—new product and training material introductions

In Phase—application information on the VM700A series video measurement set

Tek Service Notes—product service updates and warranty information

- **CompuServe Network**. The Broadcast Professionals Forum carries new product and applications information. Tek provides access information upon request.
- **Videotapes**. Subjects include:
  - Differential Phase
  - Differential Gain
  - Transmitter Measurements
  - Line-Time, Field-Time and Long-Time Distortions
  - Frequency Response
  - Group Delay
  - Short-Time Distortions and K Factor Measurements
  - Chrominance Non-Linearity
  - Luminance Non-Linearity
  - Chrominance to Luminance Gain and Delay Inequalities
  - Basic Waveform Monitoring
  - Component Monitoring Using the Lightning Display

Furthermore, catalogs and product data sheets are available, along with a selection of audiotapes. For more information, please use the attached business reply card.

Committed to quality products

Tektronix's broad product line is indicative of how well they serve the marketplace. New products include:

Serial digital: The *TSG-170D* digital composite NTSC generator and *1730D* digital waveform monitor both support testing of the emerging serial digital transmission standard. The 1730D waveform monitor displays analog video and serial or parallel digital video signals, and features the *eye pattern* measurement for evaluating serial digital signal paths.

Low cost generators: The *TSG-100 series* of test signal generators are compact, rugged and cost-effective. The *TSG-100* NTSC generator features eight commonly used test signals suitable for studio, maintenance bench, mobile unit and field portable applications, or for measurement of transmission paths such as satellite and terrestrial microwave links.

The *TSG-120* and *TSG-130* provide the flexibility and accuracy needed for servicing NTSC and Y/C (S-VHS and Hi-8) video gear. They provide NTSC and Y/C signals simultaneously. The *TSG-130* multiformat generator provides signals for servicing Betacam, MII, S-VHS, Hi-8 and NTSC video equipment.

The *TSG-120* and *TSG-130* have an optional black burst output for use as a timing reference for Y/C and NTSC based production facilities.

Dual standard: The *1725* dual standard vectorscope can be operated in tandem with the *1735* waveform monitor for dual standard composite waveform/vector monitoring. Both instruments automatically recognize the standard of the incoming video and switch without user intervention.

Automated audio: Tek's *VM700A Option 40* video/audio measurement set combined with the *ASG-100* audio signal generator, provides fast, accurate automated audio measurements for broadcasters. Measuring the audio performance of a studio, STL, transmitter or satellite uplink takes about 30 seconds.

SCH phase: The *1720SCH* combines the full features of the 1720 series vectorscopes with the added capability of SCH phase indication and color frame matching. The product uses the Tektronix patented *polar SCH display*, which continuously provides SCH information.

necessary to carry it out. The accumulated knowledge of Tektronix personnel is the company's greatest strength. Tektronix is staffed by dedicated, highly experienced professionals, many of whom have worked in the TV industry for 20 years or more.

Tektronix products are marketed through both a company sales force and a network of professional video dealers. The company has more than 20 full-time sales managers in the United States and complete product sales and sales support worldwide. These seasoned professionals are the direct contact links between Tektronix and its customers. This fosters greater communication with end-users and ensures a timely response to their needs.

A number of Tektronix people participate in standards committees, most notably SMPTE, to help formulate recommended industry practices,

Tek sales engineers are sources for a wealth of information.

and to stay abreast of the latest in technology. Tek also works regularly with the ITVA to educate members on how to use video test instruments. The company recognizes the need to stay current with the pulse of the marketplace.

Leading-edge technology

With so many resources within the company, Tektronix is at the forefront of development of a number of key technologies. Armed with its own integrated circuit division, Tek maintains

numerous proprietary advantages over competitors.

Because of the size of Tek's Television Division, as well as the volume of production and worldwide distribution, Tektronix has been able to aggressively pursue *application-specific integrated circuits* (ASICs) to further improve product value for customers.

Advanced technology, combined with application knowledge, is making possible dramatic improvements in user interfaces. The benefits of a well-planned user interface can be seen in the VM700A video measurement set, which has set a precedent for intuitive user interaction.

Many of the benefits of Tektronix research go unnoticed by end-users—and they should. For example, a proprietary sync-separator integrated circuit permits the 110-S and VS-211 video synchronizers to perform far better than their competitors in the presence of unstable signals.

Tektronix designs and manufactures all of its products. In the long term, this provides the best value to the customer. The company's marketing, sales, engineering and customer support operations are tightly integrated to serve the end-user.

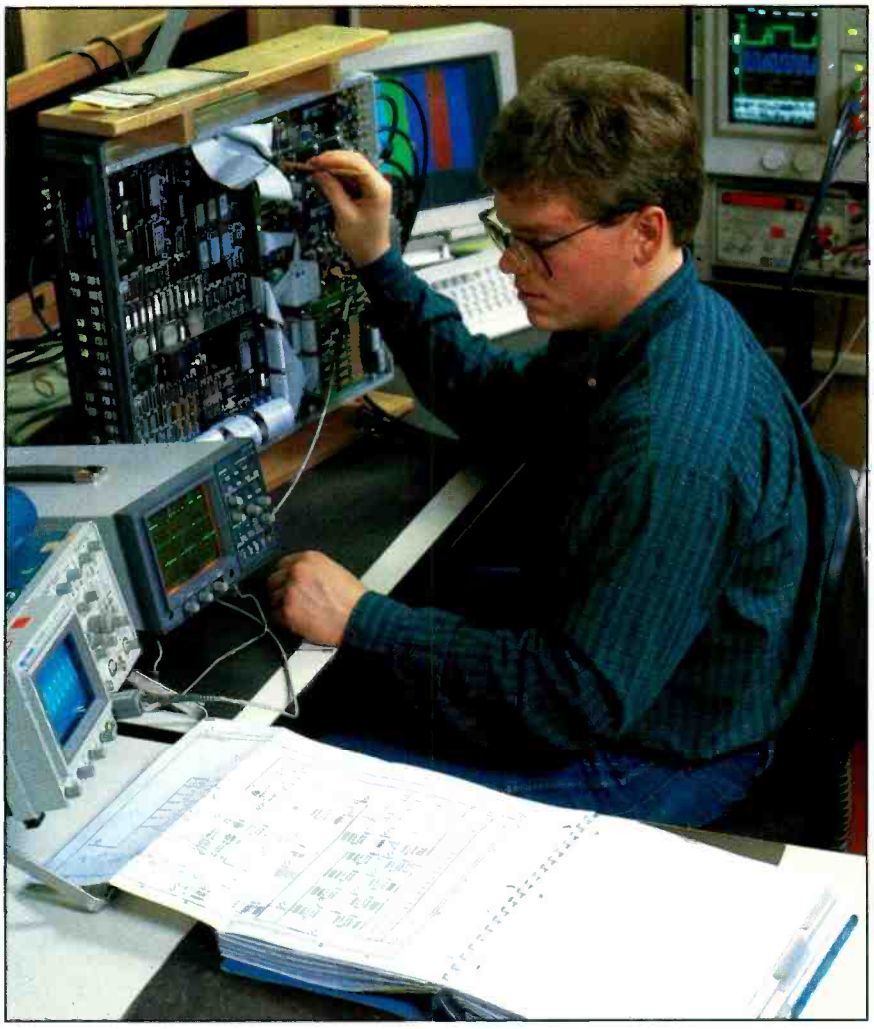
Tektronix' commitment to excellence is the hallmark of the company. Count on it.

Companies with the greatest technical resources are the ones that can best apply new technology to the marketplace.

Award-winning technology

Tektronix has received two Emmy Awards for technical excellence. In 1984, the National Academy of Television Arts and Sciences awarded an Emmy to the Television Division for "continued technical excellence and leadership in television test, measurement and monitoring technology." The company received its second Emmy for "digital intelligence in professional broadcast monitors" in 1988.

These awards are the industry's recognition of Tektronix' sustained performance as an outstanding innovator and contributor of state-of-the-art products.



High-definition television: video technology at its best. Tektronix is committed to making HDTV a reality for broadcast and non-broadcast applications. Tek's line of pioneering high-definition test and measurement products includes: TSG 1001 programmable generator; TSG 1050, TSG 1125 and TSG 1250 HDTV signal generators; SPG 1000 HDTV sync generator; 1730HD waveform monitor; and 2467BHD oscilloscope.

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Tektronix®
COMMITTED TO EXCELLENCE

Unfortunately, it doesn't always work. A tracking or edit optimization error can cause the data at the extremities of the track to be too far out of specification to be recoverable. This error sometimes results in garbled audio.

quantization errors. In the analog system, the path between any two voltage points can be thought of as a ramp. Adjusting the key clip is a subjective matter and is often performed while staring at a monitor. But if anything is misadjusted in either the signal path or the monitor, such as the contrast control, the key could look differently in the control room than it does at home on television.

The digital signal has distinct advantages for keying.

Keying

The digital signal has distinct advantages for keying. It is exactly the same reason that gives digital the potential for

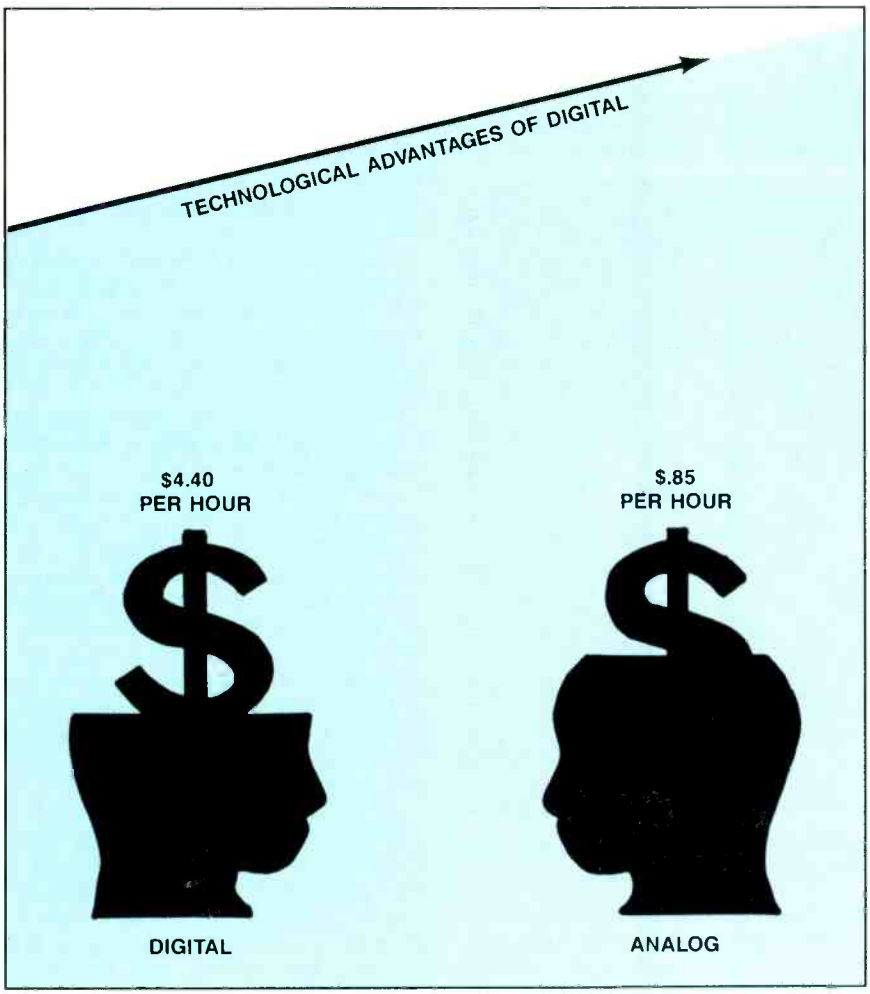
Analog systems typically treat dropout by replacing the missing signal with a delayed signal from a previous line. Digital error correctors, on the other hand, detect bad bits and replace them.

The operator's position at Vidcom Post, Burbank, CA. Editor control is to the left, and the audio mixer is to the right. Intercom is at the center.

Although digital can provide significant technological advantages, many believe it does so at an increase in operating cost.

A digital key, on the other hand, is much more concrete. If the value of a given pixel equals or exceeds a given clip point, the fill video takes its place. There is no ambiguity.

Unfortunately, this can create transitions that are too abrupt for the TV system to handle. Special filtering systems can compensate for this. One interesting new technology involves oversampling the affected pixels, and then averaging them. (See Figure 2.) The more samples per unit area, the more choices the system has, and the cleaner it can make the picture. This technique, called *subpixelization*, avoids many of the NTSC artifacts that can plague facilities that do key work strictly in the analog domain.



The composite video switcher at Vidcom Post, Burbank, CA. Users adjust the switcher controls with soft menu keyboards. The switcher has two M/Es.

Power trip

At present, digital equipment is somewhat power hungry. A D-2 machine, for instance, may use up to twice as much power as a modern 1-inch machine. It is also likely to wear out more quickly. Head life is typically less than 7,000 hours. Finally, it can cost more to operate. One estimate states that D-2 costs up to $4.40 an hour, while 1-inch costs about $0.85 an hour.

Though facilities may not be able to transfer these costs to the client, the ones that are equipped with DVTRs can offer the digital advantage, and this can draw more customers to their doors. Many facilities would rather live with the few idiosyncrasies of today's digital video systems than try to compete without them.

|:-)))|

Building a sports cable network

By Bob Billeci

State-of-the-art cable network relies on modern broadcast technology.

The growth of regional sports networks is a hot topic in the broadcast business today. Thirty-two such networks are now operating. These networks bring a local flavor to sports viewers in their areas, carrying the performances of local pro and college teams. The networks earn revenue by advertising sales and subscriber fees. In an era where cable penetration is 59%, these networks are commanding considerable attention.

Creating a modern news set for a cable network required the same design criteria as any high-quality TV production facility. Shown here is the news set at Prime Ticket.

The Prime Ticket Network is one such service. This past year, it covered more than 650 live sports events. The network also serves more than four million subscribers in California, Nevada, Arizona and Hawaii.

In May 1990, the Prime Ticket Network constructed a sleek $7 million production facility and office complex in Century City, located on the west side of Los Angeles. Engineering the facility was simple, yet complex. It was simple because the engineer had the full support of management. He had complete control of the project, and was the spokesman for the facility with vendors and contractors. It was complex because this was no ordinary facility. The network is essentially a full-service TV station, lacking only a tower and a transmitter.

Clean slate

Before building the facility, Prime Ticket contracted for all technical needs. Remote production, backhauls, satellite uplinks and master-control functions were all assigned out. At length, the network determined the practice was not cost-effective and it decided to build.

Billeci is vice president, engineering, Prime Ticket, Los Angeles.

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ALTA's new Pictoris EDE delivers first-class digital effects like flips, tumbles and curvilinear moves—all at a price that'll make you smile.

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Ask about another new ALTA product—the new Pegasus video production switcher.

Circle (61) on Reply Card

First, the network located a 4-story office building with a good address and leased the bottom floor. Then, an engineering vice president was hired to build the network headquarters. When the engineer asked the management what it needed, no one could say for sure. One of the engineer's first tasks was to figure out what was needed and develop cost projections.

Space planing

The network facility spans 30,000ft^2. It houses a master-control area, an on-line and an off-line edit suite and a graphics room. It also houses the corporate offices and sales staffs.

Adjacent to the main building is an annex, which is a raised structure set on pylons, with parking underneath. Built to be the slide-show area for the original Century City promotions, the windowless structure, considered unsuitable for use as office space, had been used for storage for 30 years. The space was converted into the new studio facilities.

Dividing the main building required diplomacy. Certain portions would best accommodate Prime Ticket's technical spaces. Power and structural integrity were primary considerations. The next step was bringing together the other department heads, determining their needs, and compiling them into the remaining spaces. An interior design company was hired to develop efficient office arrangements.

The chosen design company primarily does high-end residential work with many architectural embellishments, and prefers to work with a specific general contractor. This contractor had never built a TV station, so the engineer insisted on selecting his own electrical and HVAC subcontractors. He wanted to use companies that were knowledgeable in the construction of technical and studio facilities. Building a TV station in an office building situated in Los Angeles' marketing and advertising section would require some special permits. The engineer wanted to use subs that could navigate the city bureaucracy relative to the specific needs of broadcast facilities.

The general contractor balked, and that's where the previously negotiated management support came into play. The dictum came from upper management: If the contractor wanted the job, it would use the proven subs. This decision later kept the facility's construction on the fast track. It also eliminated conflicting communications with suppliers. The network was able to hold to the original air date, even when delays in the lease negotiations postponed construction for three months.

Backup HVAC and power

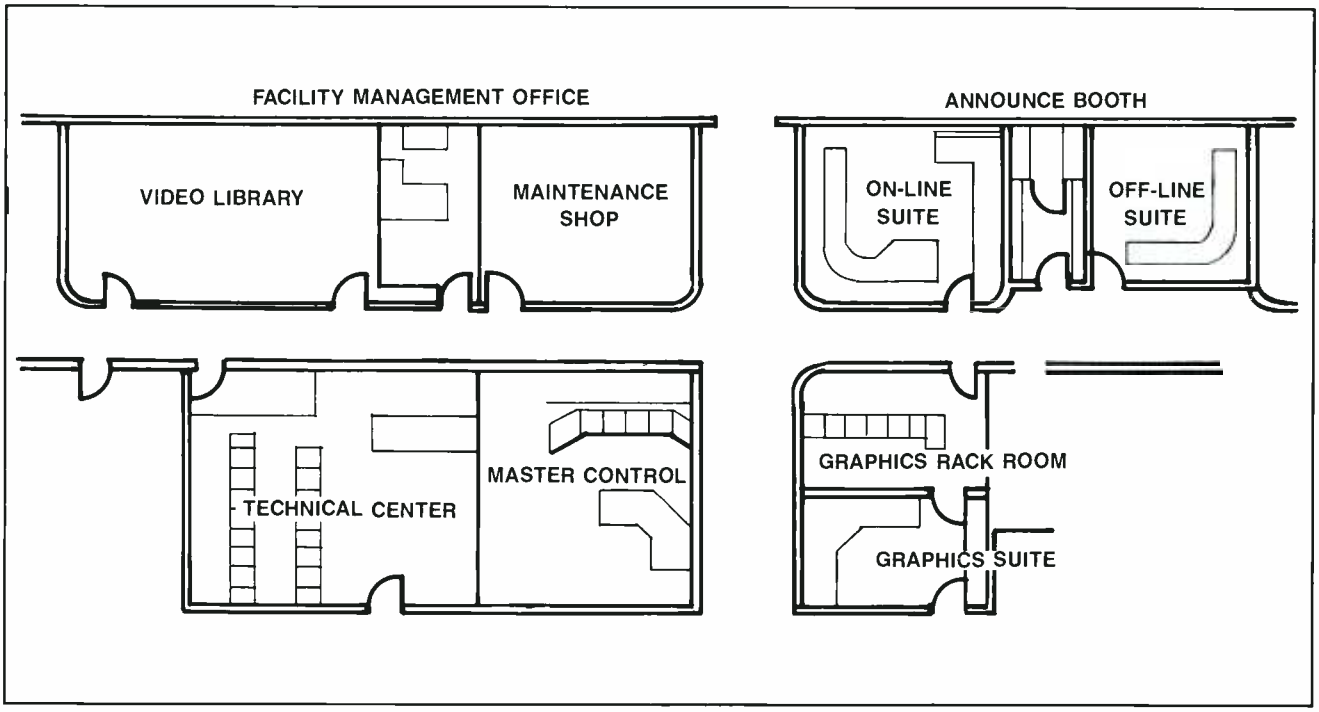
Businesses in office buildings operate from nine to five. Broadcast facilities operate 24 hours a day. This leads to some extraordinary HVAC needs. The network found it cost-effective to build a separate chiller system for all the technical facilities and after-hours office space, such as the newsroom. The facility uses the main building's chilled water during the day, and a separate 45 ton air-conditioning unit at night. This also provides the network with a backup cooling system.

To keep that air going, and for backup power to the technical areas, two layers of power protection were installed. A 20kVA UPS keeps the computers and other data-sensitive equipment running until the 350kVA emergency generator in the parking lot comes on-line.

Of course, special offers can entail some inconvenience. Some of the gear was new and without a track record.

Wire everywhere

Although the network is a cable operation, you could never tell it from the quality of the construction or the facility's electrical layout. Years of experience from working in various stations allowed the engineering staff to carefully plan the facility's design. It looks and feels like a TV station — from the choice of equipment, through the way it is installed.



Prime Ticket's floor plan of studio control room, master control, press box news set and on-line production facility.

Only SIAT® lets you test audio quality during program time.

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The SIAT Advantage Technical Characteristics

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*SIAT tests 19 different audio parameters, including intermodulation distortion. Up to 10 parameters can be included in a 5-second test.

Without disturbing your audience.

Everyone knows it's not polite to interrupt. But the fact is, the need to test audio quality is most critical *during* key programming times. Which is precisely when testing for noise, distortion, crosstalk and more is most difficult and intrusive.

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Or, you have to settle for inaudible test systems that can't measure noise at program levels—and that fail to account for poor transient response or distortion caused by overload.

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Circle (62) on Reply Card

Potential wiring problems were avoided by using conduit. All the wires are contained in conduits, and all the conduits exit from the walls. There is no need to access the ceiling spaces to run cables. This had two advantages. First, it allowed the staff to pull cables after leasehold construction was complete. Second, it eliminated the need to use plenum-rated cable.

The phone system is the one exception. Plenum-rated telephone cables run above the ceiling, but there are no terminations or junctions. Each extension has six pairs, which provide for future expansion. Each office, therefore, has the potential to be the control center.

An entirely free-lance technical staff dictated certain choices in equipment selection. They bought only name-brand equipment with which most workers would be familiar.

The facility has two in-house cable TV systems. One carries four channels that are programmable from the routing switcher. The other distributes the local cable TV system. Using two systems reduced complexity at the head end. The primary expense was the labor of running the wires. It didn't cost much more to run two cables than one.

The network's newsroom features a 15-node local area network (LAN). The newsroom system also drives the facility's teleprompter. A separate LAN connects each desk in the facility to a distributed word-processing and database system. This allows many users to share data and resources, such as printers.

Although fiber plays a large role in how signals are handled, two dual-band TVRO dishes are required for some program acquisition.

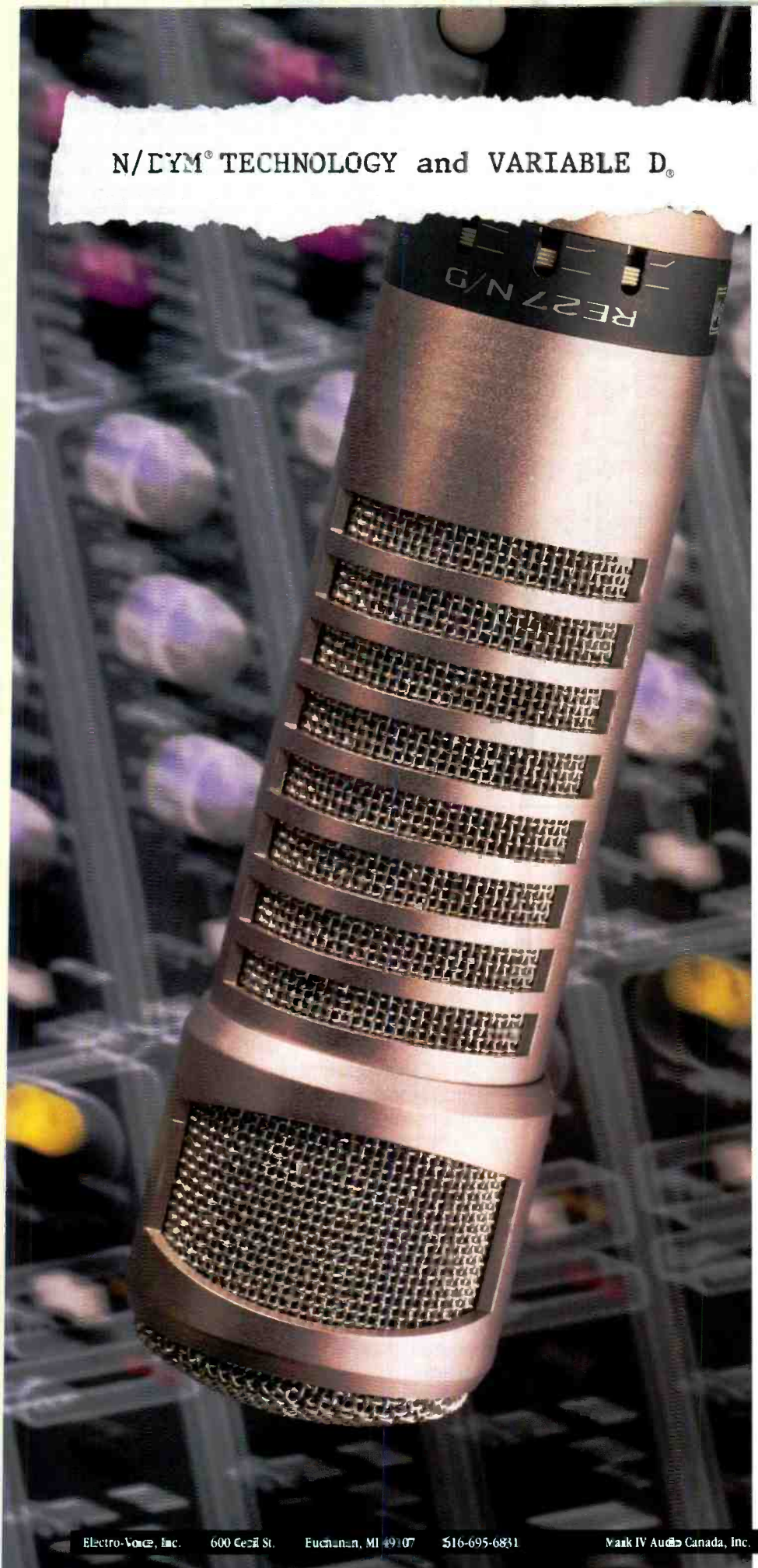
Lots of pipes

The wiring layout was planned by estimating the worst case number of wires, adding room for error, and then adding on an additional 50% for future expansion. There are three wiring systems: video, audio and serial control.

A marker line was installed in each conduit. This is a special string with numeric indicators every foot along its length. Estimating a cable run requires only that the smaller number be subtracted from the larger number. The marker line is used to pull through a cotton pull rope, which is then used to actually pull the cables through the conduit. The marker line is the sort of touch only a contractor versed in this type of construction could provide.

One of the first wiring snags encountered was that cables with different jacketing materials have different coefficients of friction. Different types of cables do not always pull well together. The result was that some of the spare conduit space, planned for expansion, had to be used in the original installation.

The facility uses computer flooring as a wiring convenience. This initially created some problems with furniture placement. The floor's 6-inch rise made it necessary to install ramps for wheelchair access, which is required by the building



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code. It was also necessary to allow turning clearances at the ends of the ramp. Although it took careful planning to fit everything in, a useful by-product is that it is now easy to roll heavy VTRs in and out of the technical areas.

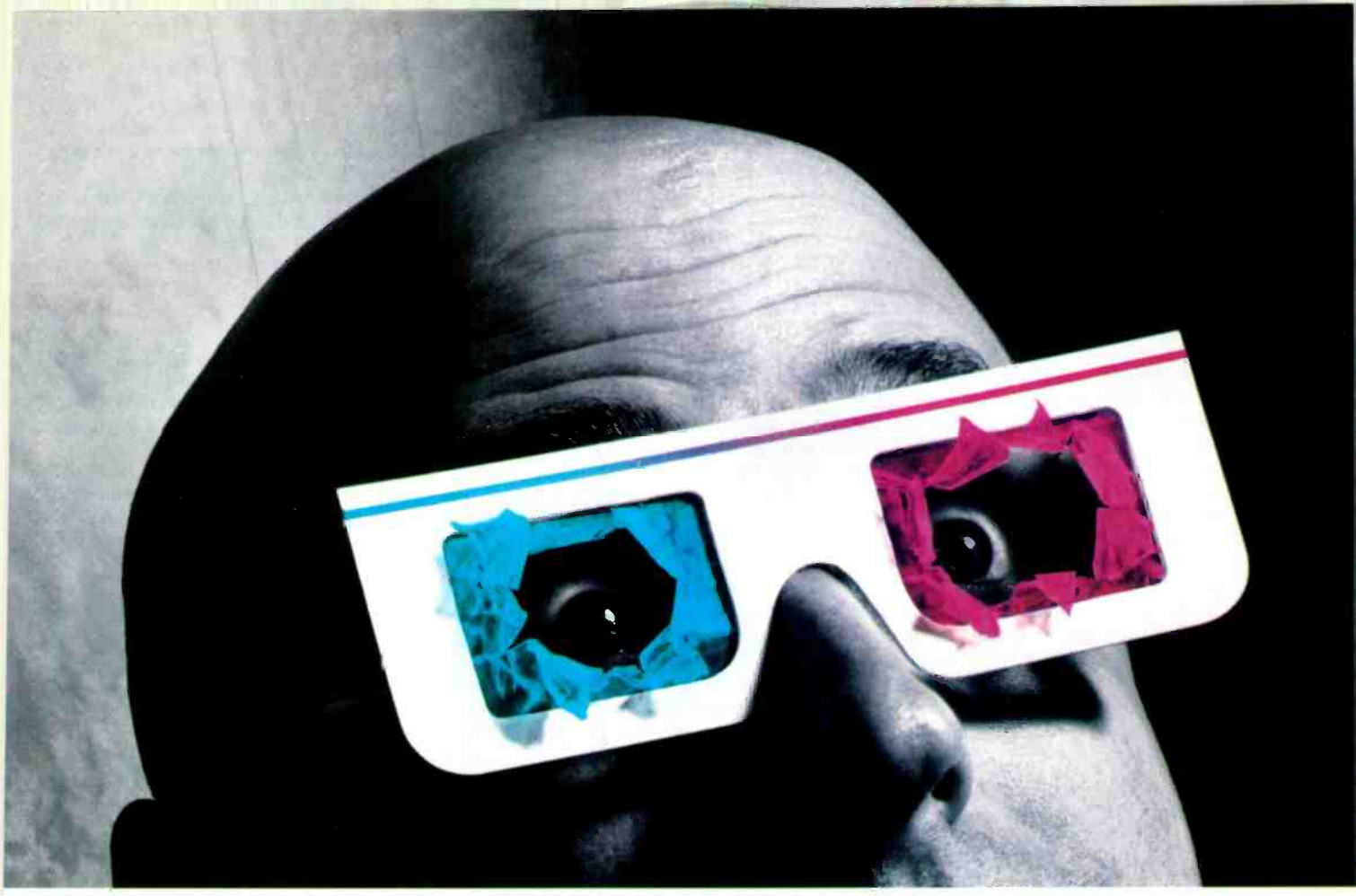
Working managers

The primary construction crew consisted of four people. This is unique because these four people were the network's technical managers. (The vice president of engineering, the manager of technical facilities, the manager of technical operations and a maintenance technician.)

The advantage of having the technical management staff build the station is that the staff knows where everything goes. This is particularly important in the network's operation, because the operating staff is entirely free lance. If someone has a question or needs help routing a signal, an engineer doesn't need to be tracked down, any technical manager will do.

Engineering facilities of this type are an exercise in broadcast engineering, even if the ultimate method of distribution is changed.

Meeting the needs of clients and production staff in the same room can be a challenge to both designer and engineer.



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An entirely free-lance technical staff dictated certain choices in equipment selection. Only name-brand equipment with which most workers would be familiar was purchased.

ate climate for the stored equipment. The only stipulation was that the network had to agree to give up that space if another tenant showed up. Fortunately, the need never arose.

programming, which is not amenable to automation, that master control is nearly always staffed.

The automation system is PC-based. A LAN provides the operator with complete control of the equipment. The automation is also interfaced to the facility's traffic system. This facilitates the generation of as-run lists and the loading of playlists.

A Betacart machine plays back the commercials. One-inch and Betacam-SP recorders are used for other production. Because much of the network's tape library is U-matic SP, a few of these machines are retained for playback purposes. They are no longer used for recording.

The master-control switcher features 30 inputs and works in concert with the routing switcher. An 8-by-1 bypass switcher can run the station if the main switcher is disabled. Because all the sources and destinations in the station are on the router, the operator can switch the station from the routing switcher if needed.

The station character generator can be accessed from several locations. It is a 3-channel system, installed so that any control room can access any channel. This allows a studio or post facility access to up to two channels, without hampering production elsewhere.

Shopping list

Because the facility was starting from scratch, everything from patch cords to VTRs was needed. This requirement did offer certain financial advantages.

Of course, using special packages can entail some inconvenience. Some of the gear was new and without a track record. This required the engineers to bank on the manufacturer's reputation as an insurance that it would work, or could be made to work. Special purchase deals may also mean accepting equipment when the manufacturer wants to send it, not the other way around. Fortunately, there was temporary space available in the building. It was dry, secure, and provided a temper-

The choice of studio cameras bears some examination. Some people believe that the industry is just on the cusp of a new generation of studio cameras. Therefore, the company felt that a large expenditure on existing CCD cameras was not justified at this time. For this reason, the facility selected small-format, view finder-equipped EFP-type cameras.

Automation

The station can be fully automated. After the playlist and commercials are loaded into the cart machine, the facility can run itself. It does so in dayparts where there is taped and syndicated material. However, the network does so much live

Although most TV facilities feed a transmitter, Prime Ticket feeds a processing amplifier. The signal then runs out a fiber optic to a nearby telephone company hub.

Modern automation equipment, complete with a library system, allows the network to operate by itself if desired. Shown here is the equipment area.

The station character generator is a 3-channel system. This way, if the studio or the post facility needs two channels, they are available, but production can still proceed elsewhere.

Enough said.

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Getting the signal out

Although most TV facilities feed a transmitter, Prime Ticket feeds a processing amplifier. The signal then passes via a fiber-optic cable to a nearby telephone company hub. (See Figure 1.)

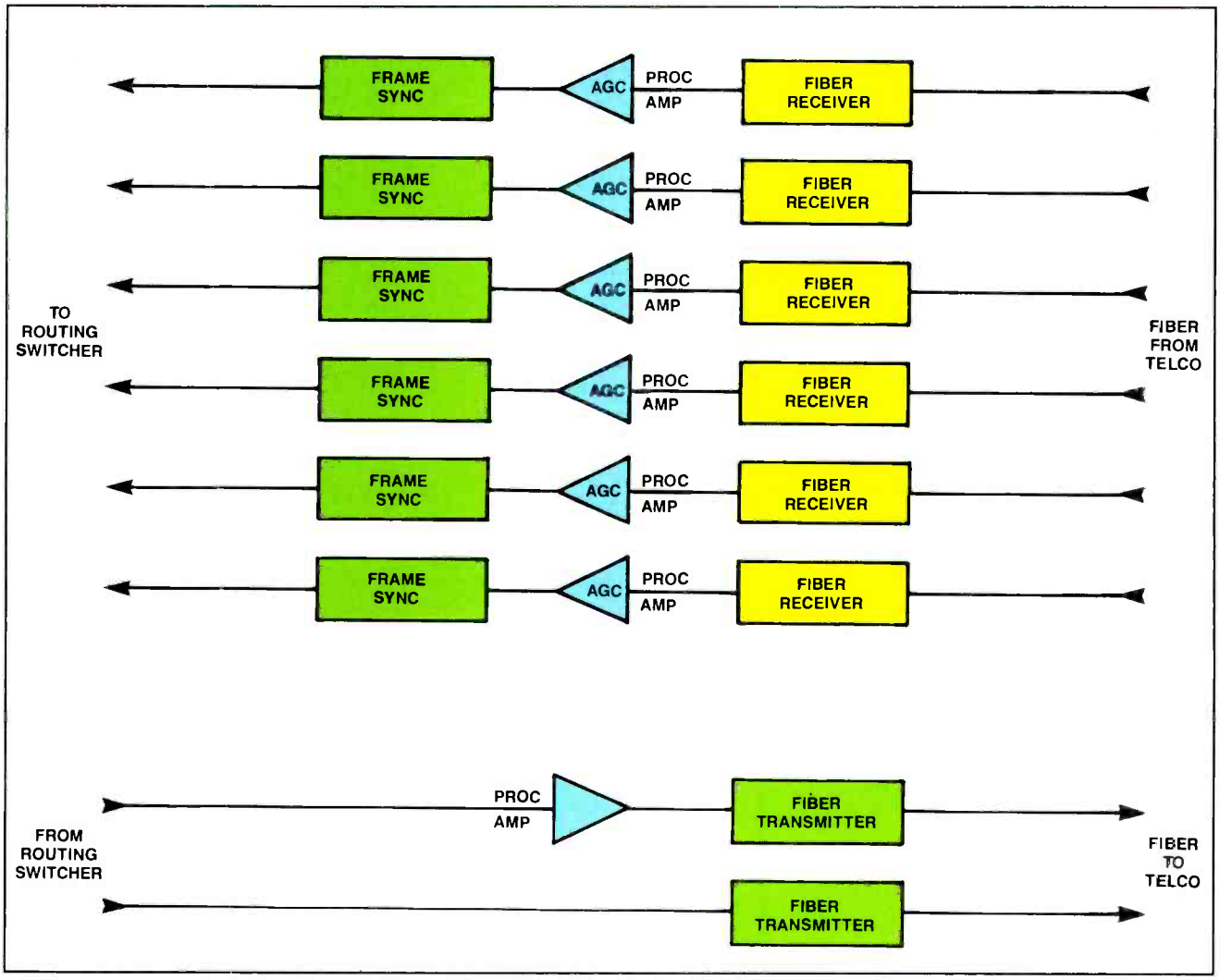


Figure 1. *Most signals enter and leave the network on fiber. The six incoming fibers are level set with AGC-equipped proc amps, and then synchronized with frame syncs. The main outgoing line is processed, the backup goes direct. There are four spare fibers.*

All of the signals leave the facility by fiber, and most signals arrive the same way. The facility also has two dual-band TVRO dishes. There are two outgoing lines, six incoming lines and four spares. The incoming signals are first level set by a proc amplifier with AGC, and then frame synchronized. Two audio signals accompany each video signal. The audio level is remotely adjustable from master control.

Communicating with the field is done via headset-equipped telephones or by extending the intercom system with telephone hybrids. The system then accommodates the tastes of whichever producer has been hired for the event.

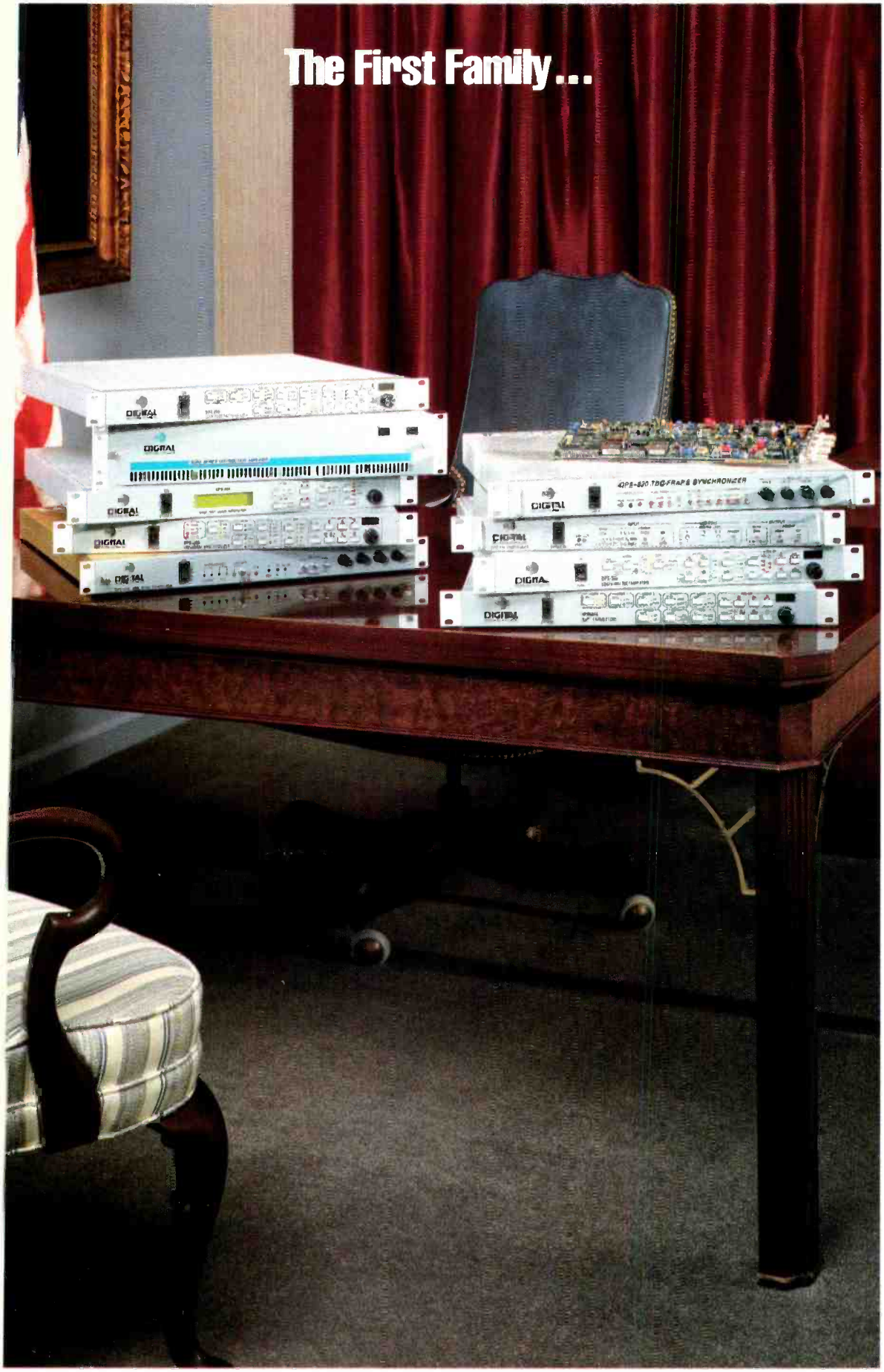
Cable opportunities?

There was a time when broadcasting was simple. If a facility only produced sound, it was a radio station. If it made sound and pictures, it was a TV station. For pictures and sound delivered to the viewer's home, there was no other choice.

Today the picture is not so clear. New economic forces have led to the creation of new services, and have allowed new program providers to emerge. One of these is cable, others are multipoint distribution services (MDS) and direct satellite.

These types of services will require the talent of broadcast engineers for the foreseeable future, especially if these new delivery mediums are to maintain the quality level the American viewing public has become accustomed to. Engineering facilities of this type are really an exercise in broadcast engineering, even if the final distribution method is changed. |:-)))|

This was no ordinary facility. The network is essentially a full-service TV station, lacking only a transmitter and a tower.



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the SOURCE

New competition for your audience

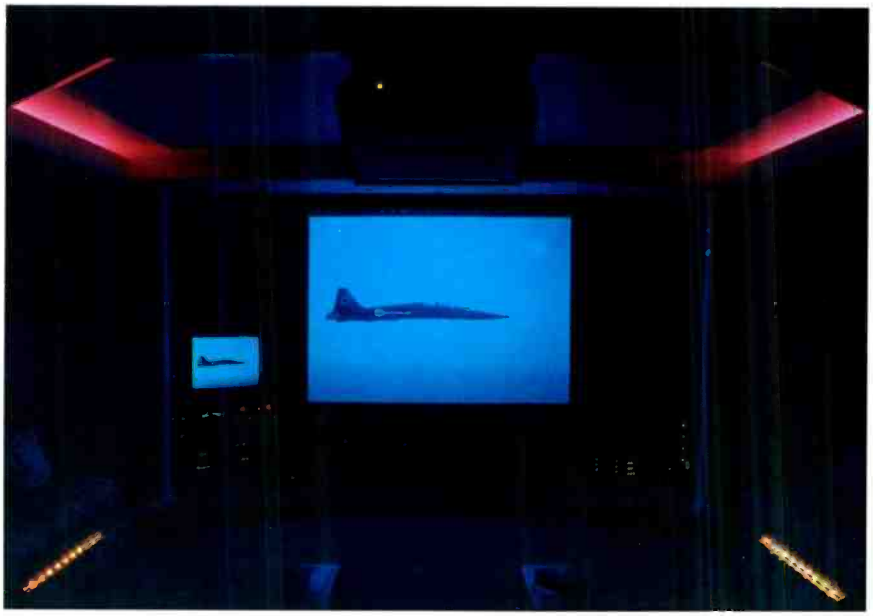
By Michael Leader

A perspective on home entertainment systems.

"The consumer has become extremely sophisticated in the choice of video products."

Isabell Faroudja

There you are, sitting quietly in your brand-new, state-of-the-art control room. It's finished and tweaked to perfection. Just one more time before you go home, you celebrate your technical brilliance — you push the play button. As the image appears on your new grade one color monitor and stereo sound fills the room, you think to yourself, "Gee whiz, this is great...if only I could have this at home."



This advanced home cinema includes a video projector with digital line doubler capable of displaying 1,050 lines from a NTSC video laserdisc. The unretouched photo illustrates how clean modern video can be. Shown is a freeze frame of the movie Top Gun. *(Courtesy of Don Dutkowski.)*

Leader is president, Leader Sound Technologies, Vancouver, British Columbia, Canada.

Look out broadcasters. A growing number of viewers and listeners are watching and listening on such systems. This audience is investing heavily in professionally-designed and installed home media systems. The audience is now, technically speaking, looking over the broadcaster's shoulder. So pay attention producer, director, CE, editor and general manager.

High-tech competition for your audience

Radio and TV broadcasters should be aware that a significant segment of their audience is no longer viewing their product on purple, washed-out color televisions, or listening on 4-inch loudspeakers. Instead, stations are being watched and listened to on equipment that may equal or surpass what your station uses.

The technical sophistication of some of today's high-class systems rival the best Hollywood screening rooms. Many viewers are now using studio-grade monitors or high-resolution (superbright, multisync) TV projection systems, complete with line doublers and motion/artifact processors. Combined with top-notch stereo surround audio, such systems allow this audience to

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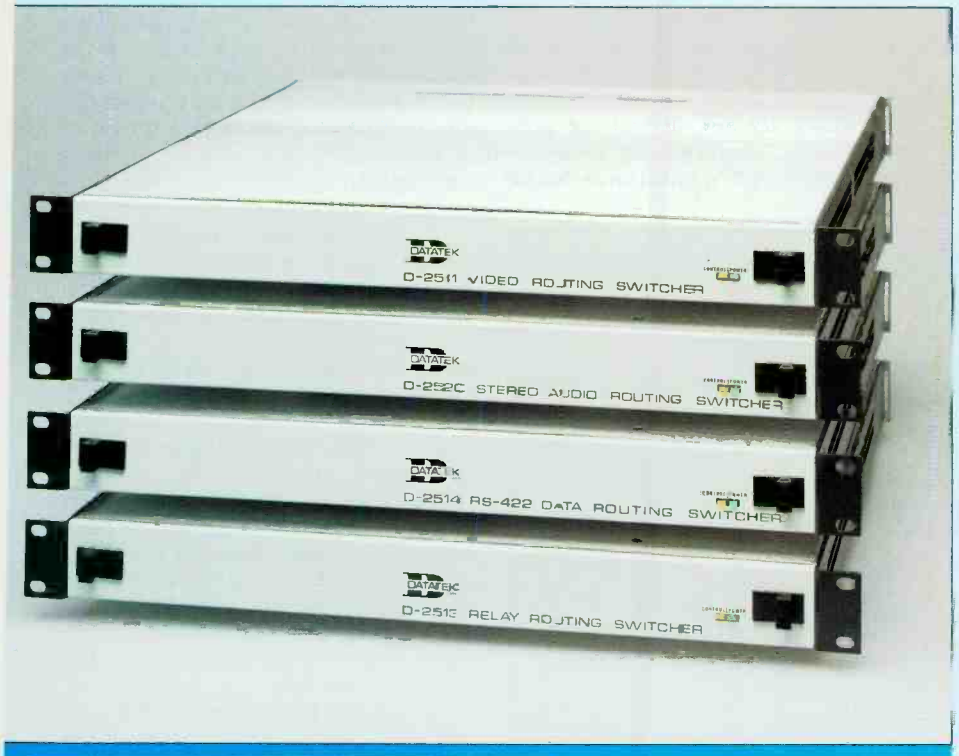

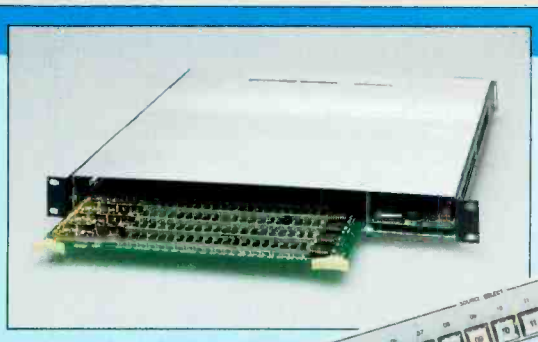

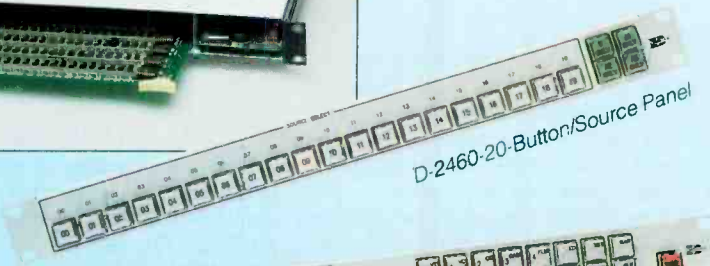

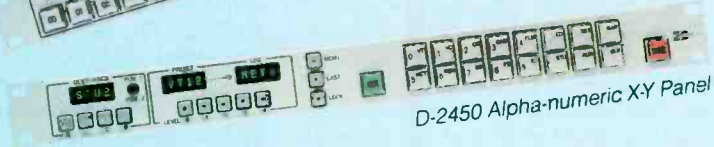

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compare your product with a wealth of other choices.

However, many of these high-class viewers may not be tuned to your station, but to alternate video sources and services. These sources may include videotapes, laserdiscs or satellite services. Some of these services provide quality many stations will find difficult to match. This article concerns a growing segment of your audience that may be judging your signal on equipment equal to or better than what you have.

Here is the same room with the lights on. Note how the entertainment system complements the room's aesthetics. (Courtesy of Don Dutkowski.)

Money is no object

Large sums of money, which could rival some station's capital budget, are being lavished on professionally-designed video, audio and acoustical systems purely for home enjoyment. The result has been the creation of an entirely new market segment.

These systems are often referred to as *architectural audio/media systems*. Working in conjunction with architects and interior designers, a hi-fi dealer provides audio and video equipment. The dealer also creatively packages the requisite utility black boxes and speakers into furniture or cabinetry to create "style and technology in harmony." In this $4.5 billion industry, the cost of a typical system averages between $25,000 and $35,000 per residence.

Consider that the total market for broadcast and audio industry hardware is approximately $2-2.5 billion per year. This means that the significant growth and trend of the high-class viewer market is capable of outstripping broadcast as the quality barometer of the industry. Indeed, this has already happened in some areas and will continue as more sophisticated video systems become available to the consumer.

How did we get here?

It wasn't long ago that the audio recording equipment, the color VTRs, cameras, processing equipment and switchers in use at local TV stations all had the same generic label — *professional*. Today, the term "professional" is much more difficult to define.

Early entertainment hardware was expensive and, generally, only those individuals serious about the business could afford studio-quality facilities. This has changed. Today's audio-video equipment is better, lighter and less costly.

The improved electronic technology originally benefited broadcasters. However, as costs fell, the consumer was able to purchase higher-quality equipment, such as laserdisc players, S-VHS recorders, surround-sound processors and digital enhancements of every kind. Such technology soon turned from the rare to the common.

In a little more than 10 years, the number of VCR/camcorders sold grew from 402,000 per year to more than 12 million per year. Today, more than 70% of all U.S. households have a VCR. In just six years, the number of stereo televisions sold jumped more than 2,500%. The audio world was running in fast forward also. From 1983 until 1989, the number of CD players sold leaped from 35,000 to almost seven million.

What does this mean to broadcasters? It means that they have new competition. From the moment that the viewer is tuned to your station, shouldn't the quality of the delivered signal be equal to that of the sources this audience uses daily? If your broadcast signal is inferior, you risk losing your audience to another station or to alternate forms of audio-video entertainment.

Improvements arrive

Improvements in the quality of broadcast signals are in the offing. The FCC recently ruled that the Super-NTSC (S-NTSC) from Faroudja Research is NTSC compatible. A live, on-air test of the system over broadcast and cable took place Jan. 29 to Feb. 1 in San Francisco. Other companies may also propose ways to improve broadcast signals.

Even if the broadcast industry rejects any immediate signal improvement technology, your audience already has access to it. It is not widely known, but some laser videodiscs are already S-NTSC encoded. Two S-NTSC discs known to me are *Indiana Jones and the Last Crusade* and *Singing in the Rain*.

The industry data shows that the average media system costs approximately $23,000. At the upper end of the scale, it is not unusual to find systems priced between $150,000 and $300,000 or even more.

It's been projected that S-NTSC processing on future consumer receivers might add $300 to the retail price. For many viewers, this may be a small price to pay for a dramatic improvement in picture quality.

Ultimate residential cinema

To give you an idea of what is possible (with enough money), here is a system recently installed in the home of a Canadian client. The client wanted to create an audio-video experience in which the viewer would be drawn into the action. Fortunately, the smaller environment of television allows the system designer greater latitude to create an intimate association often missing from the big screen.

The home's design allowed for the creation of a home cinema with exemplary performance. The architect provided space on the lower garden level for the media system. Particular requirements, such as space, power and grounding, were established prior to design.

The 1,659 square foot L-shaped room allowed approximately 525 square feet to

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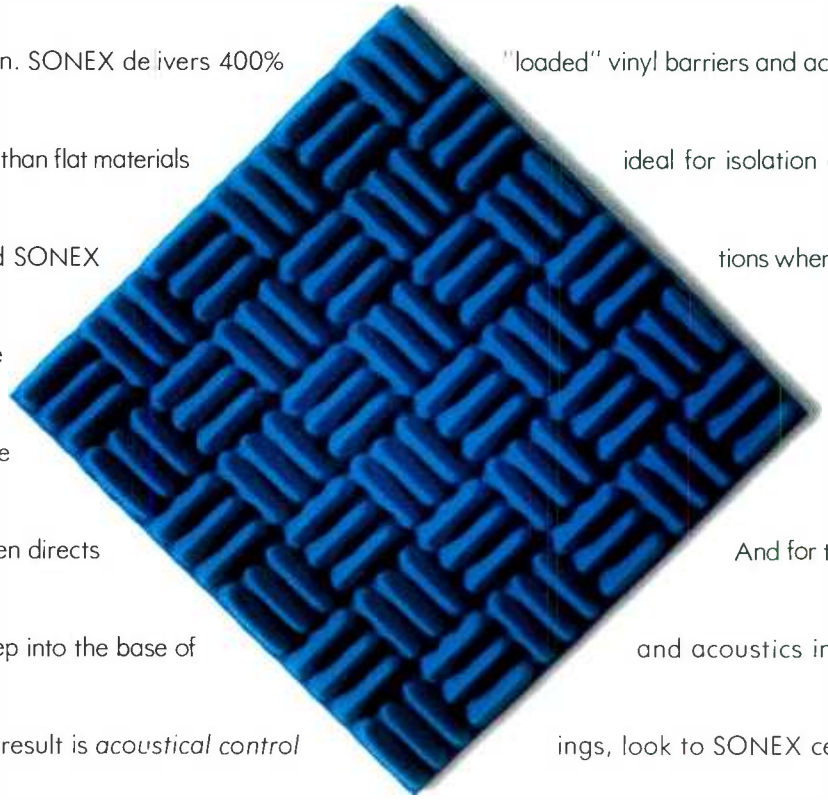

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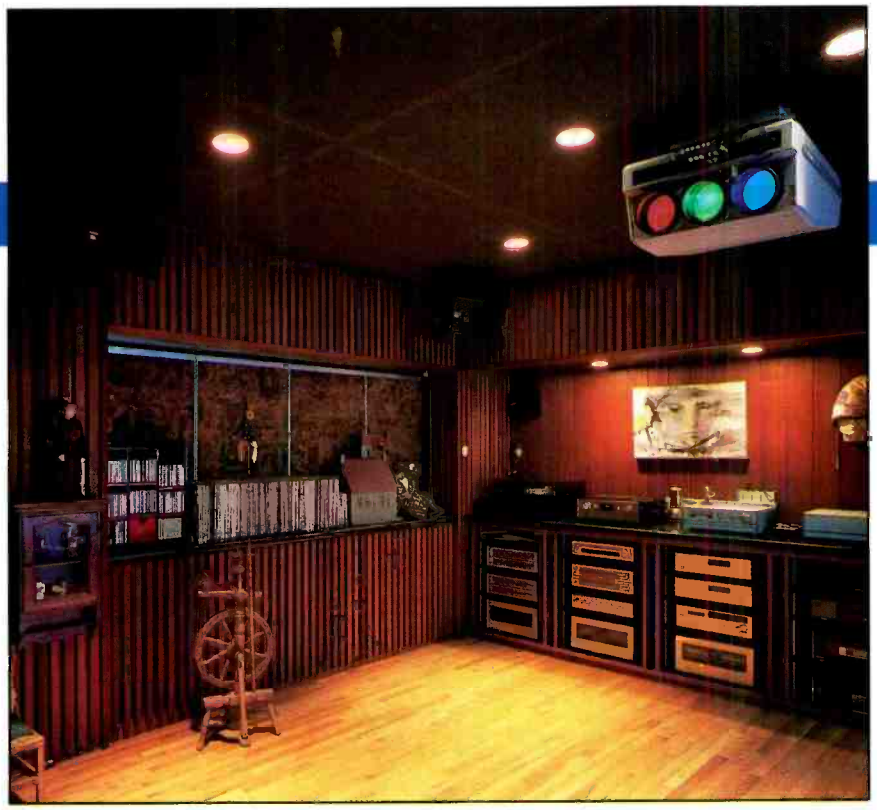

This $90,000 home cinema features a multisync projector and sophisticated sound system. (Courtesy of Theater Living Magazine.*)*

be dedicated to the cinema. A schematic view of the installation is shown in Figure 1. A perforated 5' × 7' screen rolls down when *cinema mode* is selected. The required screen size and viewing angles were calculated by observing the preference of many movie fans as they selected their seat at a typical surround-sound-equipped motion picture theater.

The audio

The goal, in terms of cinema sound, was to create an audio system that would rival those in the finest theater system. This required repackaging and tailoring medium-format studio-monitoring equipment into the system. Rack space was provided and lines installed for the future installation of Kodak's cinema digital system (CDS). This system provides a 6-channel CD-quality, discrete surround-sound system.

In keeping with contemporary music studio design, the main left and right time-compensated loudspeakers form a subtended 60° monitoring angle. (See Figure 2.) The constant directivity systems provide a wide, yet tightly controlled, hori-

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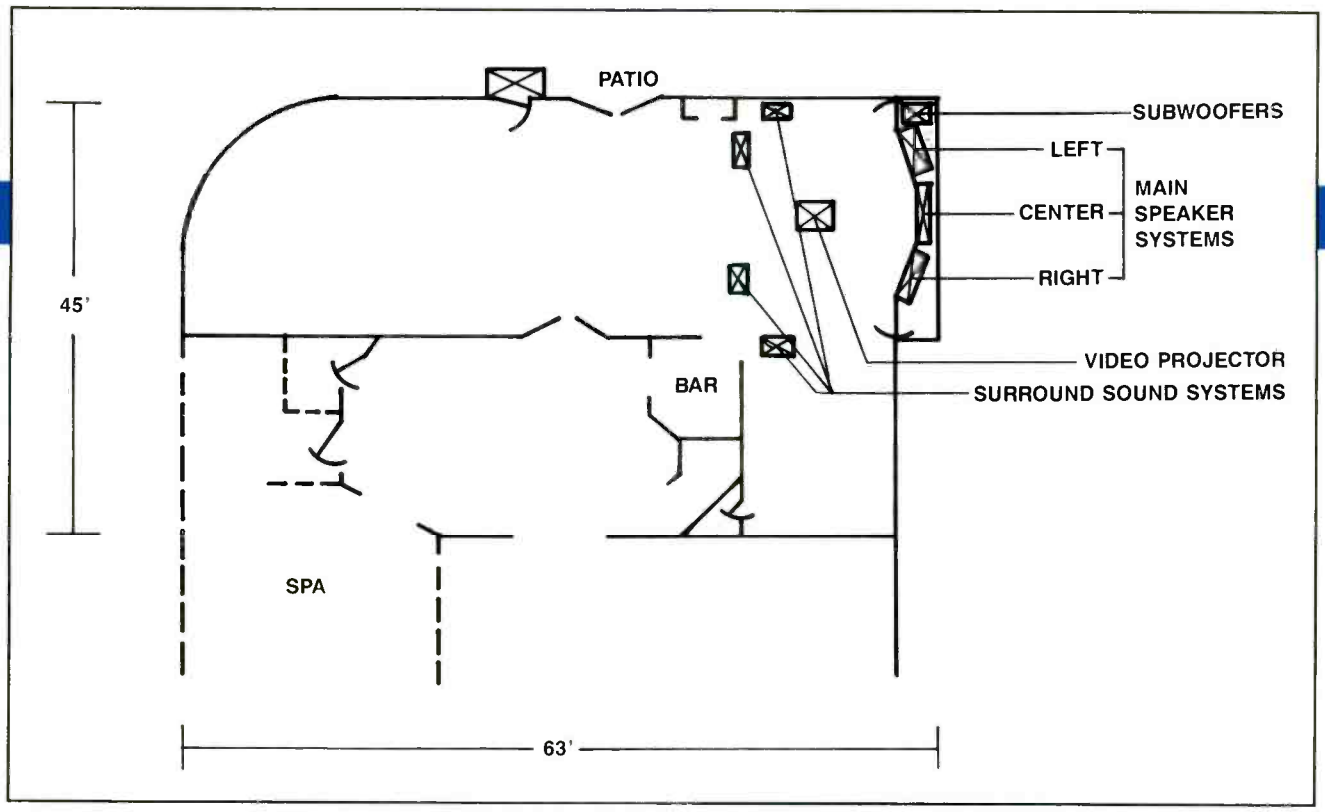
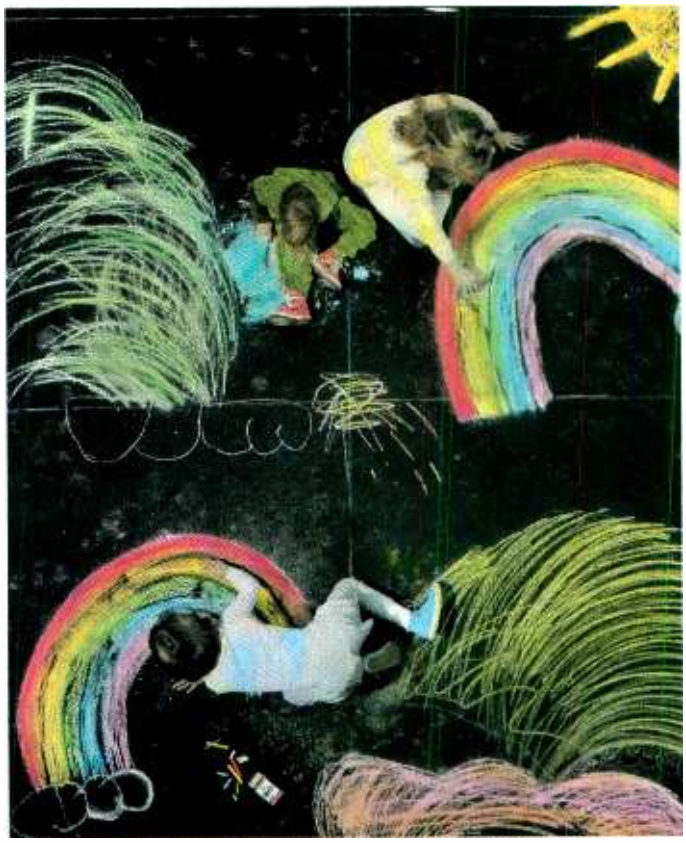


Figure 1. *The 525-square-foot room was designed from the beginning for a high-performance media center. Note the locations of the speaker systems, including those for surround sound. The processing equipment is hidden behind cabinetry.*

SPECTRUM
SYSTEMS



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zontal dispersion of 100° up to 10kHz. The result is a wide stereo image.

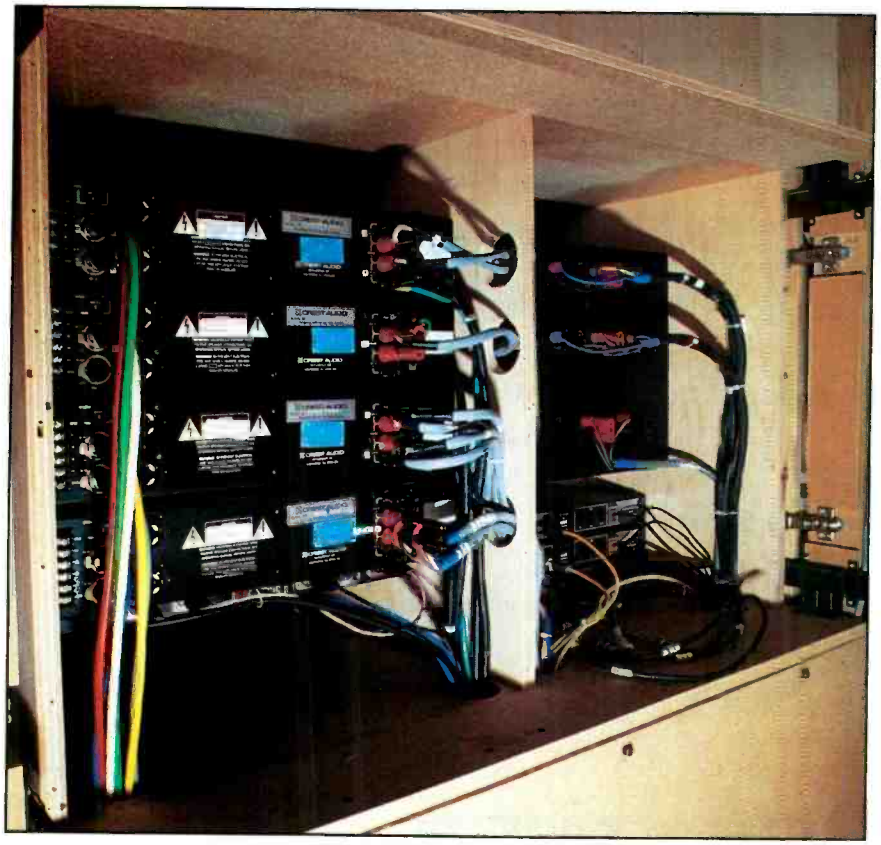
The center left and right speakers are each mounted in 5-cubic-foot enclosures. The subwoofer system requires a 26-cubic-foot enclosure, and is tuned to 27Hz. The stereo-surround Dolby-compatible processor decodes the 4-2-4 matrix from the 2-channel stereo laser videodisc, off-air television and S-VHS deck. Professional amplifiers are used to provide 4,300W (125dB SPL) of power, with the audio quality surpassing most large cinema systems.

The user-operated equipment rack includes surround decoder, video laserdisc players, S-VHS recorder, audio equipment and a professional video scan converter. (Courtesy of Don Dutkowski.)

The video

The video system was designed to match the high standards set by the audio components. The 3-beam 55kHz projection system has an RGB bandwidth of 30MHz. The glass lenses are capable of optical resolution to 2,200 lines, and the system contrast ratio is 100:1. Continuing the quality theme, the YC output from the laser videodisc player feeds a professional line doubler. This approach was selected because many laserdisc players already provide a YC output.

Future formats and enhancements can easily be added. The system's open-ended architecture allows easy conversion to HDTV or S-NTSC, once the associated source hardware and processors are installed.



In these high-end systems, the equipment and wiring techniques would make any broadcast engineer proud. (Courtesy of Don Dutkowski.)

So what, you say?

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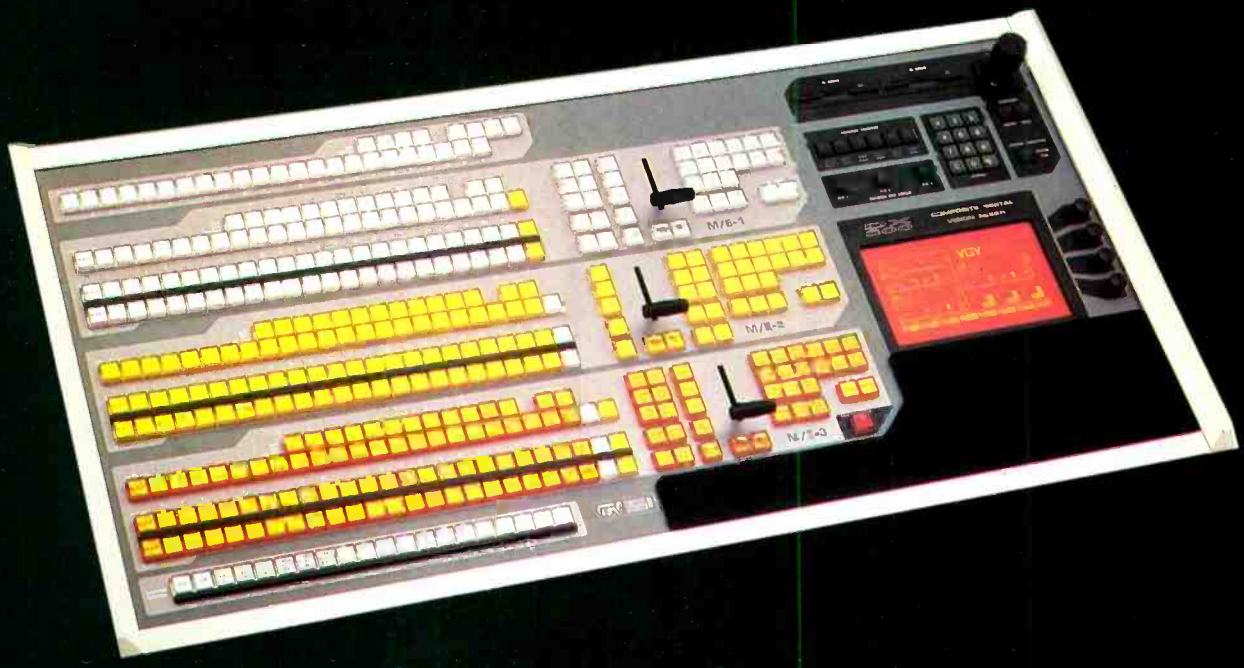

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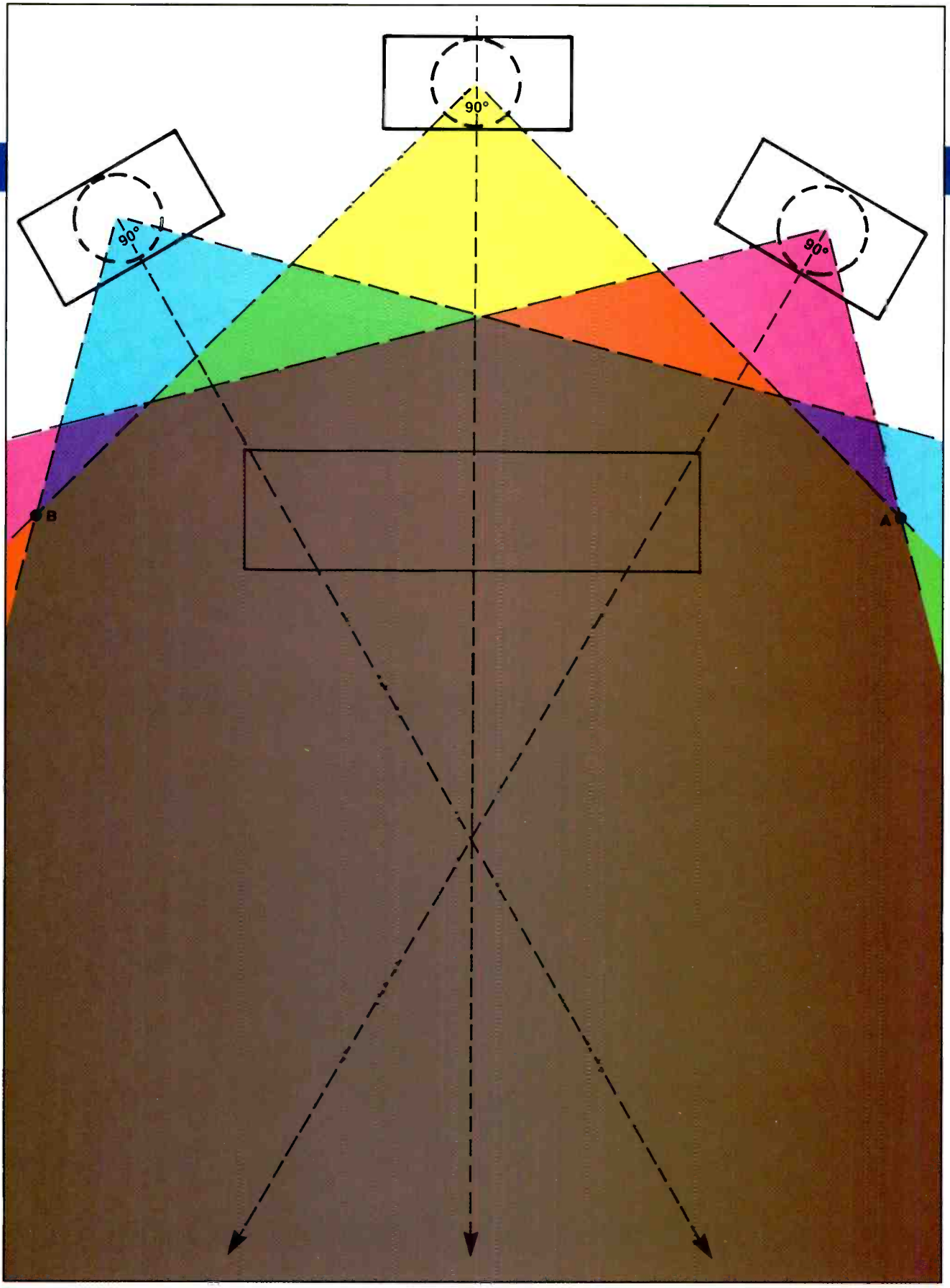

Figure 2. *Proper speaker placement is crucial to a wide stereo image. A listener at the extreme positions A or B has no difficulty in hearing the opposite speaker system. The depth of the stereo image is determined by critical distance and the room's acoustics.*

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son — has truly come to life on systems such as these. So do today's performers, with their crystal-sharp digital sounds. In such an environment, the consumer quickly becomes used to (and may soon demand) equal high quality from broadcasters. As more high-quality systems are installed, broadcasters will feel even more pressure to improve their on-air products.

Unfortunately, the signals of many of today's stations reveal several common problems. Artifacts from excessive signal processing, low-level 60Hz hum, noisy tape machines, and poor studio acoustics become immediately noticeable on quality home systems. TV stations are not immune from such comparisons either. Witness the growing popularity of videodisc and S-VHS equipment.

As your consumers increasingly become accustomed to high-quality images and audio, they will turn a critical eye and ear to your product. When more of your audience becomes aware of the availability of high-quality audio and video signals, they may harshly judge those stations that do not match this performance level. Remember, your viewers and listeners are evaluating your signal daily. Is your station ready to pass the test?

Passing the quality test

Some networks and advertisers provide either Dolby or Shure stereo-surround audio for a few of their products. The task for stations is to pass these high-quality signals to the audience without damaging their quality.

Have you ever listened to your TV audio on a high-quality receiver, with good low-end performance? Are you transmitting hum or studio noise that cannot be detected on the typical control room speaker? Transmitting a high-quality audio-video signal is no longer an option.

A solution

What can you as a broadcaster do to provide your audience with a top-notch signal? First, educate your staff. If they don't know how to perform their jobs, with quality in mind, you'll never win the battle.

Second, provide the best equipment your station can afford. You may not have to spend thousands of dollars to improve your sound or video. Simple preventive maintenance, coupled with regular checks and measurements, will go a long way in keeping your product top rate. Table 1 lists other simple tips that can help you maintain your signal quality.

The competition is not going to go away. Broadcasters are known for their innovation and leadership. Use your engineering expertise to help your station compete effectively in today's complex and changing market.

AUDIO IMPROVEMENTS:

1. Train your operators on the proper use of microphones and signal processing.
2. Audio phase check. Perform the check throughout your facility at 1kHz *and* 15kHz.
3. Check each microphone cable for reversed XLR connector pins.
4. When doing stereo production, use a scope or stereo phase monitor to verify correct phasing.
5. Monitor the mix in L+R (mono) as well as in stereo. The better the mono, the better the stereo.
6. Watch your monitor speaker placement. The operator must be able to hear the stereo mix in proper perspective.
7. Turn off your stereo synthesizer during live broadcasts. Otherwise, an annoying "rain barrel effect" can be produced.
8. Watch recording and broadcast levels. This is especially important when recording to ENG equipment with the limiter on. Quality lost here cannot be resurrected in the studio.

Table 1. *These simple suggestions don't cost a lot, and can go a long way toward improving your broadcast audio.*

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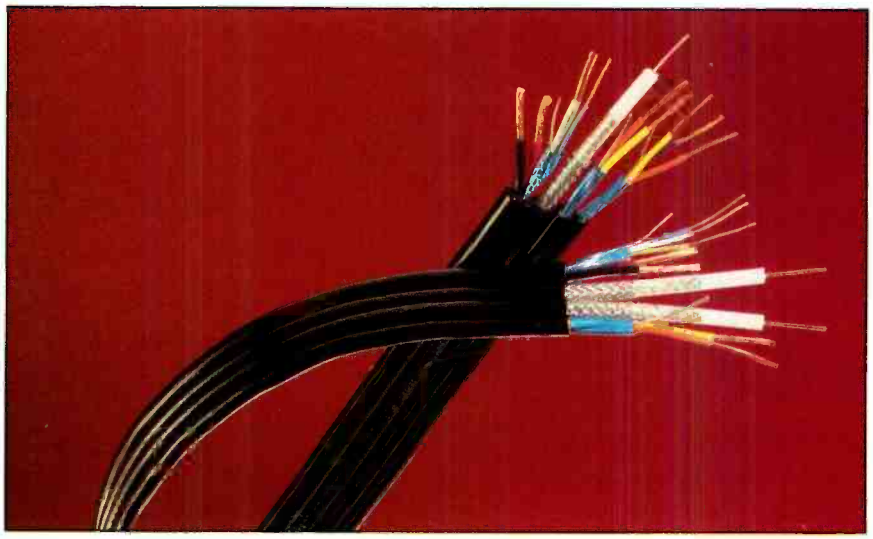
Cable considerations for broadcast wiring

By Benjamin L. Nemser

Selecting the proper cable involves electrical and legal considerations.

One of the last items broadcast engineers think of when planning new studio construction or renovation is the wiring required to accomplish the project. In the past, this has sometimes resulted in inconveniences, such as having to pay a freight premium to get the material in time, or delaying the job until the cables arrive. With the advent of changes in the National Electric Code (NEC), the price for failing to properly consider cabling requirements has risen substantially.



Installation of non-compliant cables or improper substitution can now lead to large fines and lawsuits, not to mention the additional work and cost involved in removing and replacing all of the non-compliant cables. With this in mind, I will briefly discuss the organizations responsible for cabling requirements, specific provisions applicable to cables used in broadcast applications, and how to select cables that will provide the performance needed to meet all applicable regulations.

Nemser is president of Nemal Electronics, Miami.

The National Electric Code

The starting point is the National Electric Code, which is a conglomeration of guidelines for the design and installation of all types of electrical systems and components. It is the result of work by thousands of professionals, who consider safety as their primary consideration. Every three years, the National Fire Protection Association (NFPA), the sponsor of the code, adopts new provisions and revises or deletes existing provisions based on the latest research and field experience. The 1990 release of the code is the current edition, and it contains many new requirements for wiring.

Once the code is published, it goes through an approval process by the American National Standards Institute (ANSI). At this point, the code is strictly advisory in nature, because neither the NFPA or ANSI has regulatory or legislative powers. The next step, however, is the adoption of the code or certain code provisions by local jurisdictions, cities, counties or other governmental entities. At this point, the pro-

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visions of the code have the full force and effect of law. This means that you (or your contractor/architect) must first determine the applicable provisions in effect in your area prior to cable selection. Even if some provisions of the code are not mandatory in your location, it does provide good guidance in selection of cables from a safety standpoint.

The cable approval process

Now that the code has set forth a multitude of provisions and requirements, there must be some procedure for verifying and certifying compliance with these provisions. Obviously, each building inspector cannot perform smoke and flame testing on every type of installed cable. This is where independent testing laboratories, such as Underwriter's Laboratories (UL) and Canadian Standards Association

A place for fiber

Although most studio wiring still relies on metallic cable, there are applications where fiber can be useful.

When adding cable to an existing facility, the available conduit space can be a problem. Large coax cables, perhaps combined with hundreds of video and computer feeds, can make it extremely difficult to add several new cables for additional or improved signals.

A single 0.25-inch fiber-optic cable can carry more audio signals than a 3-inch bundle of 900 pairs of copper wire. This allows fiber to tremendously increase the signal-carrying capacity of a conduit or trough without a commensurate need for cable space.

In addition, compared to conventional coaxial cables with the same signal-carrying ability, the smaller diameter and lighter weight of fiber-optic cables eases the installation process. A single conductor fiber-optic cable weighs approximately nine pounds per 1,000 feet. A comparable coaxial cable weighs 80 pounds per 1,000 feet — about nine times more. If weight is an important factor, fiber-optic cable may be the solution.

Fiber-optic cables also provide some advantages over metallic systems in the area of interference. Signals carried by fiber are not distorted by outside electrical, magnetic or RF interference. This makes them immune to lighting-induced pulses and hum fields.

Furthermore, optical cables emit no radiation, which enables them to be installed with almost any other cables without concern for mutual coupling or interference.

Fiber is often the perfect solution to local area networks (LANs), which are prone to ground loops. Because optical signals do not require grounding connections, the transmitter and receiver are electrically isolated and free from such problems.

Many of the new digital signals (audio as well as video) can be easily transmitted via fiber-optic cable. The high signal bandwidth of fiber means increased channel capacity. Also, longer cable runs require fewer repeaters, because fiber-optic cables have extremely low attenuation rates.

The next time you are faced with adding cable to crowded conduits, you need a long transmission line, you have a wide bandwidth signal or you need to prevent ground loops on a LAN, you may want to consider fiber.

Editor's note: Background material for this article was obtained from "A Guide to Fiber-Optics System Design," Belden Electronic Wire and Cable.

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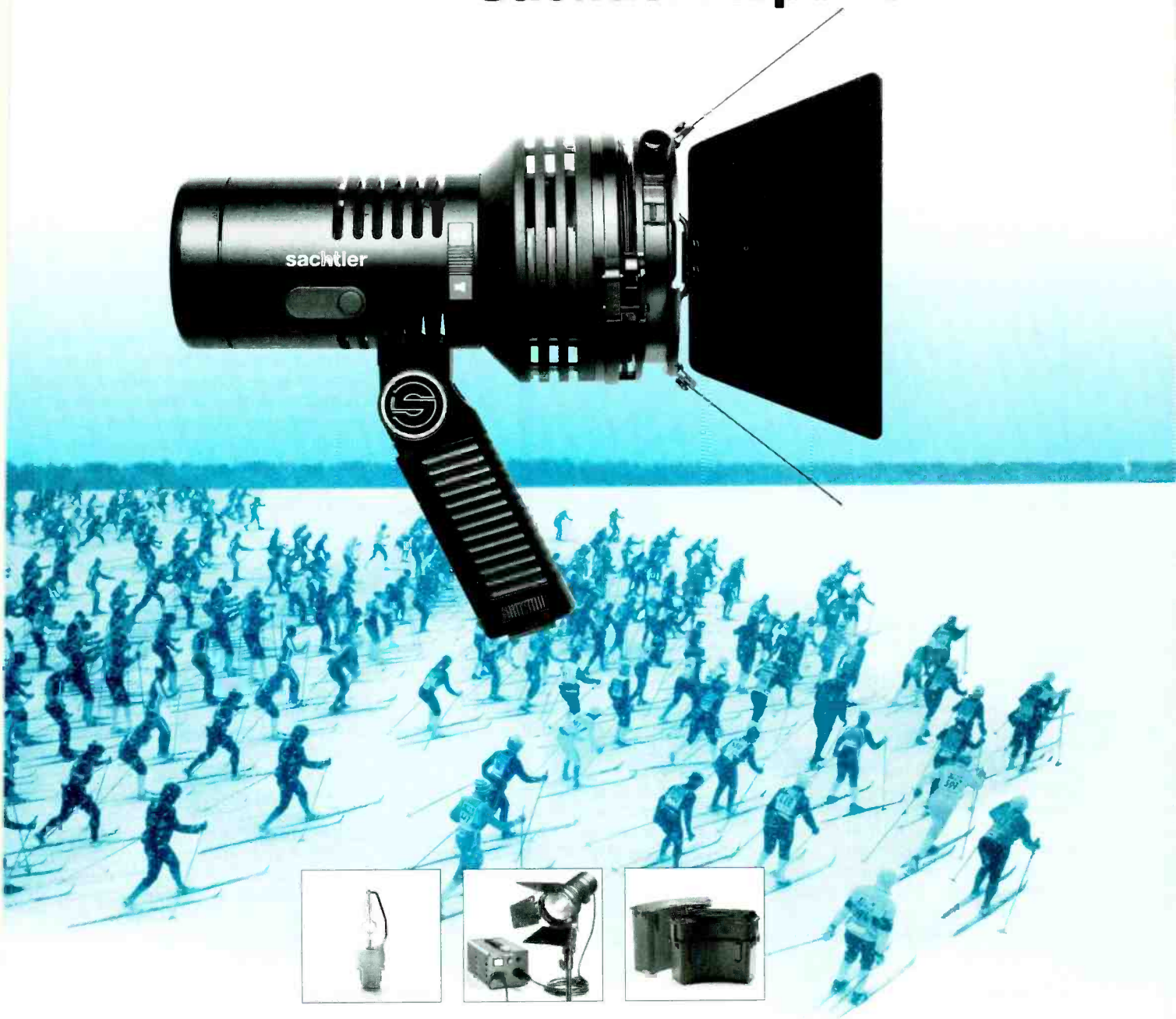

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(CSA), come in. UL is a non-profit corporation that was founded in 1894 to operate testing laboratories, and to establish standards for the listing of products as well as a follow-up service to ensure that manufacturers continue to comply with all of the requirements of the listing. The normal procedure for listing a cable in the code begins with a factory inspection by a UL engineer. Samples of the cable are then submitted for testing. Finally, UL develops testing requirements for ongoing inspection.

UL testing covers a wide range of physical, electrical and mechanical properties. A typical testing program calls for testing the raw materials prior to manufacturing, testing the material in process — including spark testing, continuity and insulation diameter and center — and finally, completed goods testing. A UL or CSA inspector may visit a manufacturer at any time to verify compliance with the listing requirements, and may take samples for complete examination.

Some of the tests required for broadcast cables include:

- Conductor size and stranding.
- Conductor DC resistance.
- Insulation thickness.
- Tensile strength and elongation.
- Dielectric withstanding voltage.
- Insulation resistance.
- Heat aging and cold bend.
- Smoke emission and flame propagation.

The predominant code articles applicable to broadcast cables are:

- *Article 725:* Remote control, signaling and power-limited circuits.
- *Article 760:* Fire-protective signaling systems.
- *Article 770:* Optical-fiber cables.
- *Article 800:* Communications circuits.
- *Article 820:* CATV systems.

Table 1 shows the cable listing types in terms of applicable UL articles.

Within each type listing are various classifications dependent on where the cable will be used. These classifications are critical, because one UL-listed cable may be perfectly appropriate for use in one location, but not at all suitable for use elsewhere. The four major UL classifications are:

- General purpose (no suffix).
- Plenum (P): For use in return air plenums, ducts and all environmental air areas.
- Riser (R): For use in vertical shafts.
- Residential (X): Limited use in dwellings and certain raceways.

The main CSA classification is *premises communication cable* (PCC), which typically requires the FT4 flame test.

Each listing type within each article calls for certain testing to ensure that the cable meets the requirements for that listing. Each listed cable must also comply with marking requirements appropriate to its listing or listings. If the cable you select for a particular job does not show the proper marking, it may not comply with the code. This could mean that you would have to replace it, if required by a building inspector. The safe approach is not to use cable that doesn't contain the proper UL markings. UL also specifies the frequency of marking on listed cables and requirements for marking on spools. Many cables offer multiple listings, such as UL and CSA. Figure 1 shows a typical example of marking on a listed cable.

MAIN LISTING TYPES APPLICABLE TO BROADCAST

Article	725	760	770	800	820
Listing types	CL2 CL3 CL2P CL3P CL2R CL3R CL2X CL3X PLTC	FPL FPLP	OFC OFN OFCP OFNP OFCR OFNR	CM CMP CMR	CATV CATVP CATVR CATVX

Table 1. *The table lists the primary types of cable used in broadcast installations and their appropriate UL article.*

The safety issue

In response to a number of tragic high-rise fires and deaths resulting from toxic smoke, the code has adopted stricter requirements regarding smoke emission and flame propagation. These revisions have had a dramatic effect on electronic cable design and construction.

For example, many previously existing cables could not pass the new smoke and flame testing requirements without major changes in design. To meet the new requirements, manufacturers often had to change the type and thickness of insulation. These changes usually resulted in a change in electrical performance. The result was that many old designs became obsolete for some previously acceptable uses.

Also, many cables became larger in order to meet the more stringent tests. Although this might not be a particular problem in some cases, it is not hard to imagine the effect of even a small change in cable diameter in a raceway containing a hundred or more cables. Larger cables also caused problems in flexibility and the availability of connectors.

The changes increased the cost of compliant cables as manufacturers had to redesign cables and use more costly materials. Fortunately, many suppliers of the compounds used in electronic cable have developed and continue to develop new materials, which are safer and offer improved performance. This is especially the case with plenum cable. The new formulations have allowed manufacturers to substitute a type of PVC in place of FEP (flourinated ethylene propylene), resulting in substantial cost savings.

Cable substitutions

In addition to the standard classification system, several ratings are available in-

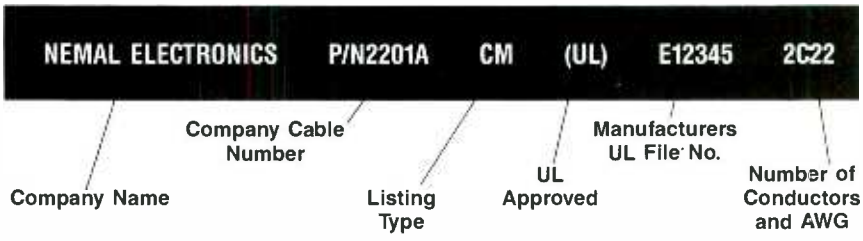

Figure 1. *Typical wiring label for a UL-approved cable. Note that a great deal of information about the cable is contained in this label.*

The TV-500: Designed for One Reason . . .

Al Centrella, Audio Engineer

April 16, 1990

Gary C. Snow, President
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Your custom boards are priced similarly to other consoles, but we've gotten far more value and technical performance from the TV–500s. We are completely satisfied with their performance in live, analog and digital recording environments.

Thanks to Tim, Andy, Paul, all the staff at Wheatstone and especially to you for providing us with a colorful, natural-sounding, state-of-the-art console to service the industry.

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Al Centrella, Audio Engineer
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dicating that a cable is particularly suited for a specific application. For example, a cable marked "sunlight resistant" or "sun res" has passed a 720-hour sunlight test.

It is important to note that the code allows substitution of a listed cable with a more stringently tested cable. However, cost considerations often make this an undesirable practice especially in a large installation. It is, however, a practical and realistic alternative in planning for cable spares and emergency stock. For example, a CM-rated cable may be substituted for a CL2 cable. Table 2 lists some allowable substitutions.

Select cable types carefully

The new requirements for cable manufacturing and testing bring a new emphasis to the proper selection of broadcast cables. Broadcast engineers can add to overall performance and safety by evaluating each cable requirement in terms of electrical performance, code provision and cost. Cable manufacturers specializing in broadcast cables may be able to help you select the proper cable for your application. Don't make a mistake in the beginning.

Finally, it is important to note that although you may have used a particular type of cable in the past successfully, today it may not be the best choice. Even more important, your favorite cable may not even be acceptable for your application under today's code. Don't risk having to replace newly installed cable. Check with the code before you complete the specifications or purchase any broadcast cable.

ALLOWABLE SUBSTITUTIONS			
CMP	CMR	CM	
CL2P	CL2R	CL2	CL2X
CL3P	CL3R	CL3	CL3X
FPLP	FPL		
CATVP	CATVR	CATV	CATVX

Example: It is permissible to substitute a CMP cable in place of a CMR cable.

Table 2. *The table illustrates acceptable substitutions. For example, it is acceptable to substitute CMP cable for a CMR cable. Although it is permissible to substitute cable types. be careful because it may increase the cable's cost.*

Editor's note: National Electric Code and NEC are trade names of the National Fire Protection Agency.

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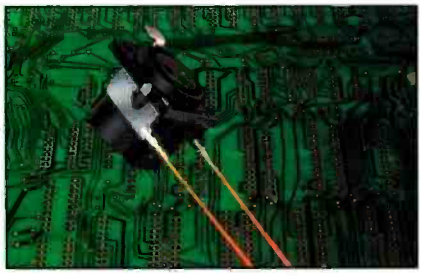

Snap-in PC mounts eliminate costly hand assembled attachment. The bifurcated contacts snap in place quickly and cleanly, stay in place during the soldering process and allow "wicking" for stronger panel/chassis retention. The modified tip spring accepts a wider range of mating plugs including EIA, EIAJ (Japan) and non-spec plugs for greater cost-savings adaptability.

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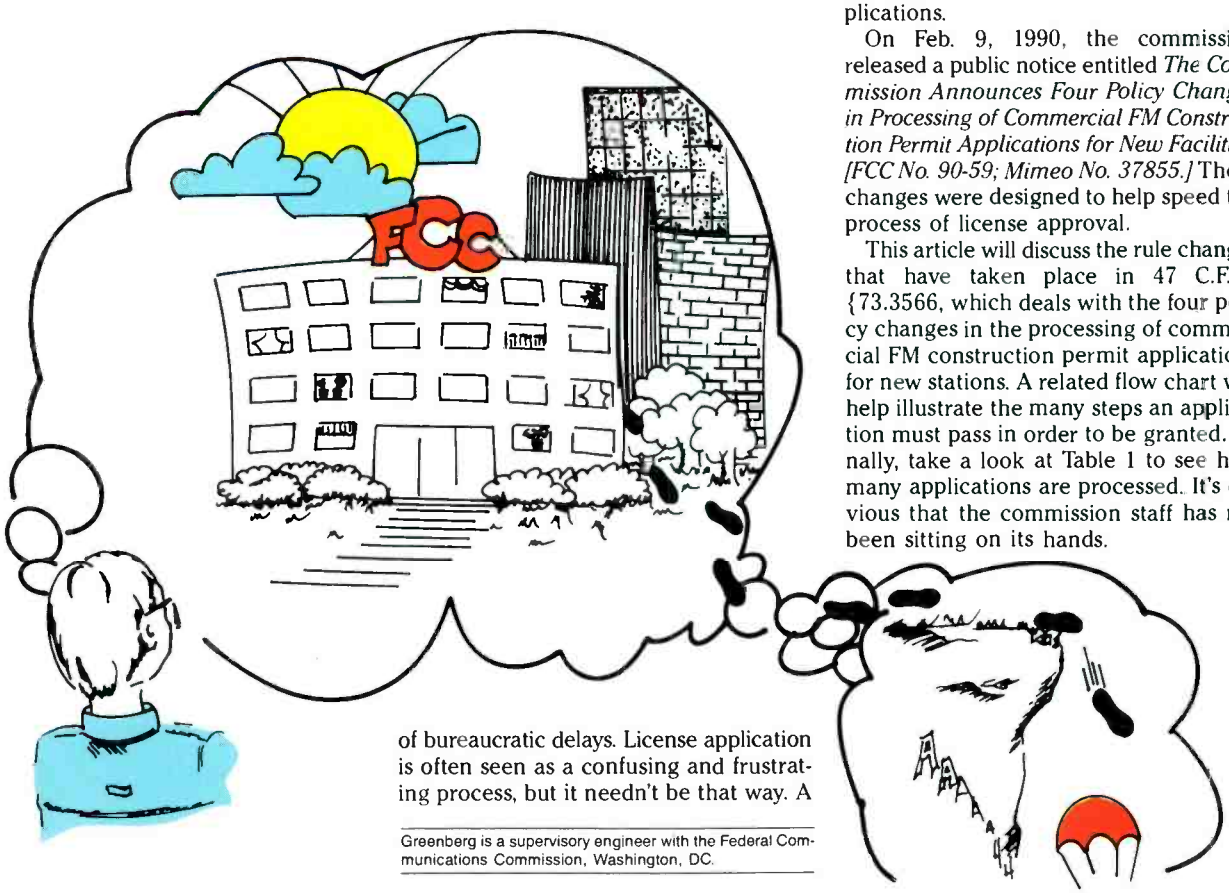
Revising the FM band rules

By Robert D. Greenberg

Most engineers have asked the question, "What happens to my application at the FCC?" Unfortunately, engineers often perceive the process as a never-ending series of bureaucratic delays. License application is often seen as a confusing and frustrating process, but it needn't be that way. A better awareness of the process will help engineers to understand why things sometimes take so long, and how delays can be prevented by properly completing the applications.



On Feb. 9, 1990, the commission released a public notice entitled *The Commission Announces Four Policy Changes in Processing of Commercial FM Construction Permit Applications for New Facilities. [FCC No. 90-59; Mimeo No. 37855.]* These changes were designed to help speed the process of license approval.

This article will discuss the rule changes that have taken place in 47 C.F.R., {73.3566, which deals with the four policy changes in the processing of commercial FM construction permit applications for new stations. A related flow chart will help illustrate the many steps an application must pass in order to be granted. Finally, take a look at Table 1 to see how many applications are processed. It's obvious that the commission staff has not been sitting on its hands.

Greenberg is a supervisory engineer with the Federal Communications Commission, Washington, DC.

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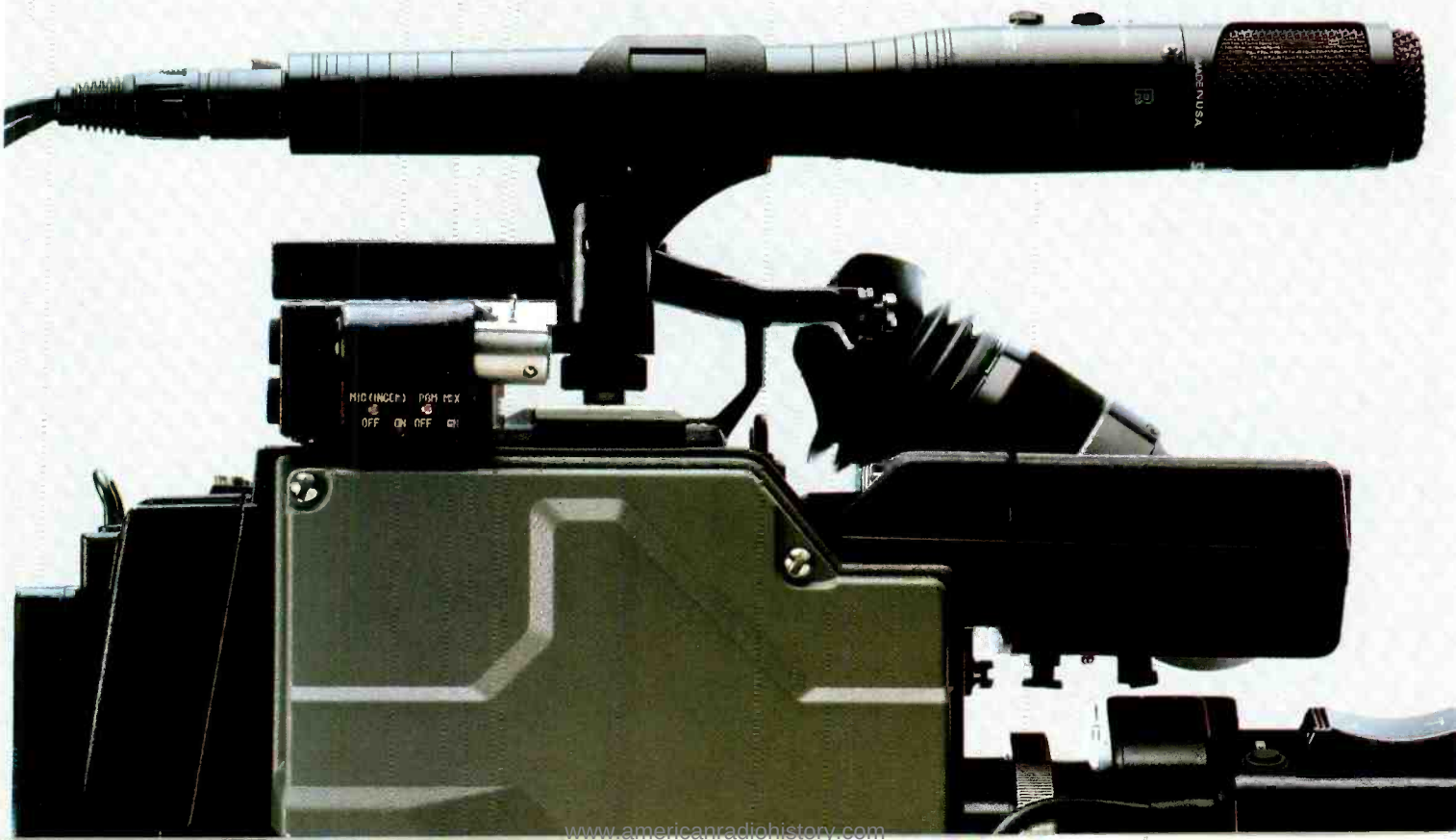


STATISTICS OF APPLICATIONS						
TYPE Date	NEW/MAJOR Received/Disposed		MINOR CHANGE Received/Disposed		LICENSE Received/Disposed	
Feb. 1989	44	62	60	68	66	49
March 1989	34	60	60	64	78	52
April 1989	105	30	60	45	49	43
May 1989	57	69	62	56	55	28
June 1989	40	75	73[A]	66	49	59
July 1989	36	80	79[A]	55	67	34
Aug. 1989	22	65	63	68	71	49
Sept. 1989	153	44	105[B]	58	75	27
Oct. 1989	122	74	80[B]	47	64	53
Nov. 1989	57	125	44	53	49	28
Dec. 1989	83	38	56	57	156[C]	16
Jan. 1990	119	95	63	68	90	52
Feb. 1990	38	277	59	51	76	18
March 1990	40	240	63	100	58	47
April 1990	33	133	52	63	64	50
May 1990	101	261	25	69	28	43
	1,084	1,728	1,004	988	1,095	648

A = Short-spaced directional antenna docket No. 87-121, effective June 26, 1989
B = Class A upgrade docket No. 88-375, effective Oct. 2, 1989
C = Certain Class A upgrades allowed on license application, effective Dec. 1, 1989

Table 1. *The table shows the number of applications filed concerning the FM directional antenna rulemaking and the Class A upgrade rulemaking.*

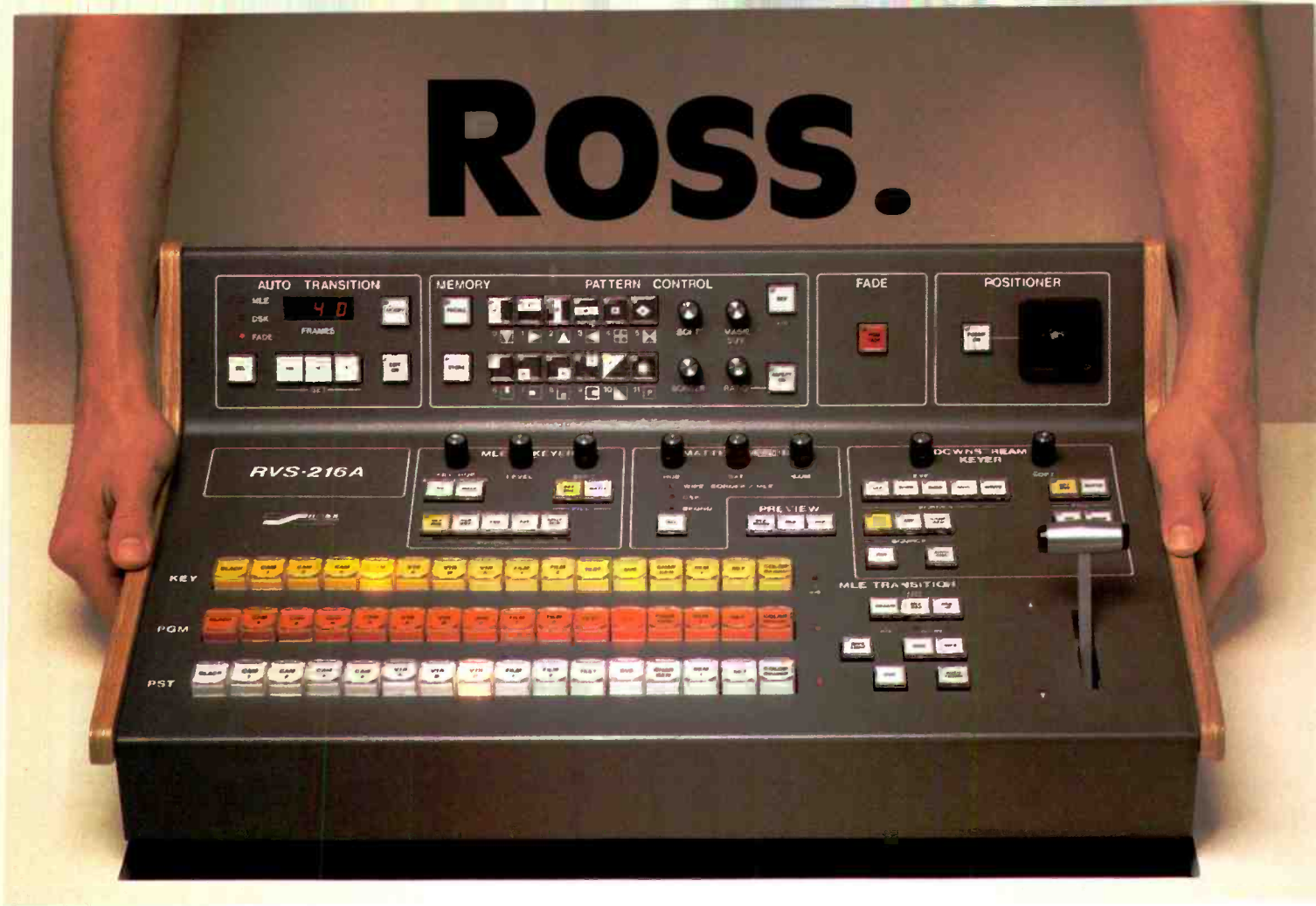
Background: the hard-look policy

In the December 1985 issue of *Broadcast Engineering* magazine, I wrote an article entitled "Changing the FCC Rules." A few revisions to the FM band rules have been made since then. The most important FM rule changes have dealt with the following rule sections:

- 47 C.F.R. {73.213 (grandfathered short-spaced stations)
- 47 C.F.R. {73.215 (contour protection for short-spaced assignments)
- 47 C.F.R. {73.316 (FM antenna systems)
- 47 C.F.R. {73.3566 (defective applications)

In June 1985, in the report and order in mass media docket No. 84-750, the commission adopted new FM *hard-look* filing window processing procedures. Among other things, this procedure restricts the period of time that amendments going to the tenderability of applications (which is substantial completeness) may be filed. Under these processing procedures, applicants may perfect the tenderability of their applications, and retain filing window status only by an amendment filed by the close of the applicable window. Almost two dozen basic tenderability criteria were specified by the commission in Appendix D to the report and order. The basic window application process is shown in Figure 1.

Ross.



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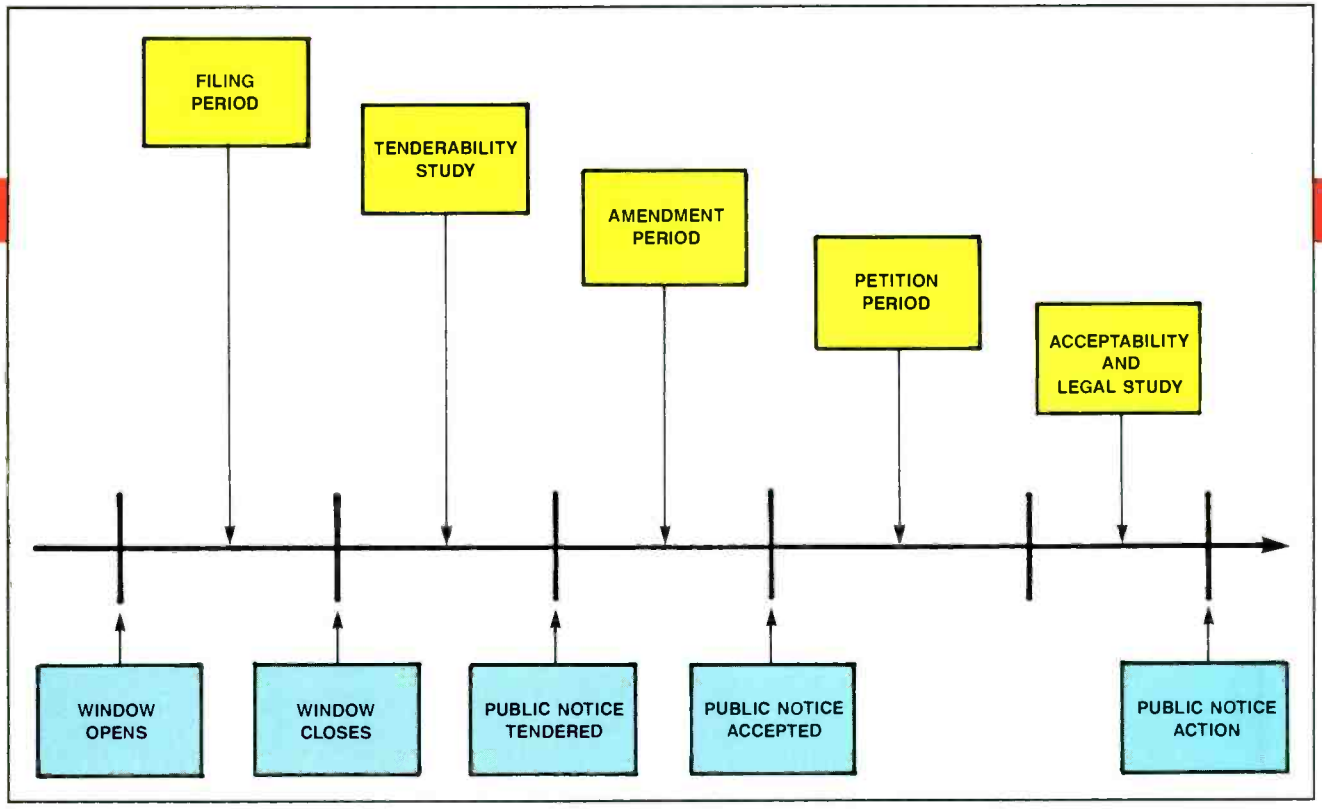


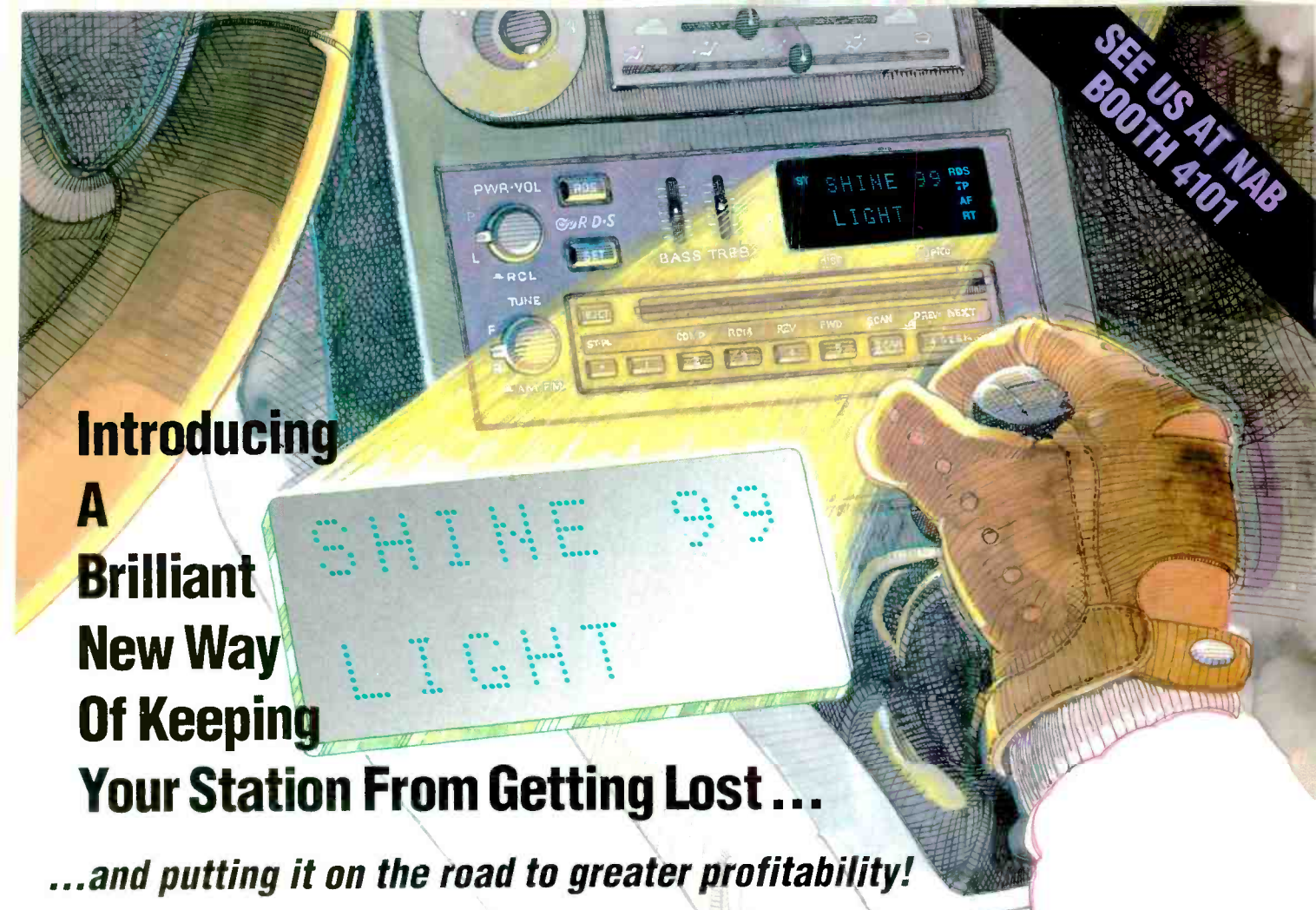
Figure 1. The chart depicts the various stages through which an application must pass in order to receive final approval.

The report and order made no substantive change in existing policy governing acceptability of applications as defined in 47 C.F.R. {73.3566(a), prior case law or the commission's public notice concerning patently defective AM and FM construction permit applications. (If an application is found tenderable, it is then studied for acceptability, which requires compliance with certain statutory and international treaty provisions and technical rules for FM stations.)

Under the hard-look processing system, applicants are given a 30-day period to perfect the application's acceptability for filing. This 30-day period is triggered by the application's appearance on a public notice as an application accepted for tender. After the period closes, the filing of amendments is severely constrained.

To date, the hard-look processing system has, in large measure, accomplished its originally intended result. Since the institution of this practice, the commission has opened filing windows for a total of 1,341 new channels. By Jan. 1, 1990, the staff had processed approximately 5,000 construction permit applications filed for these allotments. Even with the hard-look policy, the number of new facility applications currently being returned by the staff is only approximately 5% of those tendered.

Although the present level of applications for new facilities by the commission is estimated to be only 60 per month, approximately 2,200 applications remain pending. In a further effort to significant-



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...and putting it on the road to greater profitability!

To the average motorist fiddling with a car radio dial, it can seem like a jumble out there. Having stumbled on your FM frequency, they may like what they hear. But that's no guarantee that your station's identity will leave any kind of lasting impression — or that they'll be able to locate you again among all those competing signals once having gone off your frequency on the dial.

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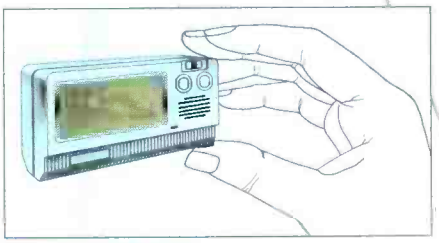
In addition to helping expand your regular audience, RDS offers the advantages of:

- Enabling your station to earn extra revenue by becoming a transmitting facility for local and nationwide personal paging services.



Alphanumeric RDS Pager

- Alternate frequency switching, which can automatically switch a car radio over to your frequency as the driver moves out of range of a similar station to which the radio was tuned.
- Allowing you to provide automatic traffic bulletins to drivers equipped to receive them.
- Participation in industrial emergency alert systems.

Having proven remarkably successful during a four-year European test run, **RDS** is now set to open up a whole new era in American radio communications.

Radio Data System (**RDS**) Generator

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Telephone (613)592-8000

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R·D·S RADIO DATA SYSTEM

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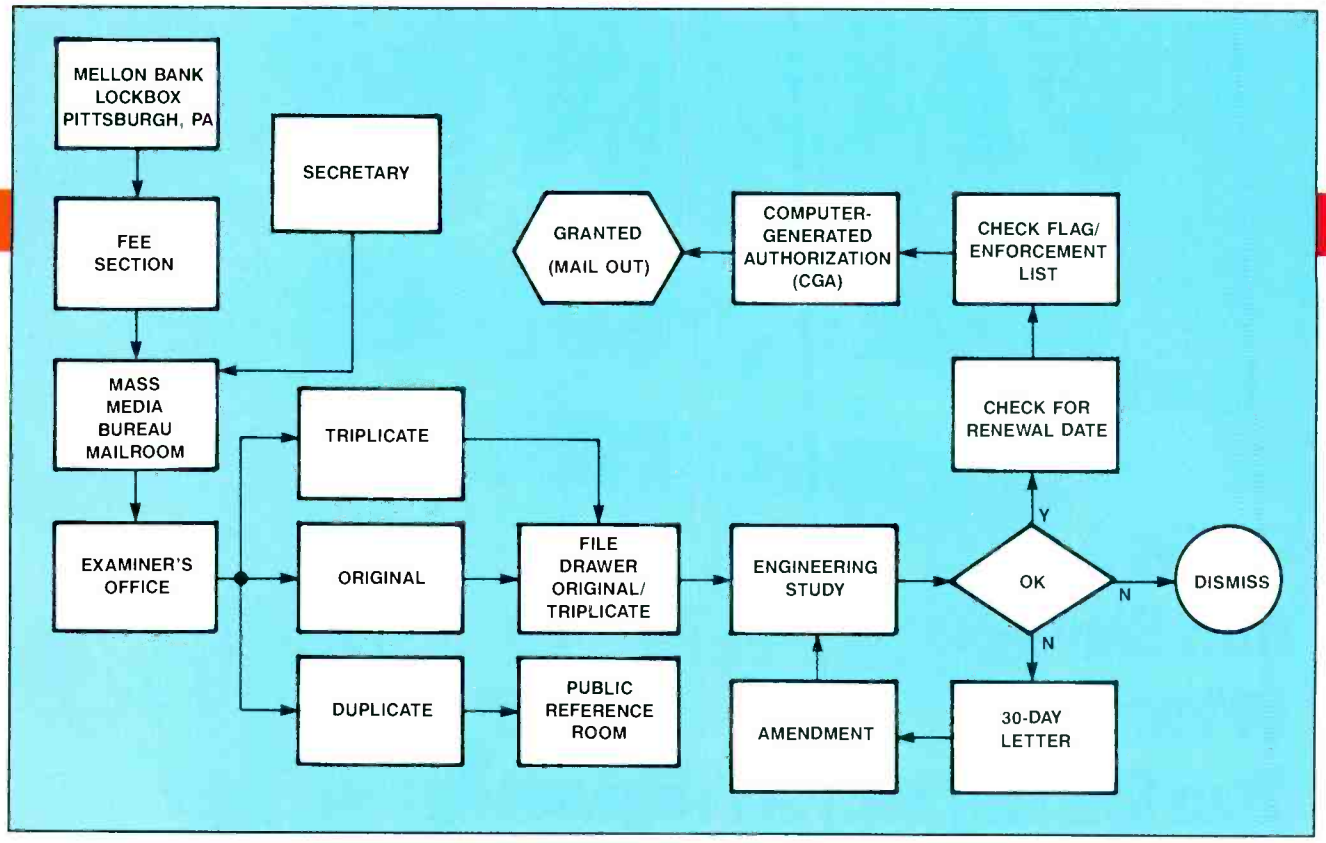


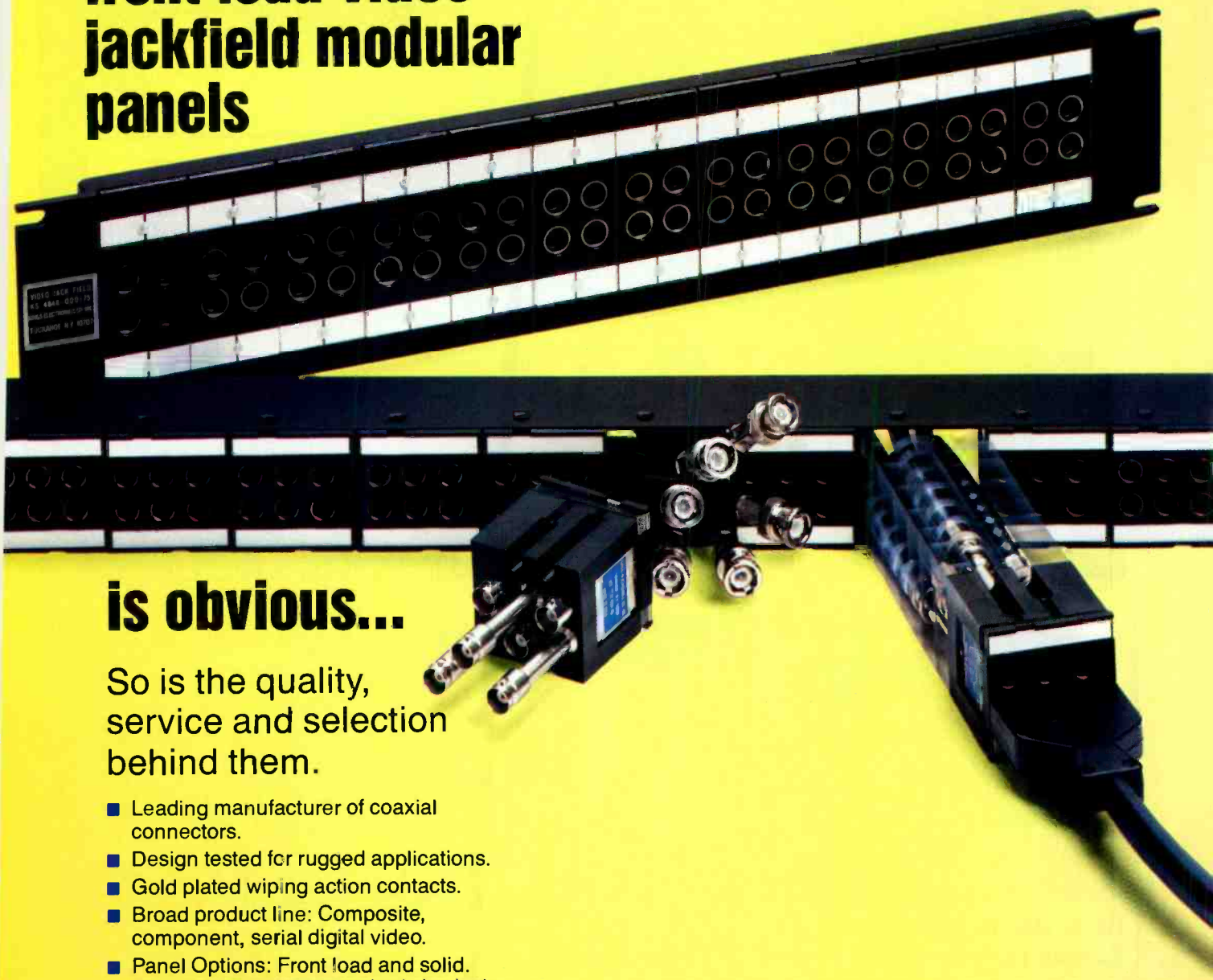
Figure 2. *The processing stages for license Form 302 are similar, but not identical, to those for Forms 314, 315 and 316.*

ly shorten current processing times for the remaining backlog of applications, the commission announced four FM processing changes relating to applications for new commercial stations. The processing for FCC license Form 302 is shown in Figure 2. Assignment and transfer forms (314, 315, 316) follow the steps that are shown in Figure 3.

The four policy changes

The first change is procedural and authorizes the staff to issue the required "Notice of Acceptance for Filing" prior to the staff's engineering study of the appli-

The advantage of KINGS front load video jackfield modular panels



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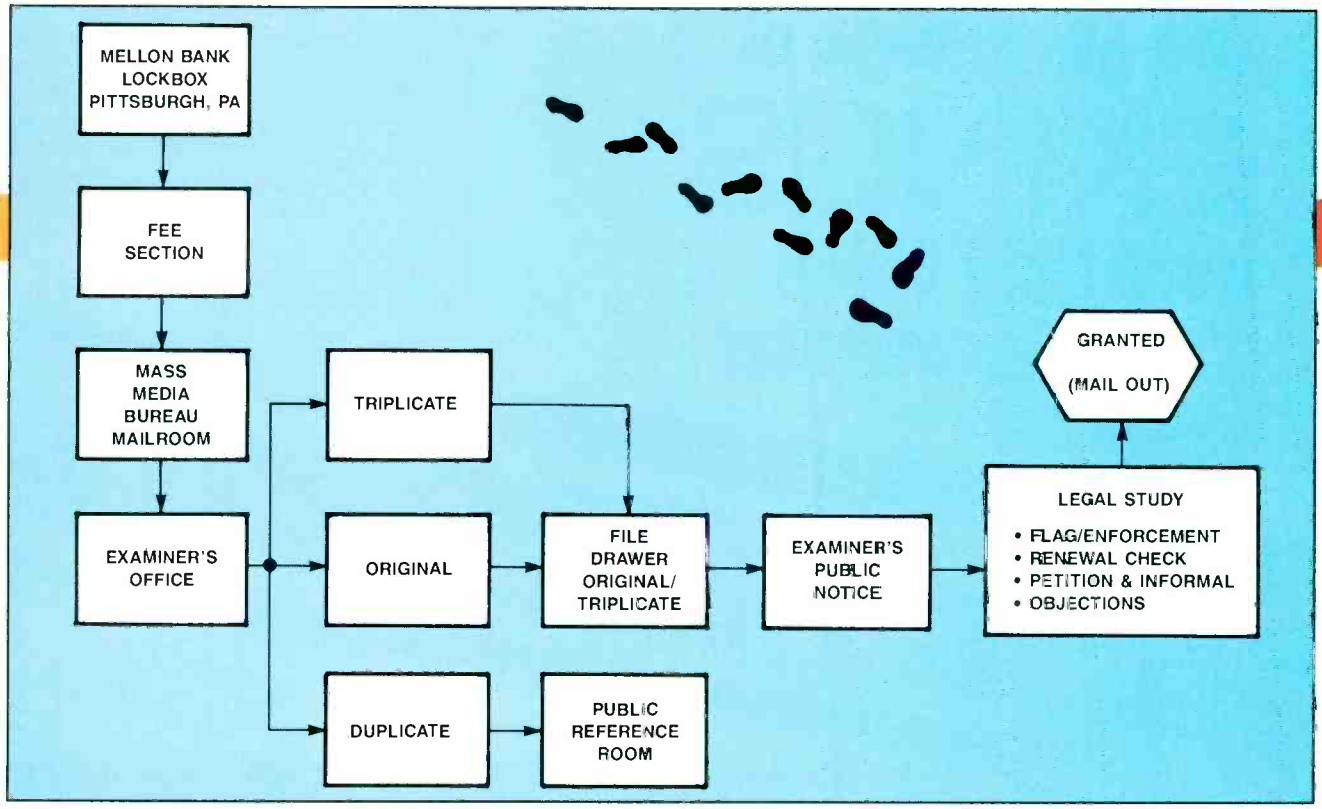
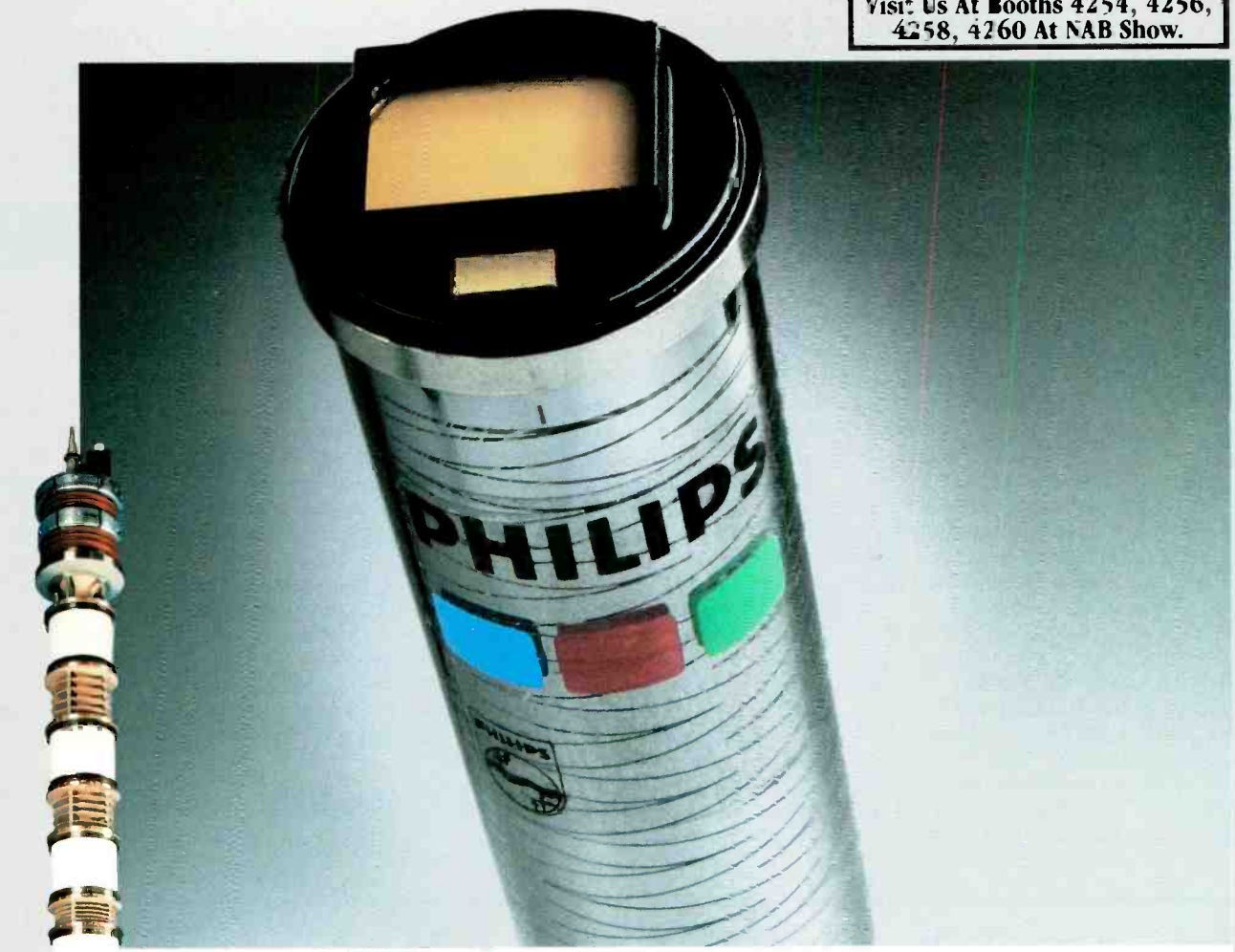


Figure 3. Forms 314, 315 and 316 follow the same process as shown for Form 302 up to the file drawer stage. From that point forward, the process is much simpler.

Visit Us At Booths 4254, 4256, 4258, 4260 At NAB Show.



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cation. This notice is mandated by Section 309 of the Communications Act for the purpose of establishing a 30-day period for the filing of petitions to deny.

Currently, the notice is released after the engineering study. The legal study cannot be completed until the petition-to-deny pleading cycle has ended. Triggering the statutory petition-to-deny pleading cycle while applications are still awaiting engineering study will ensure that each file is virtually complete before engineering and legal processing begins. The commission believes this change will shorten processing time by approximately 45 days per application. However, if an application is placed on public notice as acceptable for filing and is subsequently determined to be unacceptable for filing, it may still be dismissed. See 47 C.F.R. {73.3566.

The other three changes authorize the staff to waive the FM hard-look processing rules in these circumstances. These rules prohibit the filing of amendments curing tenderability or acceptability defects after the applicable amendment of right ends. The commission waived the hard look in the three circumstances to better serve the public interest.

Specifically, these waivers permit the immediate authorization of new service in situations where the defects in question would otherwise bar settlements or grants for applicants, and could further procedural or administrative delays. These three changes are as follows:

1. In situations where only one applicant has applied in a filing window, the staff will waive the hard-look rules to permit one opportunity to correct tenderability defects in response to commission deficiency letters. However, any such amendments cannot conflict with a previously filed acceptable application.

2. If any applicant proposes to buy out all other applicants in a mutually exclusive group, including any previously dismissed applicant whose dismissal is not final, the staff will waive the hard-look rules to permit one opportunity for the surviving applicant to correct all defects in its application. This may occur only if such an amendment does not conflict with a previously filed acceptable application.

3. As to any applicant, previously dismissed for defects and whose dismissal is not yet final, and who proposes to buy out all remaining applicants in a mutually exclusive group, including any other dismissed applicant whose dismissal is not final, the staff will waive the hard-look rules to permit reinstatement nunc pro tunc (which allows an applicant to retain its rights as though the last commission action never occurred) with a curative amendment for the limited purpose of settlement approval. This may be done providing that such an amendment cures all defects and does not conflict with a previously filed acceptable application.

The commission believes that waiver of the hard-look rules in the above limited circumstances will result in significantly improved speed of service to the public. The hard-look rules will continue to be applied in all other cases. As you can see, this is a kinder and gentler commission.

Editor's note: The opinions expressed by the author are not necessarily those of the Federal Communications Commission.

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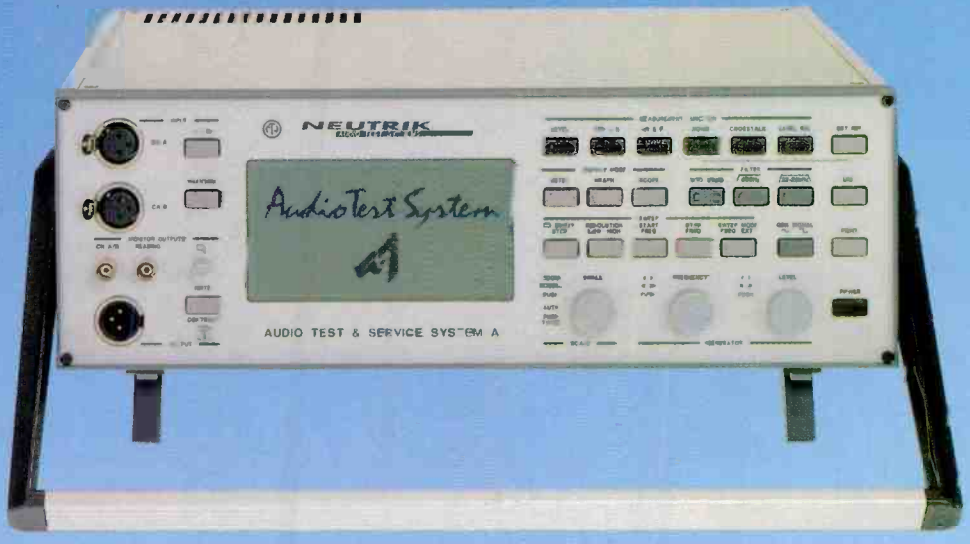

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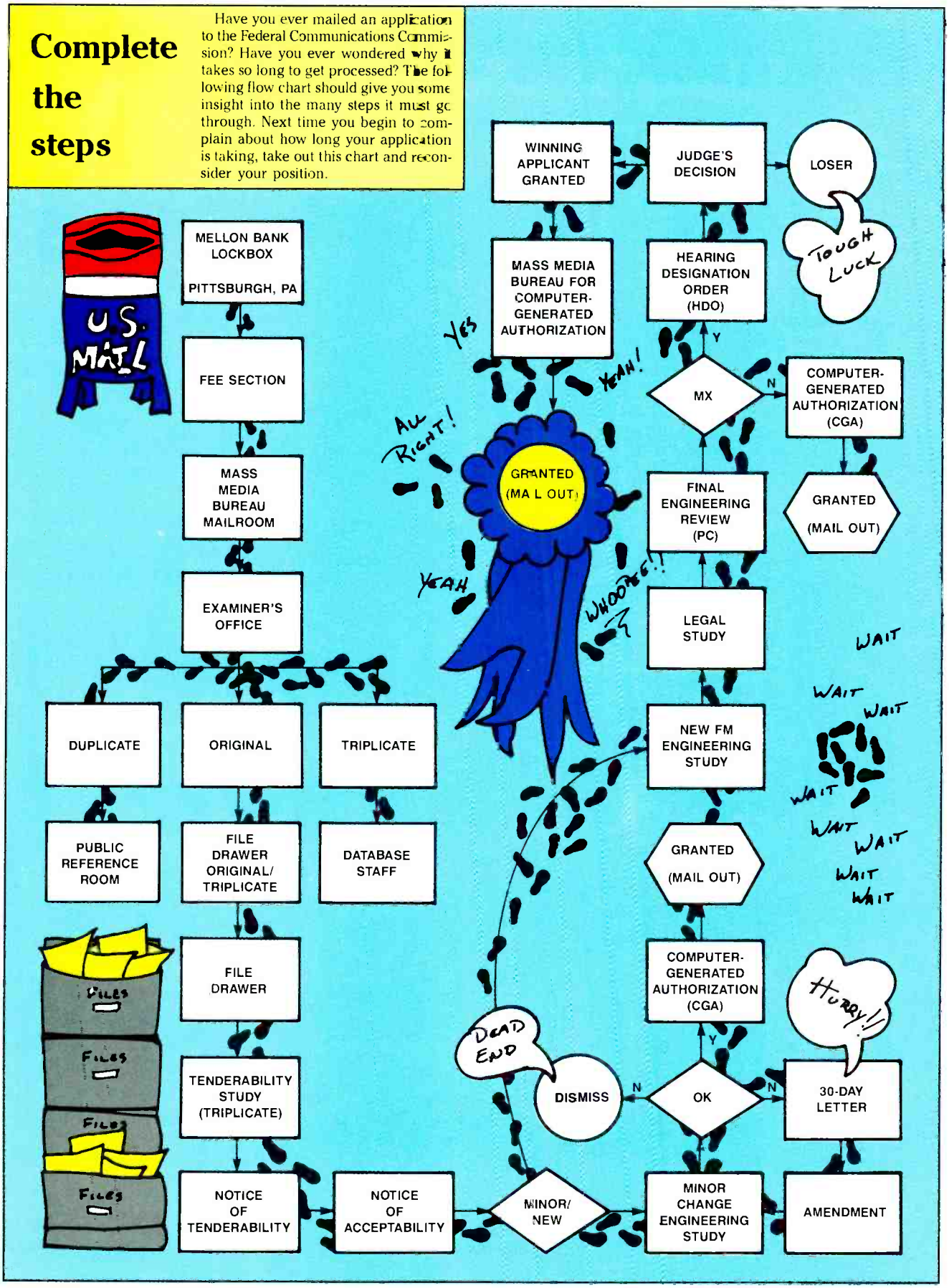
Complete the steps

Have you ever mailed an application to the Federal Communications Commission? Have you ever wondered why it takes so long to get processed? The following flow chart should give you some insight into the many steps it must go through. Next time you begin to complain about how long your application is taking, take out this chart and reconsider your position.



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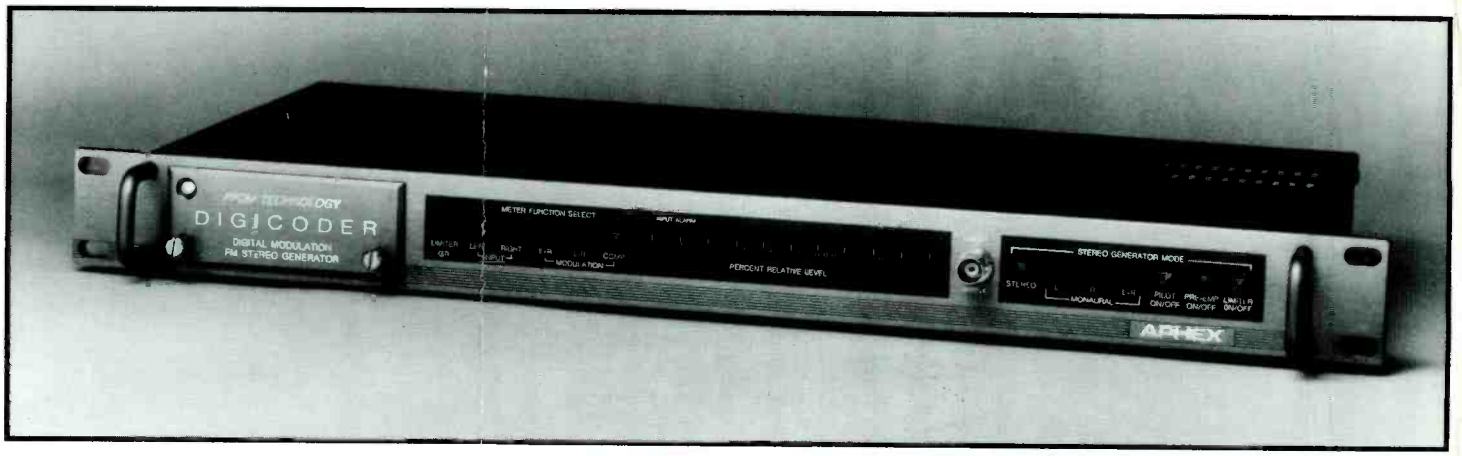
The Aphex Stereo Generator ... A Leap Beyond Digital



Under development for over six years, it's finally here. The Aphex Digicoder™ Stereo Generator ... the next link in the Aphex Audiophile Air Chain. The Digicoder provides unequaled sonic transparency of Class A analog with the separation and stability of digital ... and sustains maximum loudness. Plus it interfaces to your existing equipment with no A to D convertor.

This lab standard generator uses a proprietary PPDM™ (Parallel Path Digital Modulation*) circuit to provide a dynamic range better than 110dB. To achieve the same specs, a digital system would need 18 bit resolution sampled at 2.4 MHz.

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Broadcasters around the world have relied on the Aphex Audiophile Air Chain, a combination of the Aphex Compellor®, Aural Exciter® and Dominator™ to achieve *consistent high quality sound.* The Digicoder continues the tradition, providing the highest audiophile quality available at any price.

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All Aphex products are designed and manufactured in the U.S.A.

* Patent Pending

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NAB '91 Equipment Exhibitors

What can we expect of NAB '91? It is hard to say if the current state of the world will affect the annual gathering of broadcasters from around the world on April 14-18 in Las Vegas. Worldwide, unsettled economics and politics may show in the attendance numbers, as budgets for extras, such as travel, are trimmed. Some who might have attended this year could be occupied elsewhere in the world. However, NAB will offer relief from other worldly cares with a display of new technology.

What effect will the technology have on the future? Technology can spur greater change in society than either economics or politics. It is doubtful that this year's exhibition holds any surprises of the power of Guttenburg's printing press, the discovery of radio waves, the first transmission of TV pictures or the production of tools from metal instead of stone chips. The past 10 years have witnessed major technological changes in broadcasting. Communications technology has effectively shrunk the world, bringing us closer (at least in time) to events that are shaping our lives.

According to information provided by the National Association of Broadcasters, the exhibition halls in Las Vegas will present new concepts in equipment and services by approximately 750 companies. A wide ranging program of workshops, seminars and technical papers is scheduled for the engineering conference. What should prove noteworthy for most attendees is the *HDTV World '91* conference and exhibition, held concurrently. NHK (Tokyo), a force in the origin and development of advanced imaging, has agreed to mount its annual technology exhibit outside Japan for the first time. Joining NHK will be 25 to 30 American, European and Japanese companies involved in HDTV research and development. Although there is still much work to be done in the quest of advanced imaging, the progress thus far has had a significant impact on our industry. NAB will place an emphasis on teleproduction aspects of the industry and HDTV specifically, as well as the growing use of interactive television.

Outside the convention center, the broadcasters of Las Vegas will offer tours of some local facilities. Meanwhile, demonstrations of digital audio broadcasts are planned. If you need additional entertainment, there are, of course, other things to do in Vegas!

To help you obtain the maximum benefit from NAB '91, *Broadcast Engineering* has compiled our traditional 3-part coverage of participants in the convention. The information in the *Equipment Exhibitors* list, starting on page 150, lists those companies and assigned exhibit numbers registered with the NAB as of Feb. 1. We have been in touch with exhibitors since early December in compiling information for this issue. Some companies did not respond to our request for information, while others were uncertain about product introductions. When companies could tell us of their plans, we asked them to note featured existing products in addition to any new designs to be introduced to the industry. The comment "*See Category:* A1" associated with exhibitors, indicates that a product announcement is included in our coverage. *A1* denotes *audio mixers*. A chart of the classification codes and page numbers for "*New at NAB*" is located on page 191.

An exhibit map is bound into this issue. Unfortunately, apparent discrepancies will exist by the time the show starts. Because companies are jockeying for best positions up until the opening minutes of the exhibit, expect new companies to appear, some to move and others to drop out of the show altogether.

In the general exhibitor list and on the map, highlighting designates a company has advertised in this issue; check the *Advertiser Index* of this magazine to locate their special messages.

An expanded array of reader service numbers should speed information on products to you even faster than in the past. You will find a number with each exhibitor in the alphabetic listing, and separate numbers for each product in the *New at NAB* section. Because of the size of the card that would be required to hold the entire matrix of response numbers, you are asked to legibly write in the numbers for those products in which you are interested.

NAB '91, in Vegas, could be *your* winning ticket. Come along, join the *BE* staff and some 40,000 of your closest friends at the Las Vegas Convention Center and Hilton Convention Annex. You're not registered yet? You'd better do so soon, because hotel accommodations and flights to Las Vegas will be booking fast.

A.F. Associates **6401**
U.S. distributors for AVS **ADAC, ISIS** standards converters, **Rademac EPO** camera support products; robotic camera control systems; facilities, vehicle designs, construction. *See categories:* V3, V4
Circle (501) See Adv. Index

Abbott & Company **7137**
Facility power control products, **Safety-Locks** for 200A and 400A current levels.
Circle (502)

Abekas Video Systems **2141**
Video disk image storage systems, digital effects products; graphic titlers; video production switchers, production systems.
Circle (503) See Adv. Index

ACCOM . . . . . **.N.A.**
Digital video processing products, including **DIE-125** enhancer and **DIS-422** image store.
Circle (504)

Accu-Weather **5552**
Weather graphics products, **Ultragraphics 240** and **Amiga** systems; automated weather data services. *See categories:* S1, V4
Circle (505)

Accurate Sound Corporation . . . **1117**
Audio recording systems. *See category:* A3
Circle (506)

Acoustic Systems **2020**
Prefabricated, sound-control products, including **BB Voice Over** broadcast booths.
Circle (507)

Acrodyne Industries . . . . . **.5525**
Television transmitter systems, including **Model TRU/25KV** 25kW UHF and **TRU/1000 solid-state** 1kW.
Circle (508) See Adv. Index

Adams-Smith . . . . . **.2702**
Video editing products, including **System 2600** editor and **Zeta-Three** synchronizer. *See category:* V2
Circle (509)

ADC Telecommunications . . . . . **.6026**
Wiring, cable management products, I.C.O.N.; patch bays, jacks, plugs; fiber-optic products; **RS-422** parallel digital video patch systems. *See category:* S5
Circle (510)

Adrienne Electronics . . . . . **.7818**
Signal routers, **AEC-1/-2** 10×1, ×2; **PC-LTC/-VITC** time-code PC boards. *See category:* V2
Circle (511)

Advance Products . . . . . **.7145**
Utility, A-V carts, tables; **Pixmobile AV-444, AV-445** adjustable tables. *See category:* S4
Circle (512)

Advanced Designs . . . . . **.6005**
Weather radars, displays with **DOPRAD II** Doppler-based turbulence detection, **WDDS** weather data display systems.
Circle (513)

Advent Communications . . . . . **.7041**
Satellite communications systems, **1900 Mantis** flyaway for SNG; video exciters, signal monitors. *See categories:* R4, S3
Circle (514)

Aircraft Digital Music Library . . . . **.2234**
Production music library.
Circle (515)

AKG Acoustics . . . . . **.1226**
Audio processing systems; microphones; **dbx** processors; **Orban** broadcast processors; audio workstations. *See category:* A5
Circle (516) See Adv. Index

Alamar Electronics . . . . . **.5857**
Station, playback automation controllers.
Circle (517)

Alcatel ATFH . . . . . **.7045**
Fixed, mobile microwave links.
Circle (518)

Alden Electronics . . . . . **.5237**
Weather graphics workstations, displays, data services. *See category:* V4
Circle (519)

Alesis . . . . . **N.A.**
Audio mixers, **Model 1622**; **QUADRAVERB** digital effects processor. *See categories:* A2, A4, A5
Circle (520)

Alexander Batteries . . . . . **N.A.**
Battery, chargers, analyzers, **MZ-3100** 3-unit

The standards converter with the smoothest moving image of any system.

OKI's Digital Television Standards Converter Model LT2000 achieves *True Motion Continuity*. Next Generation Technology has produced the "Motion Vector System" (MVS™), making possible the first portable standards converter to eliminate motion discontinuity, or jerkiness, that occurs with high-speed camera panning and fast-action video program material. Other standards converters, using the 2-and 4-field interpolation systems, fail to reduce motion discontinuity, and as a result have been objectionable to the professional market.

MVS™ divides each field of video into pixel sections for motion vector detection and measurement, using the Interactive Gradient Method (IGM). IGM, the most advanced method ever developed for precise and finite motion detection, allows the LT2000 to produce the smoothest moving image of any system available. MVS™ accomplishes this without the resolution loss common on other high-end standards converters. The displayed video picture is not only free from conversion artifacts, but also without interpolation resolution loss. The end result... a clean, sharp picture with *True Motion Continuity!*

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Circle (111) on Reply Card

video optimizer. *See category:* V8
Circle (521)

Alias Research **2026**
Graphics, animation software, **Designer** and **Style** packages. *See category:* V4
Circle (522)

Allen Avionics **5751**
BAL Digistream data interface system **200M** and **MatchMan** color assessment unit. *See category:* S1
Circle (523) See Adv. Index

Allen Osborne Associates **6124**
A-V production products; portable, extendable masts.
Circle (524)

Allied Broadcast Equipment **1100**
See Harris Allied Broadcast Equipment
Circle (525)

Allied Tower **1031**
Tower products, services.
Circle (526)

Alpha Audio **3075**
Acoustic materials, **Azonic** acoustical foam, **Soundtex** wall fabric. *See category:* S4
Circle (527) See Adv. Index

Alpha Image **2011**
Digital signal routers, including **Alpha-264**; **Alpha-311** analog to digital converter. *See categories:* S1, V7
Circle (528)

Alpha Video & Electronics/AVEC . **6316**
Alphatized VCRs, retrofit time code, accessory products.
Circle (529)

ALTA Group **5401**
Video switchers, time base correctors, effects systems, including **Pegasus** and **Pictoris-EDE**. *See category:* V3
Circle (530) See Adv. Index

Altronic Research **1463**
RF power test loads; transmitter heat exchanger systems. *See category:* S3
Circle (531)

Amber Electro Design **1411**
Audio distortion measurement systems, including **#3501** portable and **#5500** programmable sets.
Circle (532) See Adv. Index

AMCO Engineering **4201**
Equipment enclosures, shielded racks to meet FCC standard EMI specs, including **Frugal Frame** line; quick shipment program. *See category:* S4
Circle (533) See Adv. Index

AMEK Consoles/TAC **2021**
Audio mixers, including **BC-III** and **SR6000**. *See category:* A1
Circle (534)

American Broadcast Systems . . . **5800**
TV cart systems, including the **MicroCart 50** series playback systems and related products. *See category:* S1
Circle (535)

American Studio Equipment . . . **.1906**
Motion picture equipment; grip products; rental plans.
Circle (537)

Ampex Corporation . . . . . **.4301**
Video cameras; graphic titlers, **ALEX**; recorders, **VPR-200/-300 series** D-2 composite DVTRs; editing controllers; video switchers, effects. *See categories:* S1, V2, V4, V7
Circle (538) See Adv. Index

Ampex Recording Media . . . . . **.4301**
Video recording tape, including **# 319** D-2 digital videocassettes, **198/298** master broadcast Betacam/SP cassettes. *See category:* S6
Circle (539) See Adv. Index

AMS Industries/Neve . . . . . **.1248**
Hard disk audio recording systems, including **AudioFile PLUS** with **LOGIC 1** console. *See category:* A1
Circle (540) See Adv. Index

Amtel Systems . . . . . **.2351**
Video editing, time code products, **E-Pix** non-linear system.
Circle (541)

AMX Corporation . . . . . **.7025**
Remote-control products including **Axcess** and **Touch Panel** for teleconferencing; lighting control equipment. *See category:* V8
Circle (542)

Andrew Corporation . . . . . **.5533**
Microwave antennas, products; TV broadcast antennas, including **Trasar EP** UHF series; RF distribution products; antenna control automation, feed line and satellite communications products, including **3.7M transportable** earth station antenna. *See category:* R4
Circle (543)

Angenieux Corporation . . . . . **.5129**
Video, cine lens systems, including **14x ENG** and **15x wide-angle studio** series optics.
Circle (544)

Anixter Brothers . . . . . **.2047**
Terrestrial microwave, STL antennas.
Circle (545)

Anritsu America . . . . . **.7349**
Test/measurement products, **GMG6301** digital video generator, **MS2601A** RF spectrum analyzer. *See category:* S3
Circle (546)

Antenna Technology . . . . . **.6416**
Satellite receiving electronics, **Simulsat** antenna systems. *See category:* R4
Circle (547)

Anton/Bauer . . . . . **.4322**
Batteries, chargers, including **Logic Series** high-energy NiCad **Magnum** and **Compac Magnum** with **Magnum Quad** faster charger. *See category:* V8
Circle (548)

Anvil Cases . . . . . **.5353**
Equipment transport containers, including **ATA** series and **Forge II** cases.
Circle (549) See Adv. Index

Aphex Systems Ltd. . . . . . **.6336**
Audio processing products, including **320 Compeller** and stereo generators. *See category:* R2
Circle (550) See Adv. Index

Applied Research & Technology . . **1141**
Audio delay products, **Model 250 PD-3**; **Model 300** 1/3-octave EQ with *Smartwave*. *See category:* A2
Circle (551)

Arcor Engineering . . . . . **.7757**
Cable, connector products for broadcast applications. *See category:* S5
Circle (552)

Arrakis Systems . . . . . **.1802**
Audio mixers, audio distribution products.
Circle (553)

Arriflex . . . . . **.5933**
Cine cameras, related products, **ARRI HMI** lighting and **ARRI grip** product lines. *See categories:* V6, V8
Circle (554)

ASACA ShibaSoku . . . . . **.3048**
Video cart systems; high-resolution monitors; signal generator, envelope delay instruments, video noise meter, audio analyzers; encoders, decoders; routing switchers; magneto-optical A-V still-stores. *See categories:* S3, V3, V5
Circle (555)

ASC Video/Case Editing Systems . . **7010**
Videotape editing control systems, including **CASE**. *See category:* V2
Circle (556)

Associated Production Music **1706**
Production music libraries.
Circle (557)

Aston Electronic Designs . . . . . **.6514**
Video titlers, **Aston 4** character generator; **Wallet** still-store. *See categories:* V2, V4
Circle (558)

AT&T . . . . . **.4639**
Communications services.
Circle (559)

ATI Audio Technologies . . . . . **.1058**
Broadcast consoles, including **Vanguard**; **DA10000** modular audio signal distribution system. *See category:* A5
Circle (560)

Audi-Cord . . . . . **.1012**
Audio cartridge systems, **Models DL, S**.
Circle (561)

Audio Accessories, Inc. . . . . . **.2010**
Signal distribution products, **Audio-Line** jack panels, pre-wired panels and accessories.
Circle (562) See Adv. Index

Audio Action . . . . . **.7131**
Production music libraries from Australia, Europe. *See category:* S8
Circle (563)

Audio Broadcast Group **1701**
Human engineered studio systems for on-

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Circle (112) on Reply Card

BASYS 6415
Newsroom automation, **BasMaster** master control automation, *Jemani* graphics, **PET** portable editing terminals; Basys *LaKart* library systems. *See category:* S1
Circle (585)

BCS Broadcast Store 7625
Distributor, audio, RF products.
Circle (586)

Beaveronics 1520
Video switchers; character generators; studio clocks.
Circle (587)

Beck Associates 7542
Custom consoles, racks, edit carts.
Circle (588)

Belar Electronics Lab 1448
Frequency, modulation monitors for AM, FM, TV, SCA, TV stereo. *See category:* R2
Circle (589) See Adv. index

Belden Wire & Cable 6424
Audio and video wire, cable and fiber-optic products.
Circle (590) See Adv. index

Bencher 7345
Graphic system peripherals, **M3 videostand**, **Copymate** copystand. *See category:* V4
Circle (591)

Benchmark Media Systems 2204
Audio distribution products of **System 1000** series; mic pre-amps, including **MIA-4** units. *See categories:* A4, S2
Circle (592)

BEXT 1020
FM, TV transmission products **HPT** FM translator and **LCR** FM composite receiver. *See category:* R1
Circle (593)

beyerdynamic 5314
Microphones, including **MC086/M85** ENG/EFP instruments and headset products, including **DT-108/109** with attached mics. *See category:* A5
Circle (594)

Bill Daniels Company 4555
Industry reference material, **Equipment Buyers' Guides**, **Technical References**.
Circle (595)

Bio-Electronics 7517
Video production system.
Circle (596)

BMS 3033
Microwave products, **BMA-3000** steerable antenna pedestal and **TBT-50A** frequency agile transmitter. *See category:* R3
Circle (597)

Bogen Photo 5803
Lighting, camera support products.
Circle (598)

Brabury/Porta-Pattern (BPI) 5839
Video test charts, **Porta-Pattern Illuminators**; signal monitors, **Hamlet Video** video scopes. *See category:* V5
Circle (599)

Bradley Broadcast Sales 2007
Distributor; **Telos** telephone-to-intercom and digital telephone systems, **Cutting Edge Technologies** audio processors. *See categories:* A2, S5
Circle (600)

Bretford Manufacturing 7626
A-V, utility carts, tables.
Circle (601)

Brite Voice Systems/Cityline 7807
Listener/call-in information systems.
Circle (602)

Broadcast Audio 2217
Audio consoles; distribution products.
Circle (603)

Broadcast Automation 1912
Broadcast automation products, including **Live Assistant** and **Digi-Cart** equipment. *See category:* S1
Circle (604)

Broadcast Electronic Services 5969
Video utility interface products, including **BBS800** Betabox and **GPI Network 410**.
Circle (605)

Broadcast Electronics 1162
Audiotape cartridge systems including **Trak 90**; **"B"** series FM broadcast transmitters. *See categories:* A1, A4, S1
Circle (606)

Broadcast Marketing International .7545
No information provided.
Circle (607)

Broadcast Products 7237
Mobile radio broadcast vehicles, including **Star-Cruiser** and **Super Roving Radio**.
Circle (608)

Broadcast Supply West/BSW 1808
Distributor; audio mixers, processing, recording systems, including **Studer Dyaxis**; microphones, remote operation products; automation equipment. *See category:* A4
Circle (609)

Broadcast Technology Partners/FMX 6218
FM audio processing.
Circle (610)

Broadcast Video Systems (BVS) . . .5221
Safe area generator **SA-103**; component signal transcoders **Model 734/735**; keyers; time/date/ID generators; encoders, decoders. *See category:* V3
Circle (611) See Adv. Index

Broadcasters General Store 2223
Distributor for audio, and broadcasting support products, transmitters, including **Digimod 2000, XT**; Hit Design **Tailor** products. *See category:* A6
Circle (612)

Bruel & Kjaer Instruments (B&K) . .7811
Studio mics; audio system, acoustical test equipment.
Circle (613)

Bryston Ltd 2406
Audio monitor amplifiers.
Circle (614) See Adv. Index

BTC Test & Measurement/Philips .5320
Test equipment, **Philips Test & Measuring** products.
Circle (615)

BTS Broadcast Television Systems .4032
Cameras, including **LDK-91**; video master control, signal routing switchers, including **TVS/TAS-3000**, control panels; analog, digital video recorders. *See categories:* S1, S2, V1, V6
Circle (616)

Burke Technology 1907
Transmitter, other equipment remote controllers, **ARC-16** and **TC-8**. *See category:* R1
Circle (617)

BURLE INDUSTRIES 5345
Replacement camera tubes, RF power tubes.
Circle (618) See Adv. Index

Cablewave Systems/RF Systems . . 1148
Microwave parabolic antennas; **Flexwell** foam, air dielectric coaxial cable; elliptical waveguides. *See category:* R1
Circle (619) See Adv. index

Cal Switch 2119
Test equipment.
Circle (620)

Calaway Editing 5401
Videotape editing controllers for NTSC, PAL standard video, including models **CE-75** and **CE-150**. *See category:* V2
Circle (621) See Adv. index

Calculated Industries 4573
Special purpose time-code calculators.
Circle (622)

Calzone Case 6613
Equipment transport products, **Escort** series with shock-mount; **custom die cut** camera, VCR, mobile studio cases; rack-mount cases. *See category:* S4
Circle (623)

Camera Mart 5351
Distributor; audio, video products; cameras, recorders; lighting equipment; batteries, chargers; audio mixers; sales and rental programs.
Circle (624)

Camera Platforms Int'l 7739
Production support products, **Shotmaker** camera cart; **Lightmaker** AC/DC HMI ballast.
Circle (625)

Canare Cable 6040
Cable and wire, **V4-3C** component video multicable; distribution products, **242U-VJ22W-C** video patch bays. *See category:* S5
Circle (626) See Adv. index

Canon USA 5913
TV lens systems, **J14A"8.5B IRS** and **J55 Super** models. *See category:* V1
Circle (627)

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Circle (115) on Reply Card

Carpel Video **6027**
Distributor, recording media; reconditioned videotape.
Circle (628)

Catel Telecommunications **2117**
Modulator, demods for CATV, low-power broadcasting.
Circle (629)

CBSI Custom Business Systems . . **1452**
Station business automation packages.
Circle (630)

CCA Electronics **1025**
FM broadcast products, including 25kW **FM25,000G**, 5kW **FM4,000G** FM transmitter systems. *See category:* R2
Circle (631)

CEL Electronics . . . . . **.6316**
Video processors, TBCs, synchronizers; **Maurice MS852B** digital effects systems; **Tetra Plus** standards converters; editing control systems. *See categories:* S3, V4
Circle (632) See Adv. index

Central Dynamics . . . . . **.5039**
Video encoders, **Stage★1**; **SDS-2+** A-V routing, video production switchers.
Circle (633)

Central Tower . . . . . **.2014**
Guyed, self-supporting towers; complete construction, electrical engineering services. *See category:* R1
Circle (634)

Century Precision Optics . . . . . **.6706**
Lens **wide angle** adapters, **macrozoom** attachments; Cartomi fluid heads, tripods.
Circle (635)

Channelmatic . . . . . **.4665**
Automated advertisement insertion, videocassette playback systems, **ADCART** and **Broadcaster II**. *See category:* S1
Circle (636)

Chapman/Leonard Studio Equipment **7652**
Lighting, camera support products
Circle (637)

Chester Cable/Alcatel NA . . . . . **.6319**
Single, multipair **audio** cable; precision, component analog, RGB+Sync, A-V composite **video** cables; RS-232/-422 **data** cable; **fiber-optic** materials. *See category:* S5
Circle (638)

Christie Electric . . . . . **.4551**
Battery products, chargers, analyzers.
Circle (639)

Chyron Group . . . . . **.5545**
See: *Aurora Systems, Chyron CMX, Digital Services/DSC*

Chyron . . . . . **.5545**
Character generators, graphics equipment.
Circle (640)

Cine 60 . . . . . **.6013**
Rechargeable NiCad batteries, accessories; portable **Sun-Gun** lighting products.
Circle (641)

Cinema Products . . . . . **.5334**
Camera, lens control systems, camera mounting products, **Steadicam** series; film transfer utility products, **CP Keykode** reader and **WorkPrint logger**; cine film magazines. *See categories:* V1, V6
Circle (642)

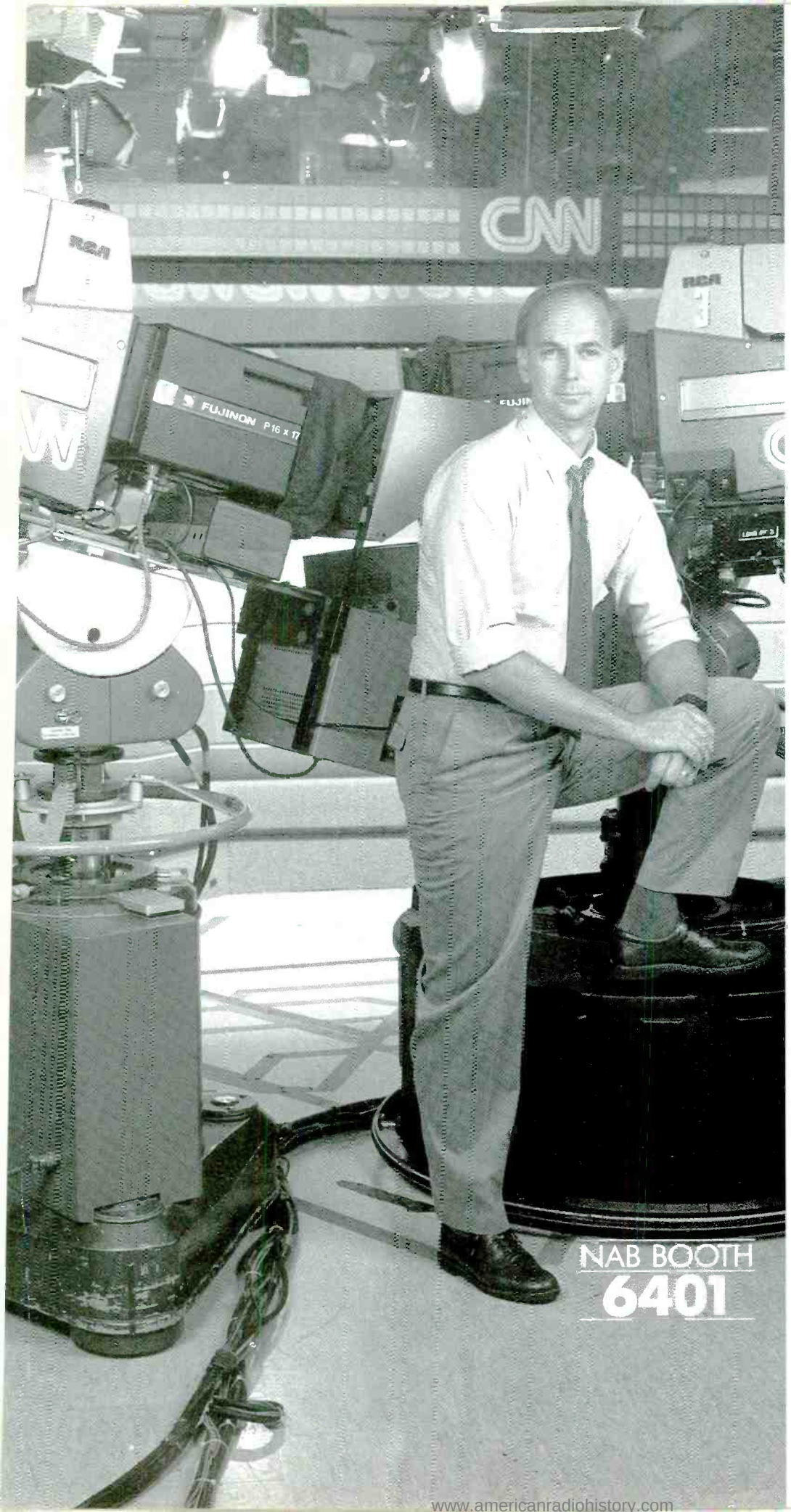
Cinemills . . . . . **.7449**
Studio lighting products, CMC **Silver Bullet** 12kW HMI light; lighting filters.
Circle (643)

Cipher Digital . . . . . **.5347**
Audio editing control, **CDI-5000**; time-code products, **CDI-750**. *See categories:* A5, V2
Circle (644) See Adv. index

Circuit Research Labs (CRL) **1814**
Audio processors, **Audio Signature**, **MBL-100**, an AM talk processor. *See category:* A2
Circle (645)

Clark & Associates Ltd . . . . . **N.A.**
Automation systems for broadcast **EDAAS**; products for radio, TV and cable **PC-2000**. *See categories:* S1, V4
Circle (646)

Clear-Com Intercoms . . . . . **.5851**
Intercoms, **ICS-1000, 1500 Matrix Plus** point-to-point stations; multichannel party-line systems; monitors. *See category:* A5
Circle (647) See Adv. Index



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Clipper Products 7731
Equipment, utility carts.
Circle (648)

CMC Technology 4549
Replacement heads, refurbishing service for **VPR, BVH** 1" type C, Betacam SP VTRs. *See category:* V2
Circle (649)

CMX 5545
Videotape editor controllers, **CMX 6000** non-linear, **CMX 300** 3- and 4-VTR systems. *See category:* V2
Circle (650)

Coaxial Dynamics 1338
RF power measurement products.
Circle (651)

ColorGraphics Systems/Dynatech . .5401
Videographics systems for newsroom, weather, **DP 4:2:2, DP/MOSAIC, LiveLine 5**. *See category:* V4
Circle (652) See Adv. index

Colortran 4259
Stage, studio lighting control, **Prestige 3000 Plus** control console, **ENR** dimmers.
Circle (653)

Columbine Systems 6300
Station automation software, **Sales, Traffic** and **Business** systems. *See category:* S1
Circle (654)

Comad Communications/SIRA . . .1918
TV broadcast antennas.
Circle (655)

Comark Comm./Thomson-CSF . . . 5045
UHF transmission systems to 240kW, with **Klystrode** designs, common or diplexed amplification. *See category:* R1
Circle (656) See Adv. Index

Comband Technologies 6326
Terrestrial microwave **ProBand, ComBand** wireless cable systems. *See category:* R3
Circle (657)

COMLUX 7554
Fiber-optical interfacing, **System 2000** modular digital, **System 3000** digital data communications links. *See category:* S1
Circle (658)

Commodore Business Machines . . 7255
Amiga computers, **A2500** and **A3000**.
Circle (659)

Communications Graphics 1352
Promotional products, stickers, labels.
Circle (660)

Compact Storage Systems 7616
Media, archive storage systems.
Circle (661)

Comprehensive Video Supply . . . 5863
Audio, video production, lighting equipment; rental programs; PC packages **Script Master, Edit Lister, Cue Master** prompter. *See categories:* A1, S1, V2
Circle (662)

Comprompter 6345
Teleprompter systems.
Circle (663)

Computer Assisted Technologies . . N.A.
Maintenance management software, including **BCAM** for broadcast and post-production engineering. *See category:* S1
Circle (664) See Adv. index

Computer Concepts 1063
Radio station traffic, business automation hardware, software.
Circle (665)

Computer Engineering Associates . 7542
CEA Newsroom automation, sales/traffic, financial systems. *See category:* S1
Circle (666)

Computer Music Consortium 7216
Program music.
Circle (667)

Computer Prompting 6933
Captioning, prompter products, **CPC-1000** SmartPrompter, **CPC-500** CaptionMaker. *See category:* V4
Circle (668)

Comrex 1240
Audio bandwidth extenders, **3XP-3XR**; distribution products. *See category:* S1
Circle (669)

Comsat World Systems 2057
International satellite programming, data transmission services. *See category:* S8
Circle (670)

THE HEART OF A GREAT TV TRANSMITTER!

Thomson Tubes Electroniques!

Make sure the UHF transmitter you invest in comes with the unique competitive advantage of a TH 563 tetrode from Thomson. With 25 kW in common and 40 kW in vision-carrier amplification, the TH 563 is based on the same principles as the TH 582, which routinely achieves more than 20,000 hours of operational lifetime.

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Tel. : (1-201) 812-9000
Fax : (1-201) 812-9050

Comtech Antenna **1508**
Earth station antennas.
Circle (671)

ComTek **2604**
Wireless mic, IFB, cuing systems, **Models M-182, PR-72.** *See category:* A5
Circle (672)

COMWAVE **6915**
Wireless cable transmission products, 50W **SB050A, SBM1-8** 1W TV transmitters.
Circle (673)

Concept Productions **1059**
Program music libraries; program automation equipment.
Circle (674)

Conifer **5859**
Wireless cable products, **QL-3010** block, **HLN series** ITFS downconverters. *See category:* R3
Circle (675)

Connectronics **3073**
Wire, cable, connectors, adaptable **Bodge** utility plugs. *See category:* S5
Circle (676)

Conquest Sound **7353**
Audio, video wiring. *See categories:* S3, S5
Circle (677)

Consultronics Limited . . . . . **.N.A.**
Audio testing products, **PC3000** stereo audio analyzer. *See category:* S3
Circle (678) See Adv. Index

Continental Electronics **1220**
FM broadcast transmitters, **Transtat** series covering 500W to 70kW power levels; AM radio transmitters.
Circle (679) See Adv. Index

Control Concepts **5246**
Power protection systems, **ISLATRON, ISLATRAN** series. *See category:* S3
Circle (680) See Adv. Index

Convergence **6514**
Videotape editing controllers, including **ECS-185** and **ECS-985** series.
Circle (681)

Corporate Communications **4061**
Video signal color processors.
Circle (682)

Corporate Computer Systems . . . **2123**
Digital audio codecs, **Micro56, MBMicro64** operating at 7.5kHz. *See category:* A4
Circle (683)

Cortana Corporation **7113**
Products preventing or reducing damage from lightning, **Stati-Cat, Radial Chaser.**
Circle (684)

Countryman Associates **5205**
Microphone products.
Circle (685)

Crouse-Hinds CAM-LOK Products . **5560**
Electrical connectors, receptacles; power distribution devices.
Circle (686)

Crouse-Kimzey Company . . . . . **.2000**
Information not provided.
Circle (687)

Crown International . . . . . **.2040**
Audio monitors, measurement products, including **D-75** amplifier and **Model SASS-P.** *See category:* A5
Circle (688) See Adv. Index

Current Technology . . . . . **.7230**
Power line surge, conditioning products.
Circle (689)

Cutting Edge Technologies . . . . **.2007**
Audio processors. *See category:* A2
Circle (690)

Cycle-Sat . . . . . **.7309**
Program, commercial distribution via satellite; signal security products, including **Cyclecypher.** *See category:* S8
Circle (691) See Adv. Index

Data Center Management . . . . . **.7051**
Newsroom automation products, **Version 4.0 software** and **Election Report** system. *See category:* S1
Circle (692)

Data Security . . . . . **.1707**
Erasers, degaussers for audio, video recording media, including **990-0000 TC-14, 910-0001 MP-14.**
Circle (693)

Datatek . . . . . **.5625**
Signal routing switchers, including **D-2400** and **D-2500** series. *See category:* S2
Circle (694) See Adv. Index

Dataworld . . . . . **.1609**
Databases, computational software for AM, FM, TV, LPTV, ITFS, MDS, MMDS, OFS services. *See category:* S7
Circle (695)

dbx/AKG Acoustics . . . . . **.1226**
Audio processing systems. *See category:* A2
Circle (696) See Adv. Index

DEC/Digital Equipment . . . . . **.7231**
Computer hardware.
Circle (697)

Decision . . . . . **.2041**
Business software, **Broadcast System III** management information package for computers using DOS, UNIX operating systems. *See category:* S1
Circle (698)

Dedotec USA . . . . . **.6337**
Lighting fixtures, **Dedolight** series; **Petroff** matte boxes. *See category:* V8
Circle (699)

Delta Electronics . . . . . **.1000**
RF test and radio monitor products, **AM Stereo System** and **Splatter Monitor.**
Circle (700)

DeSisti Lighting/DESMAR . . . . . **.6836**
Studio, portable lighting products.
Circle (702)

DeWolfe Music Library . . . . . **.3023**
Production music libraries.
Circle (703)

DHK Group/Macromedia . . . . . **.7618**
Information not provided.
Circle (704)

Di-Tech . . . . . **.5733**
Signal routers, **Model 5860** AFV switcher, **Model 9002** virtual matrix control *See category:* S2
Circle (705)

DIC Digital . . . . . **.7733**
Recording media, **digital audio, 8mm** videotape materials. *See category:* S6
Circle (706)

Dielectric Communications . . . . . **.5029**
Broadcast transmission line products; TV power and multichannel combiners; TV, FM antennas. *See category:* R1
Circle (707)

Digital Arts . . . . . **.7342**
Video graphics software.
Circle (709)

Digital Audio Labs . . . . . **.1913**
Information not provided.
Circle (710)

Digital Audio Research . . . . . **.1901**
Digital audio workstations, **SoundStation II; Wordfit** dialog synchronization option, optical disk systems. *See category:* A4
Circle (711)

Digital Audio Technologies . . . . **.7814**
R-DAT, analog audio recorders, mixers.
Circle (712)

Digital Dynamics . . . . . **.7648**
Audio production workstation.
Circle (713)

Digital F/X . . . . . **.7035**
Integrated video production systems; off-line editing software.
Circle (714) See Adv. Index

Digital Microwave . . . . . **.7751**
Digital video microwave systems, **DV18** 18GHz, **DV23** 23GHz. *See categories:* R3, R4
Circle (715)

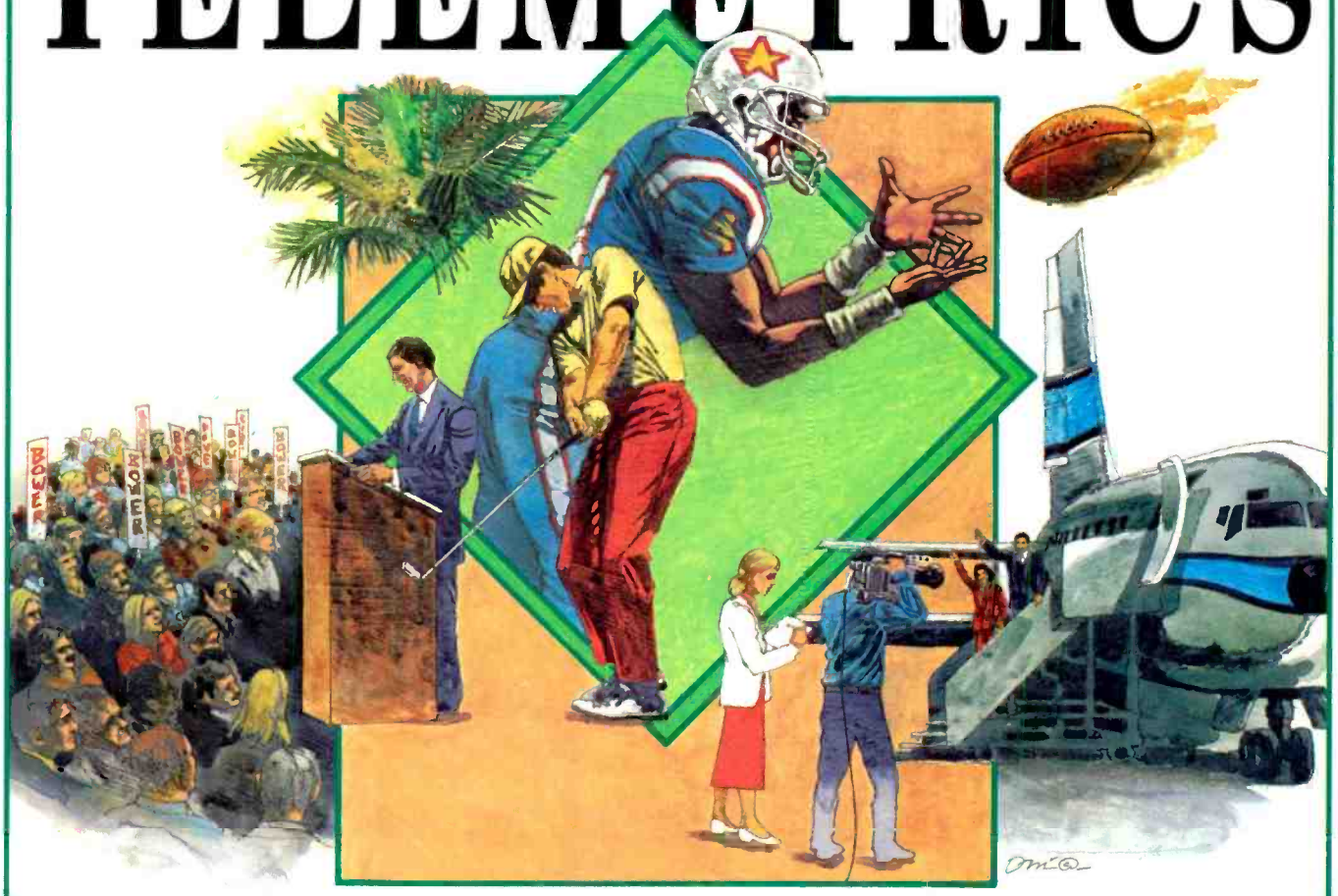
Digital Processing Systems . . . . **.6536**
Video signal processors, **DPS-270** TBC, **DPS-265** frame synchronizer. *See categories:* S2, S3, V3
Circle (716)

Digital Services (DSC) . . . . . **.5545**
Digital video effects **Eclipse 5500.**
Circle (717)

DN Labs . . . . . **.7248**
Stage, studio lighting, including **HMI Par** systems. *See category:* V8
Circle (718)

Dolby Labs . . . . . **.1404**
Audio noise control with *spectral recording,* **363-SR/A** noise reduction, **XPSR** multitrack units. *See category:* A2
Circle (719) See Adv. Index

TELEMETRICS



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Circle (120) on Reply Card

Dorrough Electronics **1604**
Audio processors, signal metering units, **Model 40-A** loudness meter, **Model 1200** stereo signal test set. *See category:* S3
Circle (720)

DSI Communications **5725**
Information not provided.
Circle (721)

Dubner Computer Systems **5301**
Digital graphics, titling systems, **GF-50 Graphics Factory**, **Full Color Turbo** paint for NTSC, D1, D2 signals. *See category:* V4
Circle (722)

Duggan Manufacturing **2222**
Case hardware, including metal corners, handles, hinges.
Circle (723)

DVS Digital Video Systems . . . . .**HDTV**
HDTV equipment.
Circle (724)

Dwight Cavendish **6629**
Videotape duplication systems, **Copymaster 250-5, 500**, duplicator-related products. *See categories:* S2, V2
Circle (725)

DX Communications **2230**
Satellite receivers.
Circle (726)

DYNAIR Electronics **4459**
A-V routers, **DYNASTY**; fiber-optic transmission products. *See categories:* S2, S5
Circle (727) See Adv. Index

Dynatech Corporation **5401**
See: ***Alta Group***
Calaway Editing
da Vinci ColorGraphics
Dynatech ColorGraphics
Dynatech NewStar
Quanta Corporation
Utah Scientific
See Adv. index

Dynatech NewStar **5401**
Newsroom automation systems, **NewStar I**, **NewStar II** with LAN. *See category:* V4
Circle (729) See Adv. index

Eastman Kodak . . . . . .**HDTV**
Motion picture film; HDTV products. *See category:* V6
Circle (730)

Echolab **6116**
Video production switcher and effects products, including **DV-5**. *See category:* V4
Circle (731)

Econco Broadcast Service **1165**
Transmission tubes, devices.
Circle (732)

Ediflex Systems **7045**
Non-linear videotape editing, **Ediflex**.
Circle (733)

Editing Machines Corporation . . . **6303**
Non-linear videotape edit controllers, including **EMC²**. *See category:* V2
Circle (734)

EDX Engineering **7155**
Engineering-oriented software including functions of **RPATH** propagation path analysis, **SHDMAP** area-wide coverage analysis. *See category:* S1
Circle (735)

EEG Enterprises **4559**
VBI data transmission products, **EN270** Smart encoder, **DE132** data recovery decoder. *See category:* S1
Circle (736)

EEV **6400**
RF power devices, **1OT7360** inductive output tube, **KSC3371** energy saving collector klystron for UHF TV; **XQ2070/05** 1" Leddicon for HK357 cameras; **XQ3457** ⅔" mixed field Leddicon for ENG cameras.
Circle (737) See Adv. Index

EG&G/Electro-Optics **1304**
Strobe obstruction **LS-161** medium-intensity beacon, **SS-125** high-intensity light.
Circle (738)

egripment **7810**
Camera support products, **146/147 Piccolo** crane, **124/200** mini jib arm and dolly. *See category:* V1
Circle (739)

Eidophor/SAIC . . . . . **HDTV**
Video projection systems.
Circle (740)

Electro Impulse Laboratory **1113**
RF measurement products, calorimeters; transmitter loads.
Circle (741)

Electro-Voice **1011**
Wireless microphone systems, **Series 600** UHF, **VX-20** camera mountable systems. *See category:* A5
Circle (742) See Adv. Index

Electrohome **5308**
Digital video effects systems, **Jazz** Tempo, **Ensemble** combining switcher, keyer, borders, shadow effects. *See category:* V4
Circle (743)

Electronic Graphics . . . . . .
Video graphics systems.
Circle (744)

Electronic Script Prompting **7635**
Video prompting systems, **Electronic Script Prompting** in V5.0 and Laptop V2.0.
Circle (745)

Electronic Theatre Controls (ETC) .**2362**
Lighting control products.
Circle (746)

Electronics Research **2500**
Antenna products, **COG1084CP** master antenna system **LP-2E-DASP** ½-λ directional low-power antenna. *See category:* R1
Circle (747)

Electrosonic Systems **7822**
Video presentation products, videowall and projection displays. *See category:* V5
Circle (748)

Ellis & Watts **7719**
Facilities, mobile and production vehicle designs, construction.
Circle (749)

Elmech Marketing **7109**
Information not provided.
Circle (750)

EMCEE Broadcast Products **6028**
VHF, VHF, MMDS transmitters, **TTS100MC** multichannel, **TTS10HS** frequency agile MMDS transmitters. *See category:* R1, R3
Circle (751)

Emcor Products **2201**
Modular electronic enclosures and consoles. *See category:* S4
Circle (752) See Adv. index

Energy-Onix **1520**
AM, FM broadcast transmitters, **MK-30** 30kW FM system; **Hindes** audio processors. *See category:* R1
Circle (753)

ENG Mobile Systems **5251**
ENG vehicles.
Circle (754)

Ensemble Designs **7339**
Time base correction system controllers, including **Model TC4000**. *See category:* V3
Circle (755) See Adv. index

Enterprise Electronics **5566**
Weather radar equipment with Doppler technology, **DWSR-90CTV**. *See category:* V4
Circle (756)

Equipment Broker (The) **7654**
Equipment brokerage services.
Circle (757)

ERGO 90/Ergo Industries **7234**
Equipment mounting, rack accessories.
Circle (758)

ESE **4233**
Time-code products, titling products; **ES180** WWV master clock, **ES207** video DA; signal distribution products. *See category:* S2
Circle (759) See Adv. Index

Eventide **1600**
Audio signal processors, **BD1000** digital video delay, **H3000B Ultra-Harmonizer** time compensation; digital audio recording equipment. *See category:* A4
Circle (760)

Evertz Microsystems **2101**
Time code, editing system products, **Model 4015** film footage encoder, **Model 7100** ATR emulator. *See category:* V2
Circle (761)

Excalibur Industries **5151**
Equipment transport cases.
Circle (762)

Fairlight Electric Sound & Picture .**7021**
Audio production workstations, MIDI products.
Circle (763)

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Circle (122) on Reply Card

Faroudja Laboratories . . . **5934, HDTV**
Enhanced NTSC video processing devices, **CTE-SN** encoder, **CTD-3** decoder; line doublers. *See category:* V3
Circle (764) See Adv. index

Farrtronics **6128**
Audio routing, control systems.
Circle (765)

Fast Forward Video **6445**
Time-code generator, reader products, including **Model F30**. *See category:* V2
Circle (766)

Ferno Washington/Salesmaker . . **7226**
A-V production utility carts.
Circle (767)

FGV Panther **7631**
Camera support products, **Super Panther Dolly**, **Lightweight Panther**. *See category:* V1
Circle (768)

Fiberbilt Cases **4563**
Equipment transport products, including **#909** shipping, **#624** carrying cases.
Circle (769)

Fidelipac **1041**
Audio mixers; cartridge recording tape, cart systems, **Dynamax Cobalt** tape cartridges, **Dynamax CTR90**. *See category:* A1
Circle (770)

FirstCom **1062**
Production music libraries, services, including **Digiffects Sound Effects**, **House Library and Software**. *See category:* S8
Circle (771)

Flash Technology **1342**
Tower obstruction lighting, **FTB-205** high- and **FTB-301** medium-intensity beacons.
Circle (772)

FloriCal Systems **6325**
Video cart playback automation, network delay systems.
Circle (773)

Focal Press **7200**
Industry reference books, including **Radio Production** by Keith, **D-2 Digital Video Recorder** by Watkinson. *See category:* S8
Circle (774)

FOR-A **5901**
Video cameras, TBCs, frame synchronizers, signal correction processors; audio, video mixers; video production systems, **VPS-500**; **MF-1000** Multifex 2D digital effects system. *See categories:* A1, V1, V2, V3, V4, V7
Circle (775) See Adv. index

Fort Worth Towers/FWT **1312**
Guyed and self-supporting towers, communications buildings.
Circle (776) See Adv. index

Fosterdene **7815**
Information not provided.
Circle (777)

Fostex **1530**
Audio mixers, **#812/820**; **G16** 16-track analog; R-DAT recorders. *See categories:* A1, A3, A4
Circle (778)

Frezzolini Electronics/PAG . . . . **.5801**
Batteries, accessories, chargers, **MC2** and **SF1** smart chargers. *See category:* V8
Circle (779)

Fries Engineering . . . . . **.7812**
Camera support products, including **Action Tracker** camera stabilizer.
Circle (780)

Fujinon Optics . . . . . **.6713, HDTV**
TV zoom lens systems; pan/tilt heads.
Circle (781) See Adv. Index

Future Productions . . . . . **.4575**
Videocassette duplicator system accessories; camera control products.
Circle (782)

G&M Power Products . . . . . **.6712**
Batteries, chargers; lighting products.
Circle (783)

Garner Industries . . . . . **.3053**
Recording media bulk tape degaussers, erasers, **Model 680**, **Eliminator 4000**.
Circle (784)

GDI/Generic Designs . . . . . **.1042**
Serial-parallel control interfaces.
Circle (785)

GE American Communications . . **.4538**
Satellite services in C-, Ku-band; digital audio, SCPC, network programming, data; broadcast, syndications, SNG, international/ocassional; business video; international.
Circle (786)

GE Lighting . . . . . **.5229**
Lamps, studio, theatrical lighting products. *See category:* V8
Circle (787)

GE Support/RCA Broadcast . . . . **.7535**
GE lamps for stage, studio; support group for RCA broadcast equipment; tech assistance, manuals, training; 24-hour service.
Circle (788) See Adv. Index

Gefen Systems . . . . . **.1405**
Mac-based audio production equipment.
Circle (789)

General Instrument/Videocipher . **HDTV**
Signal security encyption, decryption.
Circle (790)

Gennum/Video-Broadcast . . . . . **.7242**
Video switching ICs, components. *See category:* S3
Circle (791)

Gentner Electronics . . . . . **.2033**
Portable analog, digital telephone hybrids; remote-control products, **VRC-2000** system. *See categories:* A2, A6
Circle (792) See Adv. Index

Geocam . . . . . **.7525**
Camera accessories, **4x4 Universal** matte box, **ENG bracket/handle**. *See category:* V1
Circle (793)

GEPCO International . . . . . **.7802**
Wiring, cable products for audio and video. *See category:* S5
Circle (794) See Adv. index

Getris Images . . . . . **.6322**
Digital graphic products, including the **Venice** system. *See category:* V4
Circle (795)

GML, Inc. . . . . . **.7354**
Post-production audio consoles, moving fader, switching automation, **System 2000**; **series 8000** mic pre-amps, EQ, compressors, limiters. *See category:* A1
Circle (796)

Gorman Redlich . . . . . **.1024**
Antenna monitors; EBS equipment.
Circle (797)

Gotham Audio . . . . . **.1400**
Distributors; **Georg Neumann** products. *See category:* A5
Circle (798)

Graham-Patten Systems . . . . . **.6312**
Edit suite audio mixers, **Series 600**; A-V transmission products with **VAMP** process. *See category:* A1
Circle (799)

Grass Valley Group . . . . . **.5301**
Video production switchers, effects systems, **Kadenza**, **Kaleidoscope**; editors; sync generator, terminal products; fiber-optic products; master control, routing switchers, **Horizon**, **Master 21**. *See categories:* S1, V2, V4, V7
Circle (800) See Adv. Index

Gray Engineering Labs . . . . . **.5848**
Time-code units, **TCA-143** analyzer, **DR-107B** receiver/character source. *See category:* V2
Circle (801) See Adv. Index

Great American Market . . . . . **.5763**
Lighting control systems, color filter products, **ACCESS** controllers, **GamColor** polyester filters.
Circle (802)

Grunder & Associates . . . . . **.3024**
Distributors; **YEM** scan converters, **Video International** standards converters, **Feral** video switchers, signal processors. *See categories:* V3, V7
Circle (803)

GTE Spacenet . . . . . **.2361**
Program satellite-relay services.
Circle (804)

GTE Sylvania Lighting . . . . . **.6001**
Stage, studio lamps.
Circle (805)

H. L. Dalis . . . . . **.6044**
Information not provided.
Circle (806)

Hallikainen & Friends . . . . . **.1121**
Multisite remote control, interface products, **DRC190** multisite controller, **IT-177** Moseley interface. *See categories:* R1, R4
Circle (807)

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Hardigg Industries **7616**
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Circle (808)

Harris Allied Broadcast Equipment **1100**
AM, FM, TV transmitters, **Gates** and **DX** AM series; remote-control systems; audio processors, storage systems; **AKG DSE 7000** audio workstation; satellite communications products; equipment enclosures. *See categories:* A2, R1, R2, R4, S1
Circle (809) See Adv. Index

Harrison by GLW **1440**
Audio production, editing consoles, models **TV-4**, **Pro-790** stereo mixers; audio routing products. *See categories:* A1, S2
Circle (810) See Adv. Index

HDTV Newsletter . . . . . **.HDTV**
Industry publication.
Circle (812)

HEDCO **4009**
A-V routing switchers, **16X series** routers; **Pro-Bel** digital routers. *See category:* S2
Circle (813) See Adv. Index

Hi-Tech Furnishings **2127**
Studio furniture.
Circle (814)

Hipotronics **1125**
AC power, control products, **Peschel** line of automatic voltage regulators, variable transformers.
Circle (815) See Adv. Index

Hit Design **2223**
Audio signal control systems, **Tailor** dynamics processor, **SMO-900** stereo modulation optimizer.
Circle (816)

Hitachi Denshi . . . . . **5001, HDTV**
Studio, ENG, HDTV video cameras, **Z-ONE** 3-CCD; **VL-S100** S-VHS recorder; HDTV digital video recorders, projection systems. *See categories:* V1, V2
Circle (817) See Adv. Index

HLC/Killer Music **1526**
Production music libraries. *See category:* S8
Circle (818)

Holaday Industries **1449**
Radiation measurement, survey products.
Circle (819)

Hollywood Rentals/Matthews . . . **7056**
Production, generator trucks.
Circle (820)

Hoodman **2002**
Attach, detachable monitor, viewfinder hoods, glare protection.
Circle (821)

Horita **7541**
Time-code generators, readers.
Circle (822)

Hotronic **5209**
TBCs, synchronizers; solid-state video recorders.
Circle (823)

Hughes Communications . . . . . **.2063**
Satellite communications products.
Circle (824)

Hughey & Phillips . . . . . **.1817**
Tower lighting, guying accessories.
Circle (825)

IBM . . . . . **.2026**
Micro, mini, mainframe computers; specialized software.
Circle (826)

IBSS Canada . . . . . **.7409**
Information not provided.
Circle (827)

IDB Communications . . . . . **.7417**
Satellite programing services.
Circle (828)

I•DEN Videotronics . . . . . **.7655**
TBC, synchronizers, videowall controllers. *See categories:* V3, V5
Circle (829)

IDS/SAIC . . . . . **.7209, HDTV**
Facilities design; **Eidophor** video projectors.
Circle (830)

IGM Communications . . . . . **.1006**
Audio program automation control systems **SC/MC/EC**, multiple cartridge playback systems **Instacart** and **GoCart 24**.
Circle (831)

Ikegami Electronics . . . . **.5257, HDTV**
Video cameras, 3-chip **HK-355** FIT, **HK-353** IT for studio; video monitors; high-resolution projectors; satellite communications codec products *See category:* V1
Circle (832) See Adv. Index

ILC/Daymax . . . . . **.7015**
Stage, studio lamps.
Circle (833)

Image Devices . . . . . **.7741**
Information not provided.
Circle (834)

Image Video . . . . . **.5906**
Signal routers, **Model 9600** high density, **Model 9520/21** 20x10 A-V routing switchers. *See category:* S2
Circle (835)

IMC/International Music Corp. . . . **.7031**
Signal distribution products; automated equipment; digital sampling, recorders, **S1000 series**, **ADAM** digital multitrack recorders. *See category:* A4
Circle (836)

Industrial Acoustic/IAC . . . . . **.7101**
Announcer booths, acoustical products.
Circle (837)

Innotech Systems . . . . . **.5438**
Audio mixers, level meters; stereo source selectors; distribution products. *See categories:* A1, S2, S3
Circle (838)

Innovision Optics . . . . . **.7639**
Special purpose optics for animation; **Mini-Mover** portable motion control tables. *See category:* V1
Circle (839)

Inovonics . . . . . **.1700**
Audio signal processors, **Model 250**; on-screen audio level displays; **JNS Electronics** distribution products. *See category:* R2
Circle (840)

Intelligent Resources . . . . . **.7452**
PC-based video effects, graphics, titling equipment. *See category:* V4
Circle (841)

Intelliprompt . . . . . **.7615**
Video prompting products.
Circle (842)

Intelvideo . . . . . **.7436**
Video encoders, pre-coders, **Model IV-5** with enhancement, correction; **Model IV-4** digital NTSC decoder. *See category:* V3
Circle (843)

Interactive Motion Control/IMC . . **6029**
Computer-based, camera support, animation motion controller **Model 3025**.
Circle (844)

International Tapetronics/ITC . . . **7749**
Audio cart recorders, reproducers, **ITC Series 1**; **Audio Switcher** distribution products.
Circle (845) See Adv. Index

Intraplex . . . . . **.7632**
Digital audio transmission systems, including the **PT/PR-150** stereo, dual 15kHz, 7.5kHz program modules. *See category:* S1
Circle (846) See Adv. Index

IRIS Technologies . . . . . **.7011**
Machine, equipment remote control, signal routing systems, **MX 3200VLR** A-V switcher. *See categories:* S1, S2
Circle (847)

ISS Engineering . . . . . **.7551**
Satellite receivers; demod; TV modulators.
Circle (848)

ITELCO spa . . . . . **.6839**
FM, TV transmission equipment.
Circle (849)

ITS/Information Transmission . . . **6833**
UHF TV, wireless cable transmitters, **ITS-230A**; **ITS-20A** exciter, modulator retrofit. *See category:* R1
Circle (850)

J-Lab . . . . . **.6901**
Video product interface accessories.
Circle (851)

Jampro Antennas . . . . . **.1200**
FM, TV broadcast transmitting antennas, **JHPC** improved penetrator, **JSM** UHF slot design. *See category:* R1
Circle (852) See Adv. Index

JBL Professional . . . . . **.1434**
Audio monitoring systems, **Control Series** and **4400 Series** series studio monitor loudspeakers. *See category:* A5
Circle (853)

ANOTHER BURLE POWER TUBE HAPPY BIRTHDAY!

A BURLE power tube at WNCT in Greenville, North Carolina recently passed a major milestone by celebrating its *90,000*th operating hour. Quite an accomplishment, and we're proud of it.

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Of course, operating life is affected by tube usage and care (the folks at WNCT have *another* BURLE power tube that's recently passed the 68,000-hour mark, so they're obviously doing something right).

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BURLE Electron Tubes, 1000 New Holland Avenue, Lancaster, PA 17601-5688.

Circle (123) on Reply Card

Jefferson Pilot Data (JDS) **3058**
Broadcast business, traffic automation.
Circle (854)

JEM-FAB **7018**
Facilities design, engineering services; **D-Patch** self-normaling data patch panels. *See category:* S2
Circle (855) See Adv. Index

Jensen Tools **1014**
Specialized tools for technicians; tool kits.
Circle (856)

Jonathan Manufacturing Corp. . . **7141**
Information not provided.
Circle (857)

JVC **5327**
Cameras, **KY-35U, KY-90U**; recorders, **BR-S811U** S-VHS, monitors, switchers, editors; audio mixers. *See categories:* V1, V2, V4
Circle (858) See Adv. Index

K&H Products **5953**
Camera supports; equipment cases, nylon soft-shell designs. *See category:* S4
Circle (859) See Adv. Index

Kahn Communications **1005**
AM stereo system; telephone bandwidth extenders; audio transmission processors.
Circle (860)

Kalamazoo Technical Furniture . . **2111**
Broadcast studio furniture.
Circle (861)

Kangaroo Video Products . . . . . **N.A.**
Equipment transport cases, products.
Circle (862)

Karl Heitz **3019**
Support products for cameras, lighting, other equipment from **Gitzo**, tripods; mic fishpoles. *See category:* V1
Circle (863)

Kavouras **6815**
Weather graphics, lightning displays.
Circle (864)

Kay Industries **1310**
Power conversion products.
Circle (865)

Keltec Florida **7125**
Satellite communication uplink products, including **Series H40, R60**.
Circle (866)

Keystone Communications **2163**
Program distribution service via satellite, microwave, fiber optics.
Circle (867)

Kings Electronics **5338**
RF, video connectors, tools.
Circle (868) See Adv. Index

Kintronic Laboratories **2229**
RF power measurement devices; AM directional antenna phasing, matching products; AM dummy loads. *See categories:* R1, S3
Circle (869)

Klark Teknik **1919**
DDA, Midas mixers; audio dynamics processors, noise gates, delays systems. *See categories:* A1, A4
Circle (870)

Kline Towers **7621**
Design, fabrication, construction of guyed, self-supporting, platform, multi-array towers; space frame, custom antenna structures; tower engineering, inspection, maintenance services.
Circle (871)

Knowledge Industry Publications . **7820**
Industry reference publications.
Circle (872)

Knox Video/GML Grove **6321**
Video titling equipment, **K40 Microfont**. *See category:* V4
Circle (873)

L. E. Nelson Sales **5548**
Theatrical, studio lighting products, **Thorn-EMI** lamps and **CMC** color filters.
Circle (874)

L. Greenberg Electronic Prompting **7014**
Video prompters, **LG 300** camera systems. *See category:* V4
Circle (875)

Laird Telemedia **2027**
Videographics, titlers, **Legend** series, **CG-7000**; video keyers. *See categories:* V3, V4
Circle (876)

Landy Associates **5157**
Distributor.
Circle (877)

Laserdub **7343**
Optical disk production services.
Circle (878)

LDL Communications/Larcan . . . **4647**
Solid-state **Larcan VHF and CCIR** TV transmitters, **Alan Dick** antenna systems for VHF, UHF. *See category:* R1
Circle (879)

LEA Dynatech **5401**
Products reducing lightning, static electricity effects.
Circle (880)

Leader Instruments **6716**
Composite, component test products, **Model 425** component signal source; **5130** NTSC color monitor. *See category:* S3
Circle (881) See Adv. Index

Lectrosonics **7519**
Wireless microphone products.
Circle (882)

Leightronix **7644**
Event controllers, TCD-RT, mini T-IR. *See category:* S1, V2.
Circle (536)

Leitch Video **4009**
HEDCO, Pro-Bel signal distribution products; sync, test signal generators; signal security systems; image archive **DSF-3100 StillFile**; frame synchronizers; clock/timer products. *See categories:* S1, S2, S3, V2, V3
Circle (883) See Adv. Index

LEMO USA . . . . . **.4059**
Audio, video connectors.
Circle (884)

Leonetti Company . . . . . **.7117**
Studio lighting, **Sunray 1200W, 575W** Par HMI instruments; cine camera utilities. *See categories:* V6, V8
Circle (885)

Lexicon . . . . . **.3038**
Audio effects, delay processors, **480L**; audio production systems; time modification, compensation products, **#2400**. *See categories:* A2, A4
Circle (886) See Adv. Index

Lighting Methods (ETC) . . . . . **.2362**
Lighting control products.
Circle (887)

Lightning Eliminators & Consultants 4262
Products to reduce and prevent damage from lightning, **Dissipation Arrays** and **Spline Ball Ionizer**.
Circle (888)

Lindsay Specialty Products . . . . **.7149**
VHF, FM, UHF transmitting antenna systems; RF power dividers.
Circle (889)

Lipsner-Smith . . . . . **.3100**
Film maintenance, cleaning, inspection systems, workstations. *See category:* S6
Circle (890)

Listec Video . . . . . **.4558**
Studio and field prompting systems, **A-5000 series** display. *See category:* V4
Circle (891)

LNR Communications . . . . . **.7208**
Satellite uplink electronics, **DAVSAT** digital earth station, **LVE-14** video exciters. *See category:* R4
Circle (892) See Adv. Index

Logitek . . . . . **.1540**
Audio mixers, monitor, metering products, **Bright-VU** meter, **TR2** compact audio console. *See category:* A1
Circle (893) See Adv. Index

Louis Hurtubise . . . . . **.7143**
Foreign language translation and narration services.
Circle (894)

Louth Systems . . . . . **.6030**
Automated newsroom products, **NewsTrak** and **Auto-Screen**. *See category:* S1
Circle (895)

Lowel-Light . . . . . **.5844**
Studio, outdoor lighting equipment, **V.P.** system and **Light Arrays**; lighting kits. *See category:* V8
Circle (896)

LPB **1049**
Broadcast, production mixers; low-power AM transmitters.
Circle (897)

LTM Corp. of America **6436**
Lighting products, accessories.
Circle (898)

Lucasey Manufacturing **7737**
Luggage, equipment case hardware.
Circle (899)

Lyon Lamb Video Animation . . . **7243**
Video processing and animation products, **RTC** real time scan converter, **MiniVAS** animation controller. *See category:* V3
Circle (900)

M&R Data Services **7440**
Automation software.
Circle (901)

Macrovision **7717**
Videotape non-duplication product.
Circle (902)

Magni Systems **7201**
Video test, monitoring products, **Series 500** waveform, vector monitors; **Signal Creator** signal generator. *See category:* S3
Circle (903) See Adv. Index

Magnum Tower **1348**
Tower products manufactured for radio, TV, microwave applications.
Circle (904)

Manhattan Production Music . . . **.2113**
Music, sound effects libraries.
Circle (905)

Marconi Comm. Systems . . . . . **N.A.**
Radio, TV, satellite transmission products; video processing equipment.
Circle (906)

Mark Antennas/Radiation Systems **.2062**
Microwave, satellite antennas.
Circle (907) See Adv. Index

Marti Electronics . . . . . **.1034**
RPU, STL systems, **RPT-30** remote broadcast transmitter; **STL-10** SCPC STL.
Circle (908)

Matco Mfg & Test . . . . . **.6030**
Automated, programmable VCR playback systems, including model **MA-201**.
Circle (909)

Matthews Studio Equipment . . . . **.4349**
Full service, support company for film, video production; grip equipment; camera support products; generator trucks; rental programs. *See category:* V1
Circle (910)

Maxell Corporation of America . . **.5923**
Recording media.
Circle (911)

Maze Broadcast . . . . . **.6927**
Used equipment broker.
Circle (912)

MCL . . . . . **Outside**
Satellite communications TWT-design power amplifiers, **# 10999** for Ku-band, **# 10961** for C-band. *See category:* R4
Circle (914) See Adv. Index

Media Computing . . . . . **.5946**
Newsroom automation **T.E.N.**; PC-based **PROtec** remote control system.
Circle (915)

Media Concepts . . . . . **.7339**
Mobile video production vehicles.
Circle (916)

Media Touch Systems . . . . . **.7641**
Radio automation system **OmniPLAY** with touch screen user interface.
Circle (917)

Meret Optical Comm. . . . . . **HDTV**
Fiber-optics communication links, suitable for HDTV signal transmission.
Circle (918)

Merlin Engineering Works **3001**
VTR retrofit packages; automation systems.
Circle (919) See Adv. Index

Metro Lab Center . . . . . **.6224**
Information not provided.
Circle (920)

Micro Communications . . . . . **.5432**
RF combiners, transmission line products; waveguide impedance tuners; calorimeters.
Circle (921) See Adv. Index

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Circle (136) on Reply Card

Microdyne 6448
Satellite-related electronics, antennas.
Circle (922)

Micron Audio Products 6337
Wireless microphones **TX501**, **MR510** and **MDS2** multichannel diversity systems. *See category:* A5
Circle (923)

Micron Tool & Manufacturing . . . 7335
Information not provided.
Circle (924)

MicroNet . . . . . .
Information not provided.
Circle (925)

Microsonics 6704
Information not provided.
Circle (926)

Microtime 5633
Video signal correctors, **FS-8**, **-10** synchronizers, **Tx** series TBCs, S-scrambler frame synchronizers. *See category:* V4
Circle (927)

Microwave Networks 7641
Microwave radio systems, **MicroNet 18, 23**. *See category:* R3
Circle (929) See Adv. Index

Microwave Radio 3000
Terrestrial microwave products, **FLR direct modulation** microwave, **ProStar 13T1** portable 12/13GHz transmitter. *See category:* R3
Circle (930)

Midwest Communications 6536
Distributor; **Digital Processing Systems** TBCs, video processors; **Townsend** transmitter products; vehicular facilities, **M40** video production unit, **S23** satellite communications system. *See categories:* R1, V4
Circle (931) See Adv. index

Miller Fluid Heads (USA) 6801
Camera support, tripods, pan-tilt heads, **System 30** and **System 80**. *See category:* V1
Circle (932) See Adv. index

Minolta 5852
Light metering products.
Circle (933)

Miralite Communications 3025
Satellite antennas.
Circle (934)

Miranda Technologies 6348
Signal distribution products, **SEL-511-XD1** series D1 signal selector switchers. *See category:* S2
Circle (935)

Mitsubishi Electric Sales . . 4017, HDTV
Video displays, recorders, **AM-3501R** Diamond Scan monitors and **BV-1000** S-VHS VCR; video printers. *See category:* V5
Circle (936)

3M Pro A/V 4501
Audio, video recording media, **480xst** master broadcast tape, **PB series** Betacam, Betacam SP videocassettes. *See category:* S6
Circle (937) See Adv. index

Mobile-Cam Products 7651
ENG news vehicles, **Modular One**.
Circle (938)

Modulation Sciences 2400
Audio processors, **StereoMaxx** image enhancer; RF products, **Sidekick** SCA generator. *See category:* R2
Circle (939)

Mohawk Wire & Cable 7523
Audio, video, camera cables.
Circle (940) See Adv. Index

Mole-Richardson 3018
Stage, studio lighting products.
Circle (941)

Montage Group 7611
Non-linear editing systems. *See category:* V2
Circle (942)

Moseley Associates 1210
Transmitter control systems, **MRC 2**; STL systems, **RPL 4000**. *See categories:* R1, R3
Circle (943)

Motorola C-Quam/AM Stereo 1048
AM stereo equipment, modulation monitors.
Circle (944)

MSE Video Tape Services 7622
Videotape products.
Circle (945)

MZB/Gray 5815
Distributor; audio, video production systems; display products. *See category:* V5
Circle (947)

Nady Systems 6412
Wireless microphone systems.
Circle (948)

Nagra 5719
Portable, studio audio recorders.
Circle (949)

Nalpak Video Sales 5527
Equipment transport products, **TuffPak** tripod cases; **Accu-Chart** test charts. *See category:* S4
Circle (950)

National Photonics 7436
Fiber-optic remote camera control systems.
Circle (951)

Nationwide Tower Company 7638
Guyed towers. *See category:* R1
Circle (952)

Nautel 2207
Solid-state AM, FM transmitters, **AMPFET ND series**. *See category:* R1
Circle (953) See Adv. index

NEC Technologies 4449
Display products, **VUES** editing systems.
Circle (954)

Nemal Electronics International . .1451
Wire, cable, connector products, **1570** precision video, **SN series** audio snake cables. *See category:* S5
Circle (955) See Adv. Index

Neotek 7531
Audio consoles.
Circle (956)

NESBIT Systems 4139
Videotape library system software.
Circle (957) See Adv. Index

Network Music 1410
Production music libraries.
Circle (958)

Neutrik USA 2107
Audio connectors; audio system measurement sets, **TT402A**. *See categories:* S3, S5
Circle (959) See Adv. Index

Neve 1248
Audio production consoles, **66 series** stereo TV systems, **VRP** post production automated mixer; also *Orion* and *AMS* products. *See categories:* A1, A5
Circle (960) See Adv. Index

New England Digital 4601
Digital audio recording and music products, **Synclavier**, **PostPro SD**. *See category:* A4
Circle (961)

NewsMaker Systems 7050
PC/Novell-based **NewsMaker** electronic newsroom; script editor, rundown management, wire service, archival, E-mail. *See category:* S1
Circle (962)

NewTek 7301
Video production, effects, switching system, **Video Toaster**.
Circle (963)

NHK . . . . . HDTV
HDTV system information.
Circle (964)

Nikon Electronic Imaging . . 6455, HDTV
Video camera lenses; video printers.
Circle (965) See Adv. Index

Norpak 6021
Teletext, data broadcasting equipment, **TDS3** head-end system, **TTX650** receiver. *See category:* S1
Circle (966)

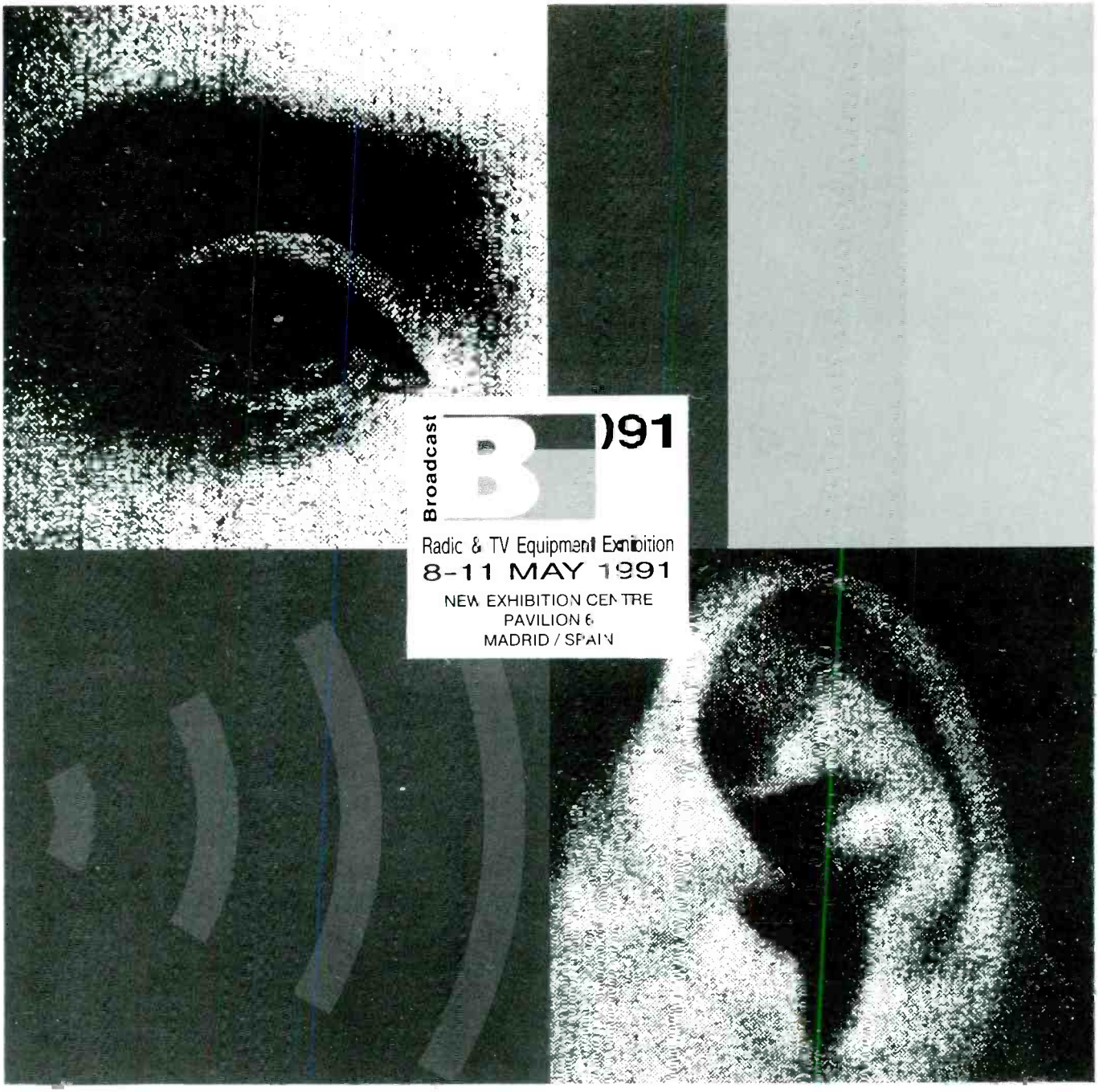
Nova Systems 2051
TBC, framestore products, **NOVA 502 EFP-TBC**, **NOVASync**. *See category:* V3
Circle (967) See Adv. Index

NPR Satellite Services 7135
Radio program distribution.
Circle (968)

NTV/Nippon TV Int'l . . . . . HDTV
HDTV system information.
Circle (969)

NUCOMM 4001
STL microwave products, **Nurad series 3**, **HS series** systems; ENG links, central receivers. *See category:* R3
Circle (971)

Numark Electronics 1123
Audio, video production equipment.
Circle (972)



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Circle (198) on Fast Facts Card

nVision . . . . . .N.A.
Audio processing, conversion products, **NV2000** high-definition audio system. *See category:* A2
Circle (973)

Nytone Electronics 6451
Flying spot video scanners.
Circle (974)

O'Connor Engineering Labs 4139
Fluid heads, tripods and other support products for film, video cameras. *See category:* V1
Circle (975)

Odetics Broadcast 4039
Video playback automation products, **TCS-2000** video cart machine, **XR 800** external VTR controller. *See category:* S1
Circle (976) See Adv. Index

OKI Electric Industry 6633
Standards converters, **Model LT1250TSC**.
Circle (977) See Adv. Index

Olesen 5825
Stage, studio lighting products.
Circle (978)

Omicron Video 2501
Routing, distribution products, **200 series** video DAs; **Model 700** Amiga gen-lock system. *See category:* S2
Circle (979) See Adv. Index

Omnimusic 2505
Production, program music libraries.
Circle (980)

Optical Disc 7317
Optical recording products.
Circle (982)

Optima Enclosures 7547
Equipment racks, consoles.
Circle (983)

Orban/div AKG Acoustics 1226
Audio processors **Optimod** systems..
Circle (984) See Adv. Index

Osram/Siemens 7001
Stage, studio lamps.
Circle (985)

Otari 1801
Audio analog, digital recorders; audio consoles; duplication systems.
Circle (986)

Pacific Radio Electronics 7355
Distributor, audio, RF products.
Circle (987)

Pacific Recorders/Engineering . . 1134
Audio mixing consoles, **STX Stereo** TV system; audio cartridge machines, **Micromax**. *See categories:* A1, S2
Circle (988) See Adv. Index

Paco Electronics USA 6025
Batteries, chargers.
Circle (989)

Paltex 6514
Videotape editing controllers, **E-series** and **Abner A/B-roll** systems. Digital video mixer/keyer systems, **DYAD**^{2}; tape degaussers. *See categories:* V2, V4
Circle (991)

Panasonic . . . . . .4513, HDTV
Video cameras, camcorders, ½" analog, digital recorders; cassette automation, library management systems. *See categories:* A1, S1, V1, V2, V5
Circle (993) See Adv. index

Patch Bay Designation 6609
Patch panel accessories.
Circle (994)

Peerless Sales 6007
Special purpose mounting products, **1480-000** yoke and **6WB-000** slim-line mounts. *See category:* S4
Circle (995)

Penny & Giles 1453
Audio faders; patchbay connectors.
Circle (996)

PEP 4300
Batteries, chargers; lighting products.
Circle (997)

Perrott Engineering Labs 5328
Batteries, chargers; lighting products.
Circle (998)

PESA America 6016
Signal routers, **System5**; **TB 8000** matrix talkback system; titlers; monitors; test generators. *See categories:* S2, S3, V4, V5
Circle (999) See Adv. Index

Philips Components 4254
RF power products **YK 1285** depressed collector klystrons; camera pickup tubes, **XQ 3500** HDTV tube. *See category:* R1
Circle (1000) See Adv. Index

Philips Lighting 7250
Stage, studio lamps.
Circle (1001)

Philips Test & Measurement/BTC . .5324
Video test signal and pulse signal generators. *See category:* S3
Circle (1002)

Pinnacle Systems 7217
Video production systems with graphics, still-store, effects capabilities, such as **Prizm 3D** workstations.
Circle (1004)

PIVOTELLI/USA 1604
Equipment mounting products, **Double** and **Triple** Pivotelli wall mounts.
Circle (1005)

Potomac Instruments 1015
RF measurement products.
Circle (1007)

Practel Sales International 7721
Information not provided.
Circle (1008)

Premier Metal Products 7634
Equipment enclosures.
Circle (1009)

Prime Image 7745
Timebase correctors, video processors, **Model 800 HR600+**; video switchers, **Model 400 Clean Cut/EFX**. *See category:* V3
Circle (1010) See Adv. Index

Pro Battery 6124
Rechargeable batteries, battery pack replacement cells; charger systems.
Circle (1011)

Production Garden Library 1115
Production music, effects libraries. *See category:* S8
Circle (1012)

Professional Design Products 7055
Information not provided.
Circle (1013)

Profit Plus Software 7555
Business software packages.
Circle (1014)

Progressive Image Technology . . .7455
Computer-to-video scan converters.
Circle (1015)

Promusic 2220
Music libraries.
Circle (1016)

Q-TV 4139
Talent prompting systems, **QCP Computer-Prompter** software, **On Camera** prompters.
Circle (1017) See Adv. Index

QEI 1035
FM transmitters, remote-controls.
Circle (1018)

QSI Systems 5845
Video VBI products, **Model 2048** message generator, **Model 2440** colorbar/multiple ID generator. *See categories:* R2, V4
Circle (1019)

Quality Video Supply 5958
Distributor.
Circle (1020)

Quanta 5401
Videographic titling products, **Orion** and **Delta** systems. *See category:* V4
Circle (1021) See Adv. Index

Quantel . . . . . .6500, HDTV
Standards converters, video processors; video effects equipment; **Picturebox** still-store; **Harriet** dynamic graphics system. *See categories:* V2
Circle (1022) See Adv. index

Quickset 5426
Tripods, pan/tilt heads.
Circle (1023)

R-Columbia Products 2701
Headphones; wired, wireless intercoms, intercom interfacing. *See category:* A5
Circle (1024)

Radiation Systems/RSI 2062
Earth station systems, **240AT transportable** and controllers, **series 5000** system. *See category:* R4
Circle (1025) See Adv. index

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Radio Computing Services **7511**
Radio business, programming software.
Circle (1026)

Radio Design Labs **7813**
Utility audio amplifiers, **Stick-On** modules; NRSC-AM compliance systems. *See categories:* A5, R2
Circle (1027)

Radio Systems **1462**
LPAM transmitters, audio mixers.
Circle (1028)

RAM Broadcast **1362**
Distributor of video cameras, recorders, battery and lighting products; studio furniture, racks; microphones, remote operation products; audio mixers, **SX series** console; distribution products, **R1S-10R** audio router. *See category:* A1
Circle (1029)

Rampart Cases **7151**
Equipment transport containers meeting ATA specifications, **Defender** series cases.
Circle (1030)

Ramsa Audio/Panasonic **4513**
R-DAT audio recorders, **SV-3700**, **SV-3900**. *See category:* A4
Circle (1031) See Adv. Index

Rank Cintel **4249**
Telecine systems, **URSA** and **Turbo**.
Circle (1032) See Adv. Index

Reach Electronics **5935**
Paging system hardware.
Circle (1033)

Rees Associates **5215**
Architectural, facilities design services.
Circle (1034)

Register Data Systems **1300**
Sales, traffic, billing, accounting software for radio/TV broadcast, **Traffic Master I, II, III** packages. *See category:* S1
Circle (1035)

Research Technology Int'l/RTI . . **3100**
Videotape maintenance products, **VT Tape-Chek** evaluators/cleaners, **D11** dropout counters. *See category:* S6
Circle (1036)

RF Technology **5833**
Microwave products, **RFL** fixed link, **UPL** ultra portable units; microwave link video color correction processors. *See categories:* R3, S3
Circle (1037)

Richardson Electronics **4565**
Power grid tubes, rectifiers for AM, FM, TV, SW; grid tubes, planar triodes for UHF translators, transmitters. *See category:* R1
Circle (1038)

Rockwell International **5914**
Terrestrial microwave, STL electronics.
Circle (1040)

ROH/Portland **1439**
Audio monitoring products, **series 190** audio monitor with switcher; **300 series** broadcast intercom. *See category:* A5
Circle (1041)

Rohde & Schwarz . . . . . **.4101**
Video, TV test products, **EMFT** TV test demod, **SGMF** test generator; RDS system products; video signal analyzers.
Circle (1042) See Adv. Index

ROHN . . . . . **.1819**
Communications towers; fiberglass, concrete equipment shelters.
Circle (1043)

Rosco Laboratories . . . . . **.5739**
Color lighting filter materials; studio draperies; special purpose video paints.
Circle (1044)

Ross Video . . . . . **.5707**
Video production switchers, **Models RVS 216A, RBS 416**.
Circle (1045) See Adv. Index

RRN . . . . . **.1040**
Radio station promotions.
Circle (1046)

Sachtler . . . . . **.6701**
Camera support products, **System 80 II** and **270DB** lighting series. *See category:* V1
Circle (1048) See Adv. Index

Saki Magnetics . . . . . **.1461**
Replacement recording heads.
Circle (1049) See Adv. Index

Samson Technologies . . . . . **.2001**
Wireless microphone systems.
Circle (1050)

San Francisco Satellite . . . . . **.2600**
Ku-/C-band satellite services; 24-hour teleport; interlink with Intelsat, Pac Bell, AT&T, numerous terrestrial microwave sites.
Circle (1051)

Sanken/Audio Intervisual Design . **.7604**
Microphones.
Circle (1052)

Sanyo Electric/Sales . . . . . **.HDTV**
HDTV products.
Circle (1053)

Scala Electronic . . . . . **.4161**
FM, STL antennas.
Circle (1054)

Schafer World Communications . **.1028**
Automated CD players.
Circle (1055)

Schmid Telecommunication . . . . **.2004**
Audio test, measurement products, **SIAT** short interval audio test system. *See category:* S3
Circle (1056) See Adv. Index

Schwem Technology . . . . . **.5941**
Imaging stabilizers, **model GX-3** and **Gyrozoom FP-1** stabilizing lens.
Circle (1057)

Scientific Atlanta . . . . . **.3010**
Satellite antennas, communications electronics, **7530A** video receiver, **7670** earth station controller; signal security encoding equipment. *See category:* R4
Circle (1058)

Selco/Sifam . . . . . **.1506**
Replacement components, **collet knobs** and **VU, PPM meters**.
Circle (1059)

Sennheiser Electric . . . . . **.2100**
Wireless microphones, **WM-1 wireless mixer** for ENG/EFP; **MKH 60 P48** shotgun mic for ENG/EFP; dynamic, condenser microphones. *See category:* A5
Circle (1060) See Adv. Index

SESCOM . . . . . **.4308**
Utility audio and test products, **SB-1 Mk II** stereo balance box, **MB-2** field news bridge. *See categories:* A5, S3
Circle (1061)

Shereff Systems . . . . . **.7454**
Video production software, **Pro Video Post**. *See category:* V4
Circle (1062)

Shively Labs . . . . . **.1234**
FM broadcast antennas, combining networks. *See category:* R1
Circle (1063)

Shook Electronics USA . . . . . **.A220**
Mobile TV production vehicles, **MOD-8-63-102"**. *See category:* S7
Circle (1064)

Shure Brothers . . . . . **.1414**
Stereo audio products, **Model VP88** MS stereo mic; **FP32** stereo audio mixer. *See categories:* A1, A5
Circle (1065) See Adv. Index

Siemens Components . . . . . **.7020**
Transmitter power tubes, devices.
Circle (1066)

Sierra Automated Systems **1362**
Audio signal routing, mixing switchers, **Series SAS 3000**. *See categories:* A1, S2
Circle (1067) See Adv. Index

Sierra Video Systems . . . . . **.7121**
Video signal A/D, D/A products; signal router products, **Series 32**, with serial control networks. *See category:* S2
Circle (1068) See Adv. Index

Sigma Electronics . . . . . **.4577**
Video test, sync products **Series 400** family; **Series 2100** signal distribution amplifiers; video decoders, encoders; video ID generators. *See categories:* S2, S3, V3
Circle (1069)

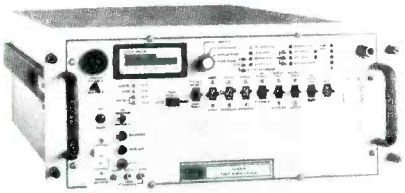
Signature Music Library . . . . . **.7030**
Production music libraries, multivolume sets on CD, for A-V, video production, broadcast. *See category:* S8
Circle (1070)

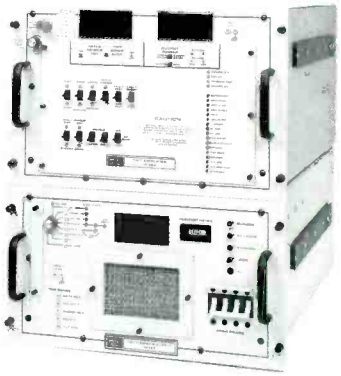
Sinar Bron . . . . . **.7016**
Lighting, photographic products.
Circle (1071)

Singer Products . . . . . **.1603**
RF transmission products **RF Dynamics**

12

Reasons To Specify MCL C-Band, Ku-Band and DBS High Power TWT Amplifier Systems.





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Circle (137) on Reply Card

F510, F550 FM transmitters.
Circle (1072)

Sira Sistemi Radio s.r.l. **1918**
TV panel antennas, **3VTV-02, UTV-01**, for HDTV, multichannel. *See category:* R1
Circle (1073)

SISCOM Satellite Information . . . . . .
Newsroom products, **NewsPro, NPrompter**. *See category:* S1
Circle (1074)

Skotel **6348**
Time-code products, **TCG series** reader, generator, character inserters, **TCT** VITC-LTC translators.
Circle (1075)

Snell & Wilcox **7548**
Standards conversion systems; film-to-tape correction systems.
Circle (1076) See Adv. index

Solid State Logic **1426**
Audio mixers, digital workstations, **Screen-Sound**; **apt-X** processors. *See category:* A4
Circle (1077)

Solutec **5959**
Playback automation systems; utility signal measurement packages.
Circle (1078)

Sonic Solutions **7717**
HDTV information.
Circle (1079)

Sony . . . . . **.4401, HDTV**
Video cameras, **BVW** and **Hi8** recorders, **BVM 1910** series monitors; production switchers; video effects systems; HDTV products; playback automation, library management systems; audio consoles, recorders, signal routers; satellite receivers. *See categories:* A5, R4, S1, S2, V1, V2, V5, V3
Circle (1081) See Adv. index

Sound Ideas . . . . . **.4227**
Program, production music; sound effects.
Circle (1082)

Sound Technology . . . . . **.1001**
Audio system test equipment, **ST 3000** series transmission/audio, **RTA-4000** real time audio/program analyzers.
Circle (1083) See Adv. index

Soundcraft/USA . . . . . **.1434**
Audio production, on-air, editing consoles, **SAC 200, 200 B/VE** audio-for-video console.
Circle (1084)

Soundmaster International . . . . **.7430**
Digital audio workstations with **Librarian, Supervisor, Cueprinter** software features.
Circle (1085)

Spectra Image/Spectra Systems . . **.7249**
Optical disk systems.
Circle (1086)

Sprague Magnetics . . . . . **.1407**
Recording heads, relapping.
Circle (1087)

Stainless/SG Communications . . . **1548**
Towers, services.
Circle (1088)

Standard Communication . . . . . **.7711**
Satellite communications products, **Agile Omni Pro** and **Broadcast** satellite TV receivers. *See category:* R4
Circle (1089) See Adv. Index

Stanton Magnetics . . . . . **.1016**
Headphones, phono cartridges.
Circle (1090)

Stanton-Video Services Unlimited . **.7448**
Camera support systems, cranes.
Circle (1091)

Stantron Unit . . . . . **.6601**
Equipment cabinets, racks, consoles.
Circle (1092)

Star Case . . . . . **.2703**
Equipment cases.
Circle (1093)

Steadi-Film (VTA/Atlanta) . . . . . **.2026**
Telecine add-ons, utility products.
Circle (1094)

Steenbeck . . . . . **.6418**
Film editing, transfer products, **ST-921 Super** 16mm 8-plate unit, **ST-721V** 35mm CinemaScope file to video transfer system. *See category:* V6
Circle (1095)

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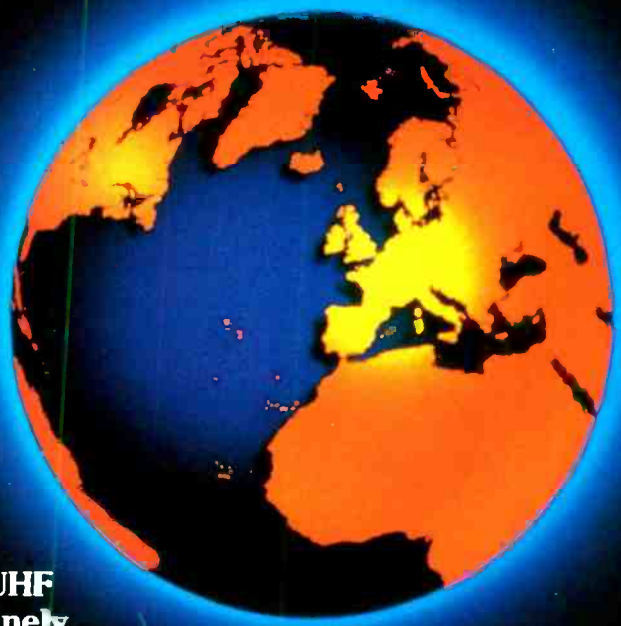

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Circle (130) on Reply Card

SAATCHI & SAATCHI BUSINESS COMMUNICATIONS

Stellavox/Digital Audio Tech. . . . 7814
Analog reel, digital audio R-DAT recorders.
Circle (1096)

Storeel 5433
Storage systems for videotape, **Room Stretcher** and **Stor-Max**. *See category:* S4
Circle (1097)

Strand Lighting 5425
Lighting instruments, dimmer control products.
Circle (1098)

Studer ReVox 1158
Audio mixers; analog, digital recording products, **Studer Dyaxis** hard disk editing system; **A807-4 TC** reel-to-reel machine; CD players. *See category:* A4
Circle (1099)

Studio Technologies 3051
Audio signal processors, **stereo simulaters and Mic-PreEminance**. *See category:* A5
Circle (1100)

Sundance Technology Group . . . 7612
Videotape editing software, **Q-CUT**; **Q-Base** scene logging database.
Circle (1101)

Sure Shot Satellite Network 5939
Satellite programming services.
Circle (1102)

Swintek Enterprises 5244
Wireless microphones.
Circle (1103)

Switchcraft 2226
Connectors, plugs, jacks; audio patch panels, audio accessories. *See category:* S5
Circle (1104) See Adv. index

SWR 5145
Transmission line, coaxial cables, **K-Line**; LPFM/TV antennas. *See category:* R1
Circle (1105)

Symbolics/Graphics Div . . .7437, HDTV
Videographics, packages **PaintAmation**, **XLAnimation** and MacIvory paint, animation systems. *See category:* V4
Circle (1106)

Symetrix 2357
Audio processing systems and digital recording products, **DPR44** workstation. *See category:* A2
Circle (1107)

Synergistic Batteries 7356
Batteries, chargers.
Circle (1108)

System Associates 4571
Used broadcast TV equipment brokers; free listing service in equipment flyers.
Circle (1109)

Systems Wireless 7054
Wireless mics, **Vega 77/R-42**, **Lectrosonics -185** series systems. *See category:* A5
Circle (1110)

Taber/AVSC 4252
Recording media degaussers.
Circle (1111)

Tamron Industries 5804
Video camera lenses; video processors.
Circle (1112)

Tannoy North America 1459
Reference audio monitors using differential-material concept, **DMT** models. *See category:* A5
Circle (1113)

Tapscan 2200
Cable, broadcasting billing, automation software.
Circle (1114)

TASCAM 4239
Audio mixing, recording and processing products, **M-3500** 8-bus mixer; **DA-800-24** DASH format 24-track ATR. *See categories:* A1, A3, A5
Circle (1115) See Adv. Index

Taurus Communications 7139
Satellite transmission services.
Circle (1116)

TEAC **4239**
Recordable videodisc systems, including **LV-210** and **LV250HC** direct record system.
Circle (1117)

Teatronics/Lighting Innovations . . **6828**
Lighting control products. **MD 288** modular dimmers. **Producer** control console. *See category:* V8
Circle (1118)

Teccom **6921**
Distributor.
Circle (1119)

Techni-Tool **7238**
Special purpose technician tools.
Circle (1120)

TEKNO **7701**
Lighting products; studio furnishings.
Circle (1121)

Tekskil Industries **6939**
Prompting systems, graphics products.
Circle (1122)

Tektronix . . . . . **4339, HDTV**
Video test, monitoring products, **VM700A, Model 1780** video measurement sets; signal synchronizers, generators; sync generators. *See categories:* S3, V3
Circle (1123) See Adv. Index

Tel-test **5439**
Signal distribution, automation and master control switching systems, **Model MCS 8/2**. *See categories:* S1, S2, V7
Circle (1124)

Telcom Research . . . . . **.7115**
SMPTE time-code products, **T5010** master generator, reader and character inserter. *See category:* V2
Circle (1125)

Telemet . . . . . **.5245**
Signal routers, TV demods; fiber-optic products.
Circle (1126)

Telemetrics . . . . . **.6933**
Camera remote-controls using coax, triax, **TM8650**; remote-control camera mounting products, **TM8800** head, **68060** trolley.
Circle (1127) See Adv. Index

Telepak San Diego . . . . . **.6331**
Equipment storage, transportation products, **T-Brief Producer/Director** briefcase organizer **T-XV100P** Sharp projector adaptation. *See category:* S4
Circle (1128)

Telescript . . . . . **.4332**
Prompting systems PC/compatible-based computers, lightweight, high-resolution monitors. *See category:* V4
Circle (1129)

Television Engineering . . . . . **.4152**
Mobile television production, ENG vehicles; system designs, construction; **IFB-19** audio controller.
Circle (1130)

Television Equipment Associates . . **3041**
Headsets; **Matthey** delay and filter products. *See category:* V3
Circle (1131)

Telex Communications/Pro A-V . . **4359**
Intercoms, wireless microphones; audiotape duplication equipment. *See categories:* A2, A5
Circle (1132) See Adv. Index

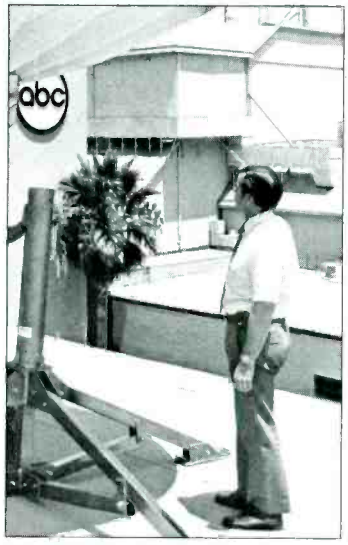
Telmak Television . . . . . **.7105**
Computer video encoders, utility video products.
Circle (1133)

Telos Systems . . . . . **.2007**
Digital Telephone **Telos One** system, **Link** telco-to-intercom interface.
Circle (1134)

Tennaplex Systems . . . . . **.4153**
FM, TV antenna systems **Kathrein**; radio broadcast automation systems, **Music Manager**.
Circle (1135) See Adv. Index

Tentel . . . . . **.4223**
VCR/VTR maintenance instruments, **HPG-1** head protrusion, **TSH**-series spindel height gauges. *See category:* S6
Circle (1136)

Find Out What Steve, Mike, Ted & Sheila Know.



Steve Pair, director of engineering, KABC, Los Angeles, CA. On-line soon.

George Singleton, vice president & general manager, and Mike Caruso, chief engineer, NBC affiliate KTVE, Monroe, LA. On-line August 1990.

Sheila Wachenschwanz, engineering operations supervisor, FOX owned- and operated-station KRIV, Houston, TX. On-line April 1990.

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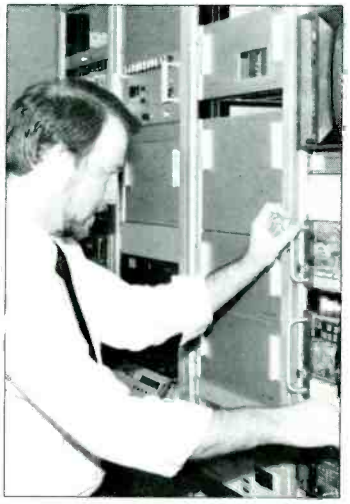
Steve Pickell, chief engineer, and Jack Chambers, assistant chief engineer, FOX affiliate WPTY, Memphis, TN. On-line May 1990.

Wendell Wyborny, chief engineer, FOX owned- and operated-station KRIV, Houston, TX. On-line April 1990.



Ted Corcanges, engineering operations supervisor, FOX affiliate WTIC, Hartford, CT. On-line April 1988.

Circle (140) on Reply Card

Texar . . . . . .N.A.
Facilities automation products for radio, TV stations. *See category:* S1
Circle (1137)

TFT **1420**
Modulation monitors for radio, TV, **Model 850 BTSC** for stereo TV aural modulation; **8900 Reciter** FM booster synchronization unit. *See category:* R3
Circle (1138)

The Express Group **1912**
Broadcast studio furniture, including **5000** and **6000** series. *See categories:* S4
Circle (1139)

Theatre Service & Supply **5250**
Studio furnishings, cyclorama curtains, tracks; grip products.
Circle (1140)

Theatre Vision/TVI **5847**
Lighting, drapery, other studio products.
Circle (1141)

Thermodyne International **6406**
Equipment cases.
Circle (1142)

Thomson-CSF **5045**
See: ***Comark Communications***
Thomson Broadcast
Thomson Digital Image
Thomson-LGT
Thomson Video Equipement

Thomson Broadcast **5045**
Digital video processors, **COLORADO** color corrector, **TTV1645 Sportcam** TV camera. *See categories:* V1, V3
Circle (1143)

Thomson Digital Image/TDI **5045**
Graphics software products, **Explore**. *See category:* V4
Circle (1144)

Thomson Electron Tubes & Devices 6342
RF power tetrodes, klystrons for terrestrial, satellite transmission systems; camera, display tubes. *See categories:* R4, V1, V5
Circle (1145) See Adv. index

Thomson Video Equipement **5045**
Cameras for standard, HDTV applications, **HD 120 Proscan** camera; digital video color processor **COLORADO**; switchers, A/D-D/A converters. *See categories:* V1, V3, V7
Circle (1146) See Adv. index

Thomson-LGT **5045**
FM broadcast translators and transmitters from 1W to 10kW; TV translators, transmitters from 1W to 40kW; tube, solid-state power amplifier designs.
Circle (1148)

360 Systems **1900**
Digital audio cart machines, **DigiCart**; audio distribution switchers, **AM-16/B**. *See category:* S2
Circle (1149) See Adv. index

Tiffen Manufacturing **6619**
Optical filters; lens accessories.
Circle (1150)

Time Logic **7444**
Playback, machine automation, **APDU-200**; **Ensemble** videotape editing system. *See categories:* S1, V2
Circle (1151)

TimeLine **2133**
Audio synchronizer, transport control, **Lynx Keyboard Control** for audio post production, **Lynx Interface** for video editors. *See category:* A3
Circle (1152)

TM Century **1053**
Radio control room **digital studio system** CD player and control; **Denon CD cart** players. *See category:* A5
Circle (1153)

Torpey Controls & Engineering . . .**5558**
Signal control products, clocks.
Circle (1154)

Toshiba/Consumer Products 6000, HDTV
Standard, HDTV cameras, camcorders, frame stores, switchers, recorders; monitors, projectors; hardcopy printers. *See categories:* V1, V2, V4, V5, V7
Circle (1155) See Adv. Index

Toshiba/Information Systems . . . **.6000**
Digital video products for HDTV, **HSC-100** CCD camera. *See categories:* V4, V7
Circle (1157)

Toshiba/Video Systems Group . . **.6000**
Miniaturized color cameras, **IK-M30A** and **IK-T30A**. *See category:* V1
Circle (1158)

Total Spectrum Manufacturing . . **.6427**
Camera automation, control systems, **Autocam**, **MCS-4000**; pan/tilt heads, **VS-300P**. *See category:* V1
Circle (1159) See Adv. Index

TouchVision Systems **7501**
Videotape editing systems.
Circle (1160)

Townsend/Midwest Comm. **6536**
TV transmitters, **TV2000** solid-state, **CST Computer Supervised**. *See category:* R1
Circle (1161)

Transmission Structures **1336**
Towers, services.
Circle (1162)

TRF Production Music Libraries . . .**2712**
Program, production music.
Circle (1163)

Trompeter Electronics **5239**
Patch panels, jacks, cords, accessories. *See category:* S5
Circle (1164) See Adv. Index

TrueVision **7705**
Videographics software, signal processing cards.
Circle (1165)

TTC/Television Technology **3066**
Radio, TV transmitters, **FMS-4000** FM and **30kW UHF** Klystrode TV. *See category:* R1
Circle (1166)

Turner Engineering . . . . . .
Facilities design, construction; consulting. (*HDTV World* exhibit coordinator.)
Circle (1167)

TVT **7425**
FM and TV transmitters, **VISTA high power** UHF range.
Circle (1168)

27th Dimension **7527**
Production music library.
Circle (1169)

TWR Lighting **2042**
Tower lighting products.
Circle (1170)

Ultimatte **6010**
Video compositing systems, **System 6, Ultimatte 300, Foreматte**; memory heads for motion control systems. *See category:* V3
Circle (1171)

Uni-Set **3067**
Studio furnishings, scenery.
Circle (1172)

Union Connector **6728**
Power cabinets, **polybox** series; stage pin connectors **2P+G**. *See category:* S5
Circle (1173)

Unique Business Systems **7800**
Productivity, business software, **RentTrace** for tracking of equipment availability.
Circle (1174)

United Ad Label **7507**
Custom printed tape format and tape status labels. *See category:* S6
Circle (1175)

United Media **5021**
Videotape editing controllers, **UMI 500, 600** multitasking series, **UMI 400** A/B roll system. *See category:* V2
Circle (1176)

United Press Int'l **5163**
Program, data services.
Circle (1177)

US Tape & Label **1143**
Labels, promotional products.
Circle (1178)

Ushio America **7006**
Stage, studio lamps.
Circle (1179)

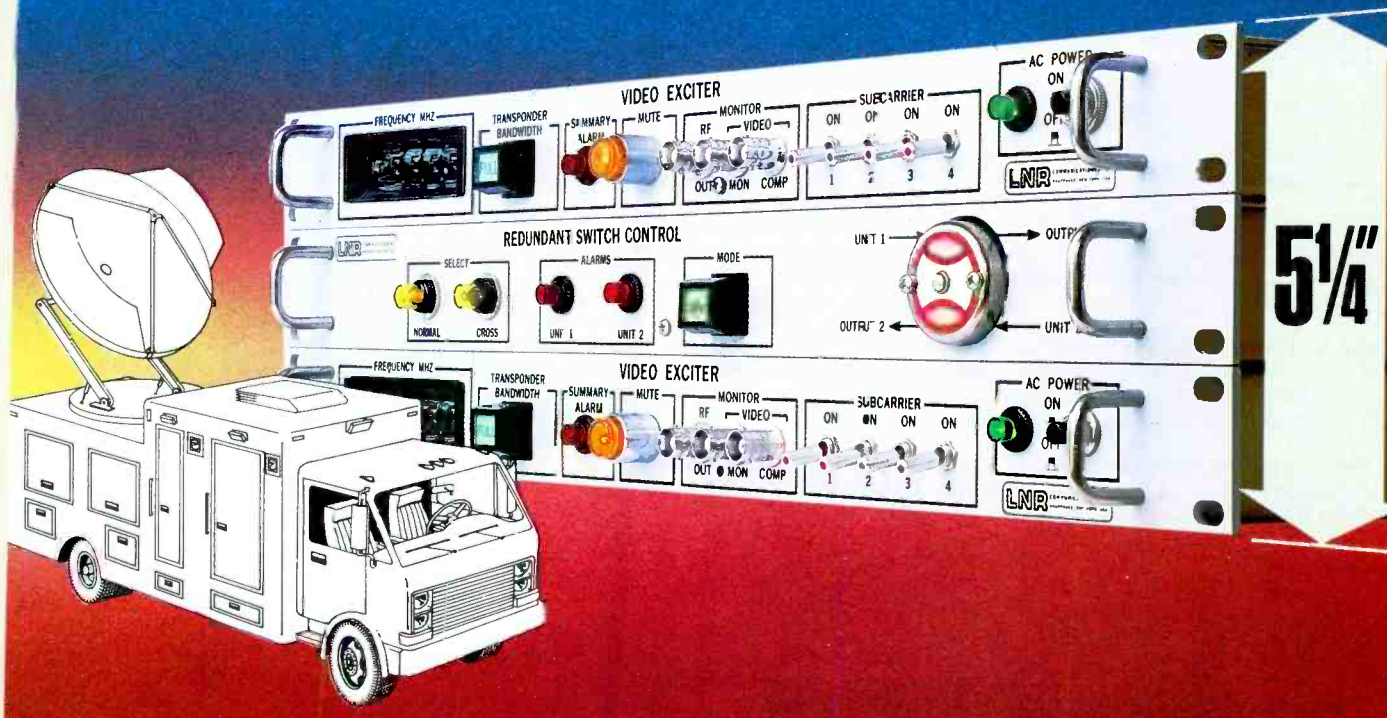
Utah Scientific **5401**
Master control, production, routing switchers; station automation systems.
Circle (1180) See Adv. Index

Utility Tower Company **1021**
Tower products for AM, FM, TV broadcast.
Circle (1181)

Valentino Production Music **1811**
Program, production music library.
Circle (1182)

Valley International **1161**
Modular audio processing products, including **Series 800**, **Model 400** microphone

TWO for the Road.



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Circle (134) on Reply Card

processor. *See category:* A2
Circle (1183)

Valmont Industries **7157**
Monopoles, free-standing and guyed tower antenna support structures.
Circle (1184) See Adv. Index

Vantage Lighting **7153**
Replacement studio lamps. *See category:* V8
Circle (1185)

Varian Canada Microwave Products 4546
C-band uplink amplifiers **VKC 7936 series**.
Circle (1186)

Varian Microwave Equipment . . . 4546
Ku-band amplifiers, **300W, 125W** single-drawer units; **VStar** small terminal HPAs.
Circle (1187)

Varian Microwave Power Tube Div. 4546
Klystrons, **VKP-7990 MSDC** multi-stage depressed collector, **VKP-75535 ACE** devices.
Circle (1188)

Varian Power Grid/X-ray Tube Div. 4546
RF power devices, **4CM400,000A**; UHF **Klystrode** devices to 40kW, air-cooled.
Circle (1189) See Adv. Index

Varian Traveling Wave Tube Div. . 4546
Traveling-wave tubes, Ku-band 300W **VTU 6393 B1** conduction-cooled, **VTU 6393 C1** air-cooled devices.
Circle (1190)

VEAM **7133**
Connectors.
Circle (1191)

VGV **4439**
Digital video production and post-production switchers, **D2500** and **DX300** systems.
Circle (1192) See Adv. Index

Vicon Industries **7645**
Camera support, positioning automation.
Circle (1193)

Video Access Software **2204**
Video producers utility software, **Easy Prompt**, **Easy Lister**. *See category:* V5
Circle (1194)

Video Accessory **6700**
Utility video signal sources, products.
Circle (1195)

Video Associates Labs **3059**
PC-and-video products, **MicroKey/A** and **MicroKey/AudioCard**. *See category:* V3
Circle (1196)

Video Central **5308**
Multistandard, PAL video equipment.
Circle (1197)

Video Communications **7204**
Software, automation.
Circle (1198)

Video Design Pro **7331**
Engineering design, documentation software, **VidCAD/AudCad**. *See category:* S7
Circle (1199)

Video International Development .6017
Video standards converters, **DTC 2604**, **DTC 3504**. *See category:* V3
Circle (1200)

Video Logic Corporation . . . . . **.7715**
Automation software **Log Producer, Log Producer 22**. *See category:* S1
Circle (1201)

VideoLab Para Technologies 7000
VCR retrofits, **TCR-579** time-code, **TSR-580** tape shuttle packages. *See category:* V2
Circle (1202)

Videomagnetics . . . . . **.4211**
VTR head **refurbishing services** for **type C VPR, BVH** transports.
Circle (1203)

Videomedia SED . . . . . **.6807**
Editing controllers, **Micron** A/B roll; **V-LAN** machine control. *See categories:* S1, V2
Circle (1204)

Videotek . . . . . **.4053**
Picture, waveform, vector monitors; **Prodigy** production switcher; **VDP-8400** frame store/synchronizer. *See categories:* S3, V7
Circle (1206) See Adv. Index

Videssence . . . . . **N.A.**
Lighting products. *See category:* V8
Circle (1205)

Viking Cases . . . . . **.6437**
Equipment cases.
Circle (1207)

Vinten Broadcast . . . . . **.6821**
Camera pedestals, support products; automation systems.
Circle (1208) See Adv. Index

Vistek Electronics . . . . . **.7044**
Varicomb video encoders, decoders; **Array** routers; sound-in-syncs equipment; S-/MAC products; HDTV, aspect ratio, standards converters; color correctors; matte, logo, clock generators; video automation systems. *See categories:* A2, S2, V3, V5
Circle (1209)

Vortex Communications . . . . . **.1240**
Various audio utility products for signal processing, distribution; time-code driven clocks. *See category:* S1
Circle (1210)

VYVX National Video Network . . . . .
Switched, nationwide fiber-optic TV transmission. (Demonstrations presented).
Circle (1211) See Adv. Index

Walter Brewer Corporation . . . . **.6439**
Studio furnishings, lighting products.
Circle (1212)

Ward-Beck Systems . . . . . **.4147**
Audio mixers, intercom systems, **MicroCom II**; **D8212** audio DA system.
Circle (1213)

WaveFrame . . . . . **.7225**
Digital audio workstation, **WaveFrame** and **CyperFrame Editorial**. *See category:* A4
Circle (1214)

Wavefront Technologies . . . . . **.7401**
Videographics software packages.
Circle (1215)

Wegener Communications . . . . . **.6827**
Satellite, microwave subcarrier electronics.
Circle (1217)

Wheatstone Broadcast Group 1556
Audio consoles, **TV-500, SP-6, A-500, A32ex**. *See category:* A1
Circle (1218) See Adv. Index

Wheelit . . . . . **.7600**
Utility carts.
Circle (1219)

Whirlwind . . . . . **.6100**
Audio, video cable, panels; transformers, patch cables. *See categories:* A1, A2
Circle (1220)

Will-Burt/TMD . . . . . **.5955**
Portable masts.
Circle (1221)

Winsted . . . . . **.5139**
Modular studio furnishings, **System/85** editing consoles and space-saving **videotape storage** systems. *See category:* S4
Circle (1222) See Adv. Index

Wireworks . . . . . **.3047**
Cable and wire products, **System 502** audio-video system, **microphone multicable** components.
Circle (1223)

Wohler Technologies . . . . . **.7630**
Audio monitors; audio routing, metering products. *See categories:* A5, S2, S3
Circle (1224) See Adv. Index

Wolf Coach . . . . . **.5121**
Mobile units for **SNG**, **ENG**.
Circle (1225)

World Tower . . . . . **.1415**
Towers for AM, FM antennas.
Circle (1226)

WSI/ESD . . . . . **.6332**
Weather data services, display products.
Circle (1227)

Yamaha Music . . . . . **.2017**
Audio mixers, effects processors, recorders, **DMR8/DRU8** digital mixer, recorder; **MS60S** speakers. *See categories:* A1, A4, A5
Circle (1228)

Yamashita Engineering Mfgr/YEM .7443
Video encoders, scan converters, **CVS-910**, and **CVS-950A**. *See category:* V3
Circle (1229)

Zaxcom Video . . . . . **.2216**
TBC remote-control products.
Circle (1230)

Zenith Electronics . . . . . **HDTV**
HDTV equipment.
Circle (1231)

Zonal . . . . . **.7026**
Audio recording, tape, film.
Circle (1232)

See *the* digital cart machine at NAB, Las Vegas

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Circle (108) on Reply Card

New at NAB: audio products — support products

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New at NAB:
audio products — support products

New at NAB

This section includes information about new product introductions at NAB '91. All products have been brought to market in the past year — following NAB '90. The table below indicates the kinds of equipment contained in each of the product categories.

Audio Products

Starts on page 192

- **A1** - Mixers, console automation, faders
- **A2** - Processing systems (delay, dynamics, noise reduction)
- **A3** - Analog recording products (cart, cassette, reel); audio synchronizers
- **A4** - Digital recording products (reel, DAT, workstations); MIDI devices
- **A5** - Microphones, wired/wireless; CD/phono reproduction; headphones, headsets; intercoms; monitor amplifiers, speakers
- **A6** - Remote operation products (RPU, bandwidth extenders, telco interfaces, IFB)

RF/Tower Products

Starts on page 199

- **R1** - AM/FM/TV transmitters, remote control systems; transmission line; antennas; towers, guys, hazard lighting; tower services; power amplifiers, cavities; power supplies, power devices
- **R2** - RF generators, exciters; demods, modulation monitors, receivers
- **R3** - Terrestrial microwave (ENG, STL, ICR, ITFS, MDS) antennas, electronics
- **R4** - Satellite related products; antennas, electronics, controllers

Support Products

Starts on page 202

- **S1** - Automation, computer hardware; accounting, programming, newsroom software; data transmission, data services; machine, remote control, timers, clocks
- **S2** - Signal distribution equipment; DAs, routing switchers, control panels
- **S3** - Test/monitor products; RF loads/calorimeters; meters, tools, signal attenuators, knobs; power filters, conditioners
- **S4** - Cases, equipment racks; studio furnishings; acoustic material
- **S5** - Wire, cable; fiber optic products; connectors, patch panels, patch cords
- **S6** - Recording media (analog, digital audio, video), tape maintenance products; film, film maintenance products
- **S7** - Production facility, remote vehicle design, construction; all consulting services
- **S8** - Music, effects libraries; programming services; promotional material; weather services

Video Products

Starts on page 217

- **V1** - Video cameras, lenses; tripods, pan/tilt heads, pedestals; camera support automation
- **V2** - Video recording products (disk, solid-state, tape; magnetic, optical; analog, digital); still stores; video editing controllers; animation products
- **V3** - Video processing products; encoders/decoders; signal correctors; A/D, D/A, serial-parallel digital converters; TBCs, synchronizers, standards converters; keyers, compositing systems; sync generators, VID generators; video delay products
- **V4** - Digital graphics, titling, effects systems; weather graphics displays; integrated production systems
- **V5** - Video display products; monitors, projectors, video printers, video walls
- **V6** - Cine/film cameras; telecines
- **V7** - Video production switchers; master control switchers
- **V8** - Batteries, chargers, analyzers; studio lighting instruments, lamps, accessories; grip products

In addition to the Las Vegas Convention Center, make sure to visit the Hilton Center and HDTV World exhibits.

Audio Products

A1: Mixers

- Console automation

AMEK Consoles/TAC 2021
TAC B2: video post-production mixer; three chassis, 8-28 inputs; discrete aux sends, individual input routing to four subgroups; stereo output; serial, parallel AFV interface; multiple 2-track monitoring. Circle (1301)
B2520 console: 24 multitrack buses, monitor 24- 32- 48-track; 8 aux buses, stereo subgroups; ASIC-controlled LED meter; routing, pan module per input. Circle (1302)

AMS Industries 1248
LOGIC 2: large format, automated digital mixer; user-configurable to 128 mono input paths in 32-, 48-, 64-channel frame sizes; 24 machine inputs from AES/EBU digital or analog audio ATR. Circle (1303)

Audio Kinetics 1358
MasterLink: console automation combined with machine transport synchronization; retrofits to most consoles. Circle (1304)

Auditronics 1258
Model 800: on-air audio console for radio stations. Circle (1305)
DESTINY: on-air, production audio console; flexible digital control. Circle (1306)

Autogram 1500
Pacemaker 618: six mixer channels, five dual input, one 8-input; 150Ω mic, 20kΩ or 600Ω line; P&G linear conductive plastic sliders; machine control on all inputs; VCA level control for signals. Circle (1307)

Broadcast Electronics 1162
AirTrak 90: mid-priced linear audio consoles; 6, 12, 18, 24 channels. Circle (1308)

Comprehensive Video Supply . . . 5863
MM-3100 EFP mixer: three balanced inputs; wide, flat response; one balanced output; AC or DC power; Cordura carrying case with Velcro closures. Circle (1309)

Fidelipac 1041
Series IV: range of mixers. Circle (1310)

FOR-A 5901
AM-100: audio mixer; for use in editing system with VM-100 video mixer. Circle (1311)

Fostex 1530
24-channel mixer. Circle (1312)

GML 7354
Model 9100: high end, configurable, rack-mount audio mixers. Circle (1313)
Moving Fader enhancements: three status configurations per fader; "Smart Start" starts mix without initial preset; "Additive Grouping" group master affects slave faders similar to VCA group. Circle (1314)
FVP-2000: film, video post-production software for moving fader automation; *Razor Blade* EDL edit feature. Circle (1315)

Graham-Patten Systems 6312
D/ESAM 800: digital audio mixer for use in the editing suite; editing controller handles switching, levels. Circle (1316)

Harrison by GLW 1440
SeriesTen B: automated audio console; save, recall features with total dynamic and instantaneous snapshot modes; system software revised for enhanced mix editor and mix-merge utilities for variations from multiple passes of mix process into alternate mixes. Circle (1317)

Innotech Systems 5438
STV/24: production mixer. Circle (1318)

Klark Teknik 1919
Midas XL88: matrix mixer; multiple output line level mixing; stand-alone 8-channel unit; each module has input, direct, matrix outputs; LED meter per channel; balanced inputs, outputs; stacking to increase number of matrix outputs. Circle (1319)
DDA DCM 224V: video post-production console; 24 routing buses, four stereo subgroups, additional routing facilities to other sub-groups; permits 104 line inputs for complex mixdown operation. Circle (1320)
Midas XL3: reinforcement mixer; eight mute groups and eight VCA masters; 18 discrete sends outputs; 16 main outputs assignable to auto mutes and to two VCA grand masters. Circle (1321)

Logitek 1540
Mariner: Modular mixer for on-air and production; different models with 5, 8, 12 and 18 mixers. Circle (1322)

Micron Audio Products 6337
Model SQN: lightweight location mixers; by *SQN Electronics*. Circle (1323)

Neve 1248
AMS Logic 2: digital-based mixing console; from AMS. Circle (1324)
Neve Orion series: production, remote, post-production consoles. Circle (1325)

Pacific Recorders/Engineering . . .1134
Production mixer: console for broadcast production and operations. Circle (1326)

Panasonic 4513
WJ-MX 15: audio/video mixer. Circle (1327)

RAM Broadcast 1362
ME2000: newsroom mixer. Circle (1329)

Shure Brothers 1414
Model FP410: 4-channel audio mixer; automation, portable unit; useful in studio or field production. Circle (1330)

Sierra Automated Systems 1362
CPI-80: 8-character alpha-numeric control panel; installs in audio consoles for audio routing control. Circle (1331)

TASCAM 4239
M-3700: VCA-controlled, automated 8-bus mixer. Circle (1332)
M-2500: 8-bus mixer with automated muting circuit. Circle (1333)

Wheatstone Broadcast Group 1556
SP-40: production mixer. Circle (1334)
TV-600a: TV audio mixer. Circle (1335)

Whirlwind 6100
MIX5-SB: broadcast mixer; 4-channel unit operates from AC or DC. Circle (1336)

Yamaha Music 2017
DMC 1000: digital mixing console; 14-input with eight mono, three stereo; with monitor input channels; all mixing, EQ, level control, processing, routing functions performed in digital domain without intermediate conversion to analog. Circle (1337)

Audio Products

A2: Processors

- Compressor, limiter, EQ
- Delay, effects, noise reduction

Alesis . . . . . N.A.
Model 3630: compressor, limiter; dual-channel unit includes hard-knee, soft-knee, gates; peak and RMS. Circle (1338)

Applied Research & Technology . . 1141
Model 350/HD-31: 31-band graphic equalizer. Circle (1339)
Model 520/MDC-2001: stereo compression, de-essing, expansion, noise-gate, limiting, exciter functions. Circle (1340)
Model 340/HD-15: 15-band dual-channel graphic equalizer. Circle (1341)

Audio Developments 5201
AD-152: integrated compressor, limiter with microphone amplifier. Circle (1342)
AD151: dual-channel compressor/limiter. Circle (1343)

BAL Components 5751
7650MAT: stereo-mono signal converter module. Circle (1344)

Bradley Broadcast Sales 2007
UNITY 2000: SM processor. Circle (1345)

Circuit Research Labs 1814
Daypart Timer: daypart timer module accessory for Audio Signature. Circle (1346)

Cutting Edge Technologies 2007
Unity 2000: audio processor with digital 4-band leveller, preprocessing, limiting with distortion cancellation; stereo generator exhibits 50dB separation; low-frequency EQ, composite clipper; keypad control; preset various program formats. Circle (1347)

dbx/AKG Acoustics 1249
363X noise gate: dual-channel unit for independent mono or two single stereo signals; threshold, hold, release rate controls; key input, engage, monitor, bypass, stereo modes; VCA design offers 1% linearity with over 100dB gain change. Circle (1348)

Dolby Labs 1404
Model 422: Dolby B-, C-, S-type reference encoder, decoder. Circle (1349)

Energy-Onix 1520
ULTRAMODE: advanced audio processor from *Hnat Hindes*. Circle (1350)

Gentner Electronics 2033
Lazer: digital audio processor for clean stereo separation, limiting. Circle (1352)

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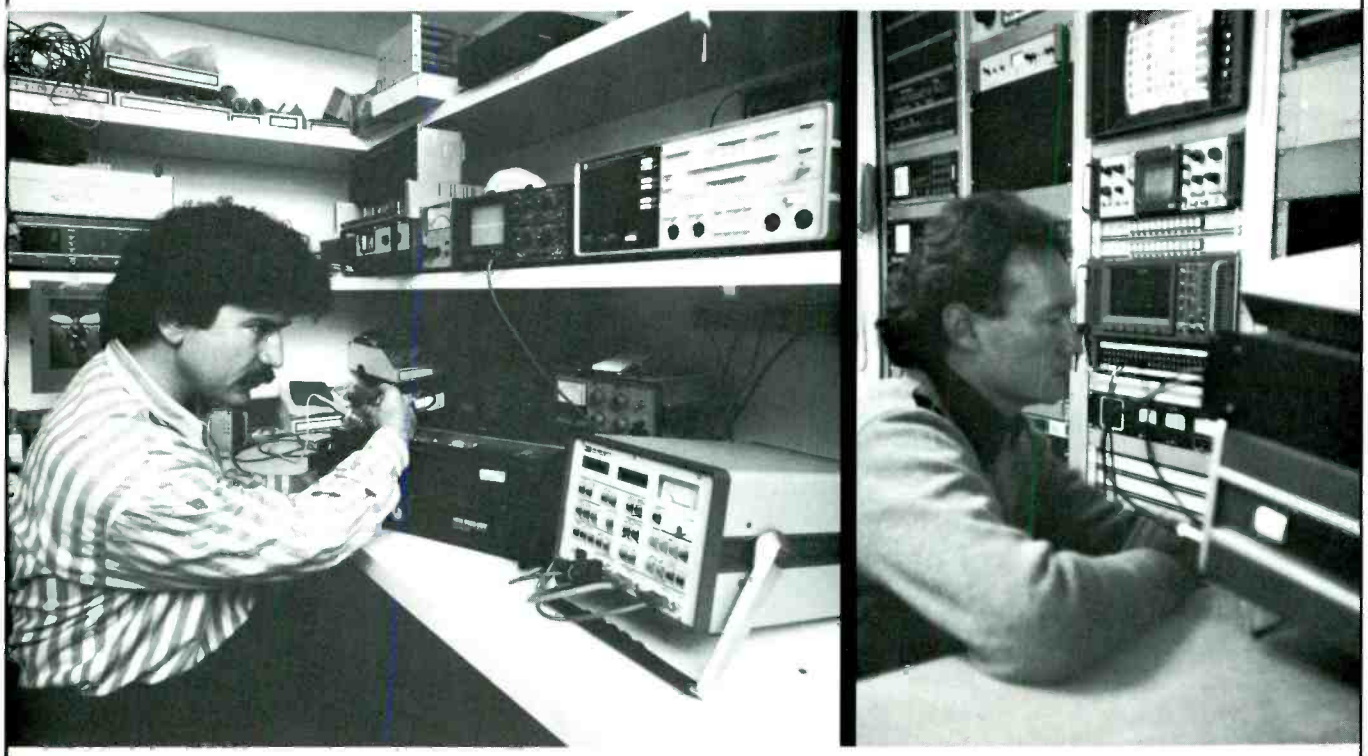

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Circle (154) on Reply Card

PRIZM: 4-band digital audio signal processing system. Circle (1353)

Harris Allied Broadcast Eqpt. 1100
Paragon: digital domain FM processor by *Audio Animation*; eliminates clipping; with touchscreen control. Circle (1354)

Lexicon 1808
Model 300: digital audio effects processing system. Circle (1355)

Symetrix . . . . . .
Model 564: audio processor; quad gate/expander system. Circle (1357)

Valley International 1161
Model DCE: all digital stereo compressor, expander with limiting. Circle (1358)

Vistek Electronics 7044
Sound-in-syncs: dual-channel encoder, decoder system for TV stereo sound alternative; encoding algorithm withstands poor quality link conditions. Circle (1359)

Audio Products

A3: Analog recorders

- Cart, cassette, reel
- ATR synchronizers

Accurate Sound Corp 1117
AS-4000: cassette logger. Circle (1360)
AS-100: reel-to-reel recorder. Circle (1361)

Audio Kinetics 1358
ES.Lock 1.11: emulator software; adds versatility to synchronizer module; integrates with Motionworker studio systems interface, console automation and studio contro from SSL, Neve, GML. Circle (1362)

Fostex 1530
G24S: 1" 24-track recorder. Circle (1351)

TASCAM 4239
Dolby SR: option provides for "spectral recording" on MSR-16 and MSR-24 audio recording systems. Circle (1363)

Telex Communications/Pro A-V . . 4359
Stereo Copyette 1, 3: audiotape duplication systems. Circle (1364)
Cassette duplicator. Circle (1365)
MCD duplicator: micro to standard format conversions. Circle (1366)

TimeLine 2133
Lynx System Supervisor: with interface for Neve audio consoles. Circle (1367)

Audio Products

A4: Digital recorders

- Reel, DAT
- Hard disk workstations
- MIDI devices

Alesis . . . . . N.A.
ADA7 recorder: 8-track digital audiotape recorder. Circle (1368)
BRC accessory: full-function remote control, autolocator for ADA7. Circle (1369)

Broadcast Electronics **1162**
AUDIOVAULT: digital record, playback and inventory storage facility. **Circle (1370)**

Broadcast Supply West (BSW) . . . **1808**
SatFire 1: digital audio storage, playback system. **Circle (1371)**

Cipher Digital **5347**
CDI-328: random access audio recording and editing system. **Circle (1372)**

Corporate Computer Systems . . . **2123**
Micro 66R: audio codec; unit has a capability of operating at one of two data rates - 56kbps and 64kbps. **Circle (1373)**
Micro 15K: audio codec with analog bandwidth to 15kHz. **Circle (1374)**

Digital Audio Research **1901**
SoundStation DSP enhancement: extensive segment-based capability for 4-band parametric EQ, gain, panning control to all audio segments; processing attributes become tags to the segments during editing, production process. **Circle (1375)**
SoundStation II options: 16-channel simultaneous output operation, provides eight track-hours of storage; rewritable optical disk storage. **Circle (1376)**
DASS 100: multifunction synchronizer, multiple device interface, signal processor; all material transferred between equipment remains in digital domain; with sampling frequency and format converter, sampling synchronization, gain adjustment; includes test signal source. **Circle (1377)**

Eventide **1600**
VR240 logging recorder: DAT-format audio logging; 184-hour capacity, 1 to 24 channel, per standard DAT cassette; play-only version also offered. **Circle (1378)**

Fostex **1530**
Portable DAT: includes record confidence heads. **Circle (1379)**
D-20 DAT: with 8310 card installed; reads, writes IEC, SMPTE formats. **Circle (1380)**

IMC/International Music Corp. . . **7031**
S1100: stereo sampler; digital output; compatible with SMPTE, Digital F/X interfaces; 2 Mbyte RAM expands to 32 MBytes; 18-bit D/A for improved S/N, dynamic range; DSP reverb, chorus, pitch-shift functions; reads disks from previous samplers. **Circle (1381)**
DD1000: magneto-optical disk recording and editing system. **Circle (1382)**

Klark Teknik **1919**
DN 735 recorder: solid-state audio system for use in video editing; 20s RAM storage expands to 175s stereo; RS-422 control from editor or front panel; synchronize playback with other equipment via external SMPTE time-code signal. **Circle (1383)**

Lexicon **1808**
OPUS Ver 3.0: software features Automix, CPEX time compression, expansion and machine control functions. **Circle (1384)**
LFI-100: digital audio interface. **Circle (1385)**

Neve **1248**
AMS Audiofile Plus: hard disk digital audio editing, recording system. **Circle (1386)**

New England Digital 4601
SoundDroid: from *Lucasfilms*; film-style interface for manipulation of sounds from screen-based cuesheet; off-line version spots effects, dialog, foley items from Macintosh II PC; project management features and on-line report creation. Circle (1387)
EditView: tape-type software editing package for manipulation of disk and Synclavier RAM samples simultaneously, with BVH, BVU, VPR-3 machine control for edit-to-picture projects. Circle (1388)

nVision . . . . . .N.A.
Digital: rate converter. Circle (1389)

Odetics Broadcast 4039
TLC-2400: time-lapse broadcast logger; 240-hour capacity; offers continuous digitally-compressed audio. Circle (1390)

Ramsa Audio/Panasonic 4513
Tool Kit: developer's software package for the SV-3900. Circle (1392)

Solid State Logic 1426
SoundNet: digital audio-for-video network system; permits multiple SoundScreen systems to share and copy work; central database of audio; has off-line backup, restore functions; in slave mode offers 56-channel playback. Circle (1393)

Studer ReVox 1158
MacMix: software package for Dyaxis systems; version 3.2. Circle (1394)

TM Century 1053
Digital Commercial System: hard disk record and playback; stereo storage with minimum of 2-hour capacity. Circle (1395)

WaveFrame 7225
Removeable Optical: removable and erasable disk media. Circle (1396)

Yamaha Music 2017
DTR2 recorder: R-DAT unit uses Delta-Sigma A/D conversion; multiple input/output connection types; twin 24-segment peak metering; achieves digital performance to 103dB S/N, 96dB dynamic range, 100dB separation, 0.0025% THD. Circle (1397)

Audio Products

A5: Microphones, speakers

- Wired, wireless mics, pre-amps
- CD, phono products
- Headphones, headsets
- Monitor amplifiers, intercoms

AKG Acoustics 1249
MicroMic C407: mini condenser lavalier; omnidirectional with vocal frequency response; 0.3″ diameter, detachable tie pin, clip, removable windscreen. Circle (1398)
V6HP amplifier: drives three sets of stereo headphones with high-output level signals; input gain controls; mix selectors for each headphone pair select from possible combinations of the two inputs. Circle (1399)
C580E: slim-line gooseneck condenser mic for podium or conference. Circle (1400)

Alesis . . . . . .N.A.
RA-100: 100W stereo reference power amplifier. Circle (1401)

ATI Audio Technologies 1058
HD1000: headphone amplifier; balanced stereo line input summed with mono mic input; master level adjustment, individual output controls; expansion bus output for remote modules. Circle (1402)
PB2x8: press box distribution amp; two mic/line inputs switch to any of eight balanced outputs; meter, XLR connector inputs, outputs provided. Circle (1403)

Audio Developments 5201
Model AD150: dual microphone amplifier. Circle (1404)

Audio-Technica US 2235
AT 804: rugged, field omnidirectional dynamic microphone. Circle (1405)
ATM 35: high-intensity clip-on instrument microphone. Circle (1406)
AT 851a: uniplate condenser microphone, low-profile design. Circle (1407)
AT 825: single-point, field stereo microphone. Circle (1408)

Benchmark Media Systems 2204
MIA-4x2: portable 2-channel mic pre-amp; ideal to replace many R-DAT original pre-amps; 0.0009% THD at 40dB. Circle (1409)
LOUDMOUTH: reporter control station; 1-mic, 4-line and 1kHz tone; 6-way selection of record and main outputs; rated at 0.0035% THD over 20Hz-20kHz; will seize and feed telco circuit. Circle (1410)

beyerdynamic 5314
Model SHM 20: mini hypercardioid condenser, low profile gooseneck. Circle (1411)
Model MC 742: stereo EFP and studio condenser microphone. Circle (1412)
170 series: hand-held, body-pack lavalier, diversity wireless mic. Circle (1413)
Model M59: dynamic voice microphone; large diaphragm and internal shock-mount construction. Circle (1414)
Model MCE 50: miniature condenser microphone; lavalier design. Circle (1415)

Clear-Com Intercoms 5851
LFS series: mini intercom stations for Matrix Plus system. Circle (1416)
IF4-4B: multichannel modular camera interfaces. Circle (1417)
MS-812: 12-channel, programmable party line station; includes split ear audio, contact closures, IFB. Circle (1418)

ComTek 2604
Model MRC-82: wireless mic receiver; attaches to camera. Circle (1420)

Crown International 2040
CM 230: three separate microphone capsules produce three separate audio feeds from single instrument. Circle (1421)

Electro-Voice 1011
QX-6A: wireless intercom. Circle (1423)

Gotham Audio 1400
TLM 50 mic: *Neumann* pressure type microphone with transformerless circuitry; flat response in diffuse sound field, becoming more directional at high frequencies; directional characteristics similar to pressure gradient instrument. Circle (1424)

JBL Professional 1434
Control SB Micro: personal system with sub-base response. Circle (1425)
Control Micro: personal monitor speaker system. Circle (1426)

Micron Audio Products 6337
MR-120/520: miniature wireless mic system receiver. Circle (1427)
MDR-150/550: miniature space diversity receiver; VHF, UHF versions. Circle (1428)
TX-601: multichannel pocket transmitter; VHF, UHF versions. Circle (1429)

R-Columbia Products 2701
TR-470/R-160: long-range VHF/UHF wireless IFB/ENG headphones; 2-mile range, full-range voice audio on VHF; IFB channel carried on VHF in one ear, UHF channel is routed to other ear. Circle (1433)

Radio Design Labs 7813
ST-GCA2: fast-response gain-controlled amplifier. Circle (1434)
ST-MX3, ST-MMX3: line level and mic-to-line level mixing amplifiers. Circle (1435)
ST-ACR2: extended delay, audio control relay. Circle (1436)
ST-SH1: headphone amplifier. Circle (1437)
STA-1M: audio line amplifier. Circle (1438)
ST-PH1: phono pre-amp. Circle (1439)
ST-MPA2: mic phantom adapter. Circle (1440)

ROH Div/Portland 1439
303TM: tabletop intercom speaker station. Circle (1441)

Sennheiser Electric 2100
MD-422: dynamic mic; cardioid pattern for broadcast, recording. Circle (1442)
MKH 50 P48: supercardioid RF condenser microphone. Circle (1443)
BF 530: dynamic mic with supercardioid pattern for recording. Circle (1444)
MKE-300: short shotgun mic; for ENG/EFP broadcast, audio/visual. Circle (1445)

SESCOM 4308
Field-Pro boxes: series of products for in-the-field operation. Circle (1446)
In-Line series: assortment of transformers and pads exhibiting high isolation characteristics. Circle (1447)

Shure Brothers 1414
Model VP64: ENG audio or production mic; omnidirectional characteristics; professional quality. Circle (1448)

Sony 4401
Series 800: wireless mics, synthesized UHF operation. Circle (1449)

Studio Technologies 3051
IFB Plus series: for talent cuing at local and remote locations; wide range of features; simple installation. Circle (1450)

Systems Wireless 7054
Wireless systems: UHF system series from *Lectrosonics*. Circle (1451)
MS-812: programmable intercom master

See what you sound like.

The VM 700A just added audio!

Now you can get *combined* video and audio performance reports with one powerful monitoring and measurement package — the industry-leading Tek VM 700A in NTSC, PAL and Dual Standard PAL/NTSC versions.

Just specify Option 40 with your instrument, and it's all at your fingertips. Audio measurements like distortion, phase and crosstalk in automatic as well as manual modes. Unique real-time spectral display of audio frequencies. Stereo audio monitoring. Plus the VM 700A's full set of video measurements.

What's more, with our new ASG 100 Audio Signal Generator, you can insert test tone sequences in the audio line to perform automated measurements with the VM 700A Option 40. In 30 seconds or less you can characterize the audio performance of studios, STLs, transmitters and satellite uplinks completely.

But don't just read about it. Call your Tek representative to arrange a demonstration. And *see* what you sound like!

Tektronix

Circle (142) on Reply Card

station from *Clear-Com.* Circle (1452)
T-677/T-680/R-662: UHF wireless mic system by *Vega.* Circle (1453)

Tannoy North America 1459
PS-88 subwoofer: near-field reference speaker; range extends down to 36Hz; 100W proprietary amplifier corrects natural 12dB/octave rolloff of woofers sealed in enclosures; active crossover, EQ, volume adjustment; high, low impedance inputs on ¼" or RCA connectors. Circle (1454)
Studio monitor series: reference monitor products using *differential material technology*; DMT Systems 10, 12, 15, 215 isolate vibrating components from cabinet to reduce resonant vibrations. Circle (1455)

TASCAM 4239
CD-301: CD player, designed to withstand rigors of broadcast and production environments. Circle (1457)

Telex Communications/Pro A-V . . 4359
Model ELM: subminiature lapel microphones. Circle (1458)
Model P515: power supply. Circle (1459)
FMR-100: diversity wireless mic; advanced technology design system. Circle (1460)
R-10 ProStar: wireless microphone product series. Circle (1461)
SSA324: intercom interface; with 2-wire to 4-wire adaptation. Circle (1462)
FMR-30: pro wireless system. Circle (1463)

Whirlwind 6100
Model P-12: power amplifier, rated 12W stereo; for headphones. Circle (1464)

Wohler Technologies 7630
AMP.9: 2-channel 1-RU powered monitor, speaker unit; acoustic performance similar to larger AMP series. Circle (1465)

Yamaha Music 2017
PC4002M professional: monitor amplifier for high-end studio listening environment; 700W/channel in 4Ω; 10Hz-50kHz, 0.005% THD; unit has calibrated metering, level controls for each channel. Circle (1466)
S8M speakers: 3-way monitor speaker for foreground, background music installations; black wood-grain finish with black grill cloth; base-reflex cabinet; 8" LF driver, 5" MF driver, 3" tweeter. Circle (1467)

Audio Products

A6: Remote operation

- IFB, RPU devices
- Telephone bandwidth extenders
- Telephone hybrids, interfaces

Broadcasters General Store 2223
Automute: automatic control of telephone muting. Circle (1468)

Gentner Electronics 2033
System One: teleconference system with acoustic echo cancellation. Circle (1469)

In addition to the Las Vegas Convention Center, make sure to visit the Hilton Center and HDTV World exhibits.

Radio Products

R1: Transmitters

- AM, FM, TV, LPTV
- Antennas, feedline
- Towers, guys, lighting
- Transmitter remote control
- RF power devices

Altronic Research 1463
Model 9750: 50kW Unibody RF load. Circle (2043)
Model 9725: 25kW Unibody RF loads. Circle (1472)

BEXT 1020
TV transmitter: complete 10W UHF system for LPTV; self-contained in 3-rack height; primarily intended to serve as translator component. Circle (1474)

Burk Technology 1907
ATS-1000: automatic transmission system option; for ARC-16 control with computer interface; compound command functions with full automatic control. Circle (1475)

Cablewave Systems/RF Systems . . 1148
Bogner TV antennas: slot-array radiation design; low-, medium-, high-power models for UHF, VHF. Circle (1476)

Central Tower 2014
Model SS-STX: self-supporting, solid-truss-leg tower; heights to 500 feet. Circle (1477)

Comark Comm./Thomson-CSF 5045
ESC-equipped system: UHF TV transmitter rated 280kW, water-cooled, diplexed amplification; design based on suppressed collector device. Circle (1478)
IOT equipped system: UHF TV transmitter, rated 280kW, diplexed and common amplification with air- and water-cooled heat control; uses inductive output tube in power amplifier stage. Circle (1479)

Dielectric Communications 5029
Control panel: universal switch controls one or two coaxial or waveguide switches at manned or remotely-controlled transmitter installations. Circle (1480)

Electronics Research 2500
SP-X-λ: optimized antenna support tower sections. Circle (1481)
Invisi-Shield: electrically transparent antenna ice shield product. Circle (1482)
Towers, antenna poles: products from *ERI Structural Division.* Circle (1483)

EMCEE Broadcast Products 6028
TTU50EE: 50W rated UHF transmitter; 100% solid-state design. Circle (1484)
TTU1000EE: UHF transmitter; 100% solid-state design for 1kW. Circle (1485)
TTV1000EE: VHF transmitter; 100% solid-state design for 1kW. Circle (1486)

Energy-Onix 1520
AM-5K: 5kW AM transmitter. Circle (1487)
SST-1000: 1kW output, fully solid-state FM transmitter. Circle (1488)

Hallikainen & Friends 1121
DRC-200: digital remote control; CRT, logging features; link to remote site on dial-up, voice grade, digital circuits. Circle (1489)

Harris Allied Broadcast Eqpt. 1100
HT 500FM: 500W FM transmitter; all solid-state design is frequency-agile and containerized. Circle (1490)
ADH-2 dehydrator: automatic, rack-mounted by *Environmental Technologies*; for pressurization of waveguide, feedhorns, air dielectric coaxial cables. Circle (1491)
UTV-10T: 10W UHF translator; 100W, 400W, 750W, 1kW also available. Circle (1492)
PT 5FM, PT10FM: 5kW and 10kW solid-state FM broadcast transmitters; additional units available with power levels of 2kW, 3.5kW, 6kW, 7kW. Circle (1493)
UTV-1000: 1kW UHF transmitter; also 100W, 400W, 750W, 5kW, 10kW. Circle (1494)

ITS/Information Transmission . . . 6833
ITS-222A: 100W UHF translator; redesign for improved performance. Circle (1496)
ITS-1230: 1kW solid-state transmitter; redesigned product. Circle (1497)

Jampro Antennas 1200
Model JBBP: balanced penetrator; broadband, side mount for FM, TV. Circle (1498)
Model JHD: UHF broadband panel antenna design. Circle (1499)

Kintronic Laboratories 2229
RTL40-20-2HV: RF contactor, for high-voltage transmission systems. Circle (1500)

KTL-LPA-100: high-frequency log periodic design antenna. Circle (1501)

LDL Communications/Larcan . . . 4647
High-band VHF CP antenna: top mounted, low wind load for replacement of existing batwing designs. Circle (1328)
High power UHF CP antenna: waveguide design; top mounting unit for input powers greater than 240kW. Circle (1356)
10kW VHF antenna: low-power system for top or side mounting. Circle (1391)
SIT series: quick setup masts. Circle (1502)
HDTV antennas: broad-band panel radiator design. Circle (1503)

Nationwide Tower Company 7638
E18, E24, E36, E48: guyed towers; solid rod construction. Circle (1504)

Nautel 2207
Modular FM: solid-state FM transmitter; 3 to 7kW power range. Circle (1505)

Philips Components 4254
YK 1283: air-cooled klystron; depressed collector concept; 30kW rated. Circle (1506)
RF power transistors: for solid-state broadcast transmitters. Circle (1517)

Richardson Electronics 4565
NL347: transmitting tube; rated 1kW in UHF TV service. Circle (1518)

Shively Labs 1234
2500 filter: FM bandpass type. Circle (1507)
1900 series: 9 3/16" motorized coaxial switch. Circle (1508)

Sira Sistemi Radio s.r.l. 1918
Channel combiner: 2x40kW unit for transmission of two UHF signals. Circle (1509)
LPTV combiner: compact dual-sound, vision combiner; for service with 1kW UHF solid-state TV transmitters. Circle (1510)

SWR 5145
FM-20-X: CP panel antenna. Circle (1511)
LPTV type: for LPTV use. Circle (1512)
FM-5-X, FM-10-X: medium-, high-power CP FM antenna. Circle (1513)

Townsend/Midwest Comm. 6536
CST series: computer-supervised UHF transmitter; high-efficiency MSDC klystron; *safety trip overload protector.* Circle (1515)

TTC/Television Technology 3066
XLS-1000MU: 1kW UHF transmitter; complete solid-state design. Circle (1516)

Radio Products

R2: RF ancillary equipment

- Generators, exciters
- Demods, receivers
- Modulation monitors

Aphex Systems 6336
Stereo generator. Circle (1519)

Belar Electronics Lab 1448
The Wizard: FM digital modulation analyzer. Circle (1520)

CCA Electronics 1025
FM20G/A: 30W FM exciter; high-performance design at low cost. Circle (1521)

Inovonics 1700
Model 550 Sentinel: AM/FM all-mode station monitor-receiver; integrated audio signal diagnostics. Circle (1522)

Modulation Sciences 2400
ModMinder DeMod: retrofit card; provides synthesized front-end design, 1mW-1W RF input range; ideal for use with RF sampling port; remote-control interface or modem links to studio; 2-D, 3-D graphic presentation of modulation data. Circle (1523)

QSI Systems 5845
Model 1500 demod: off-air/CATV MTS stereo; 155-channel tuner; auto retuning of last channel used when switching between broadcast and CATV modes; mono, stereo, SAP 1, SAP 2 selector; balanced audio out; RS-232 control. Circle (1524)

Radio Design Labs 7813
ACM-2: amplitude component monitor for FM signals. Circle (1525)

Radio Products

R3: Terrestrial microwave

- ENG, STL, ICR
- ITFS, MDS, MDDS
- Antennas, electronics

AVCOM of Virginia **5951**
MVT-1000A: video transmitter; applications for broadcast, small enough to be concealed for surveillance, security. Circle (1526)
PSR-1000A: portable surveillance receiver; companion to MVT-1000A. Circle (1527)

BMS **3033**
BMT-40GP: frequency-agile synthesized transmitter; 40GHz operation. Circle (1528)
TBR-50: Low-cost, remotely-controlled, portable microwave receiver. Circle (1529)
TBR-300: single-channel portable microwave receiver; designed for economy and reliability. Circle (1530)
BMR-40KP: frequency-agile 40GHz receiver; synthesized reference. Circle (1531)

Conifer **5859**
Model PA-1033: low-noise microwave preamp; enhances fringe area reception; offers additional gain for long cable runs; mounts directly to downconverter. Circle (1532)
Model QL-1010A: 31-channel wireless cable block downconverter; improved IF, channel-handling capabilities. Circle (1533)

Digital Microwave . . . . . **.7751**
Model DV45: digital video, audio codec; rated for 45Mbits/s. Circle (1534)

EMCEE Broadcast Products . . . . . **.6028**
TTS20HS: frequency agile MMDS TV transmitter. Circle (1535)

ITS/Information Transmission . . . **.6833**
ITS-657E: 50W wireless cable power amplifier. Circle (1536)
ITS-1610E: 20W wireless cable signal transmitter Circle (1537)

Microwave Networks . . . . . **.7641**
MVR-1000 series: family of video microwave relay radio products; transmits NTSC, PAL video between 2-12GHz; original design of *Rockwell Collins*. Circle (1538)

Microwave Radio . . . . . **.3000**
ProStar 2T2UB: portable ENG transmitter; operation on 2GHz. Circle (1539)

Moseley Associates . . . . . **.1210**
Digital STL system. Circle (1540)

NUCOMM . . . . . .
BLKDN series: block downconverters; input range of 6-7GHz or 12-13GHZ is converted to 2GHz. Circle (1541)
CER series: agile central receivers; 2GHz, 2.5GHz, 6-7GHz, 13GHz. Circle (1542)
Model PT3, RX3: portable or mobile ENG transmitter, receivers. Circle (1543)

RF Technology . . . . . **.5833**
D series: compact, portable transmitters covering 1.8-15.6GHz range; dual audio, AC power supplies, wideband, frequency agile; high RF output. Circle (1544)
UPL series: portable transmitters, receivers operating at 3.5GHz. Circle (1545)
Flashback 7: add 7GHz band operation to live news ENG link, previously limited to 2-2.5GHz; 10W output power. Circle (1546)
RF-1303C transmitter: C-series unit; miniature, DC power; dual audio, frequency agile and wideband operation; audio bypass capability. Circle (1547)

TFT . . . . . **.1420**
Model 9100, 9107: frequency-synthesized STL transmitter, receiver. Circle (1548)

Radio Products

R4: Satellite-related

- Antennas, electronics
- System controllers
- Amplifier devices

Advent Communications . . . . . **.7041**
LYNX: vehicle-based SNG system; compact, flyaway capability. Circle (1550)
AVE-2142: video uplink exciter. Circle (1551)

Andrew Corporation **5533**
ESA electronics packages: for low cost video transportable uplink. Circle (1552)

Circle (145) on Reply Card

Antenna Technology 6416
Prof-Line: satellite receivers and related electronics; includes 1GHz switching system; LNA, LNB and LNC units; refurbished satellite earth stations. Circle (1553)

BAF Communication 6907
Model 2.4AT: trailer-mounted mobile satellite uplink; air-transportable. Circle (1554)

Bradley Broadcast Sales 2007
Com Stream products: digital audio satellite equipment. Circle (1555)

Digital Microwave 7751
Model DV70: digital video modulator, demodulator for satellite links. Circle (1556)

Hallikainen & Friends 1121
Model SAT 201: control system for satellite dish and receiver; remote, local control through various types of circuits; includes scheduler software. Circle (1557)

Harris Allied Broadcast Eqpt. 1100
Series 1800: commercial C-/Ku-band stereo satellite receiver by Wegener; for network radio; two tuned audio demodulators; 600Ω outputs. Circle (1558)

LNR Communications 7208
ATIS-1: automatic transmit identifier for C-, Ku-band uplinks. Circle (1559)
TAB-10: CD-quality audio distribution by satellite. Circle (1560)
DSA-10: digital audio system. Circle (1561)

MCL . . . . . **Outside**
Model 30002: Ku-band TWT amplifier; 300W unit for antenna mounting. Circle (1562)
Model 30004: C-band TWT amplifier; rated at 3kW output. Circle (1563)
Model 10974: C-band linearizer for TWT uplink power amplifiers. Circle (1564)

Radiation Systems Inc/RSI 2062
Model 240KVO: 2.4m transportable earth station antenna. Circle (1565)
5010 software: Step Track. Circle (1566)

Scientific Atlanta 3010
Integrated receiver decoder: combines B-MAC, compression concepts. Circle (1567)
Dichroic feed and subreflector; new technology demonstration. Circle (1568)
8860/8861: adaptive, predictive program antenna control system. Circle (1569)

Sony 4401
FSR-2000A receiver: 24-channel preset tuning, memory includes subcarrier audio; 10-key control; signal strength indicator; unique ID for each unit for addressability; data output for remote control of associated peripheral equipment. Circle (1570)

Standard Communication 7711
TVM-450: frequency-agile modulator. Circle (1571)
MT-840: agile Omni, international Global satellite TV receiver. Circle (1572)
MT-900: Agile Omni spectrum advanced satellite broadcast receiver. Circle (1573)

Thomson Electron Tubes & Devices 6342
TH 3787, TH 3754: TWT devices for 10.7-12.7GHz band; 130W output rating; *3787* with radiating 4-stage depressed collector, 15-year cathode for on-satellite use; *3754* with 3-stage depressed collector; both have 58% efficiency rating. Circle (1574)

Support Products

S1: Automation, data

- Computer hardware, software
- Newsroom, library management
- Machine, remote control
- Data transmission systems
- Clocks, timers

Accu-Weather 5552
FeatureFone: turnkey voice response system and information service. Circle (1575)

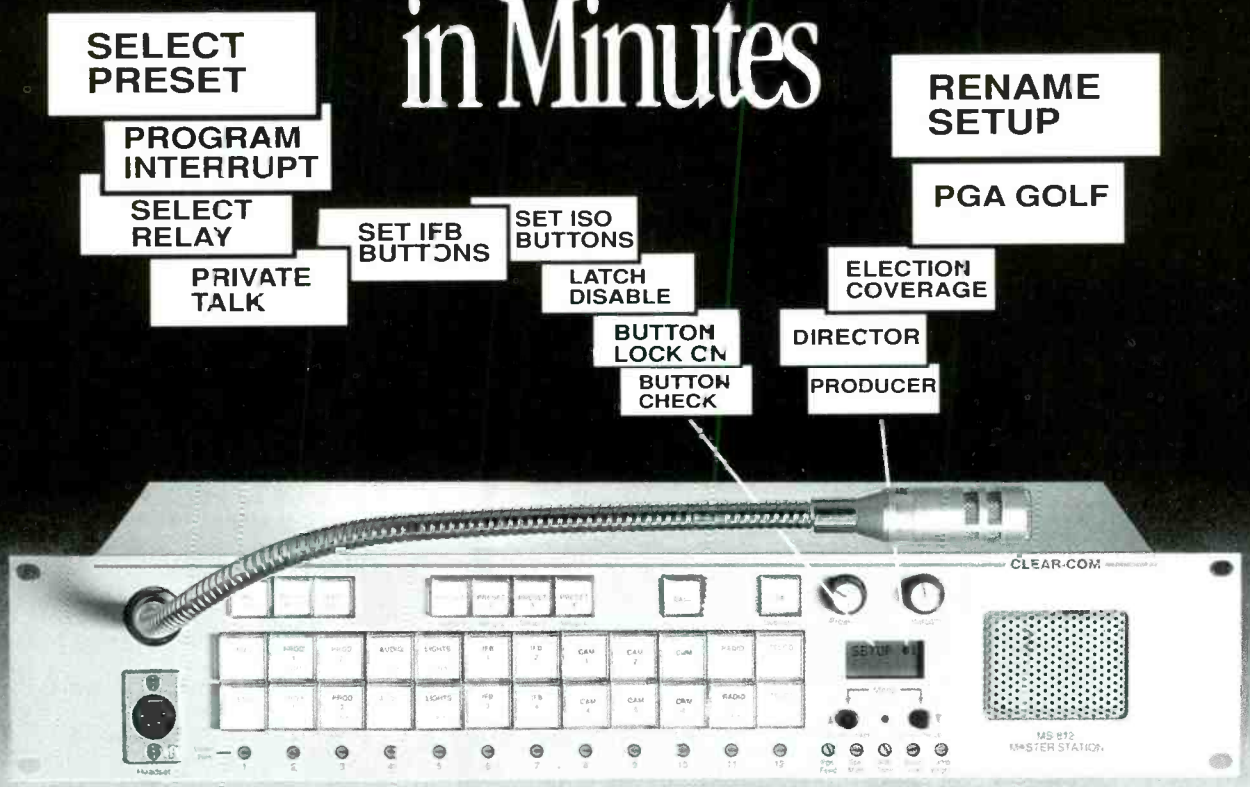
ADC Telecommunications 6026
LC series: fiber-optic transmission; for one short-haul video channel per fiber with four audio subcarriers. Circle (1576)

Allen Avionics 5751
Model III: Digistream III A/D, D/A parallel interface for data transmission. Circle (1577)

Alpha Image 2011
Alpha-330N, -340N: D-2 format utilities; converts data stream from parallel to serial and serial to parallel. Circle (1578)
Alpha-360, -370: A/D, D/A converters; bidirectional D-2-NTSC. Circle (1579)

American Broadcast Systems 5800
MicroCart 40: automated system with

A Master Station You'll Master in Minutes



Now what did I program this button to do? Even if you've never used a master station before, sit down in front of the MS-812 and you'll set up a custom mix of over 30 features without ever reading a manual or picking up a screwdriver.

Program the buttons for intercom, 8 IFB and up to 16 external ISO channels, 12 talks and listens, interruptible program feeds, relays and privacy. The "prompt" messages won't let you make a mistake. And the unique "button check" feature instantly confirms each function.

Four complete setups...just check the window. The MS-812 master station instantly recalls your preset configuration for any event. Not just a feature or two, but the whole setup. Think how easy it will be to rent your mobile truck or facility when it comes with a preprogrammed intercom!

A front panel you'd know in the dark. The dual action controls are where you'd expect them to be, and they respond to the lightest touch. There's also an adjustable brightness control, visual/audible signaling and automatic headset detection...in fact, the MS-812 has all the features you want in a top-of-the-line master station, at a price you can afford.

We haven't skimped on audio quality, either. Clear-Com combines crystal-clear audio technology, the ruggedness of its beltpacks and the advanced engineering of a party line intercom to produce the MS-812. The result is the most usable, flexible and reliable master station ever. Call us for complete specs today.

See us in Booth #3009 at NAB'91

Clear-Com SYSTEMS

USA/Canada
945 Camellia St., Berkeley, CA 94710
TEL 415-527-6666 FAX 415-527-6699
International-FAX 415-932-2171

Circle (147) on Reply Card

record, playback and delay. Circle (1580)
MicroCart 100: automated cart system; 2-channel with traffic interface. Circle (1581)
MicroCart 60: touchscreen newscast control system. Circle (1582)
MicroCart 50/AEP: low-cost automation spot-playback controller. Circle (1583)

Ampex Corporation 4301
ACR-225 feature: *AMAC* software operates two ACR-225 systems from a single playlist; permits expanded library capabilities to more than 20,000 spots on-line; control for 8 (or optional 16) devices; AutoResolve conflict resolution. Circle (1584)
ACR-225 feature: *Multi-Run* software runs two playlists simultaneously for systems serving multiple markets; single playlist can be split into two separate active logs at any time during the schedule. Circle (1585)

AVID Technology 2046
MEDIALOG, MEDIAMATCH: logging and film-to-tape-to-film matchback software packages. Circle (1586)

BASYS 6415
Caption 21: integrated closed-captioning and prompting system. Circle (1587)
ALS-500: automated library system provides net delay. Circle (1588)
BasManager 150, 200: master control automation systems. Circle (1589)
Librarian: high-capacity PC-based archive system. Circle (1590)
MCA-100: broadcast master control automation system. Circle (1591)
ALS-500: multichannel automated library system. Circle (1592)
RMS package: resource management system for incoming feeds, VCR scheduling, tape tracking. Circle (1593)

Broadcast Automation 1912
Easy Sat 6: link for *360 Systems Digi-Cart*; for direct starts of liner carts for satellite delivered radio formats. Circle (1594)

Broadcast Electronics 1162
Core 2000: radio automation controller; includes live-assist capability. Circle (1595)

BTS 4032
DDS-7 series: digital video serializer, deserializer; modular products hold up to four serializers, deserializers in any combination; switch between 8-, 10-bit; 4:2:2 parallel input, 270Mbit/s serial output; works with 525, 625 video systems. Circle (1596)

Channelmatic 4665
Model NSS/CCU: network share switcher and channel control unit; for automated program channel operation. Circle (1597)
Model 600: CompuEdit A-V commercial compiler-editor. Circle (1598)

Columbine Systems 6300
Columbine Sales: automation linking to master control for immediate feedback regarding commercials aired. Circle (1600)
News/Production: extension to automation capabilities with interface to news and production, including closed-captioning and teleprompting. Circle (1601)

COMLUX 7554
Model 3081, 3082: audio codec for 8-channel, 16-bit operation. Circle (1602)
Model 3681, 3682: 1.55 Gigabyte/s fiber-optic terminal pair. Circle (1603)
Model 3903/3904: digital video codec; dual channel operation at 9-bit with 8.5MHz sampling rate. Circle (1604)

Comprehensive Video Supply . . . 5863
LOG MASTER upgrade: offers expanded database capability; frame grabbing, V-LAN features. Circle (1605)

Computer Assisted Technologies . . N.A.
BCAM 1.70, BCAM LAN: enhanced packages assist in tracking of maintenance requirements; upgraded single station and local area network versions. Circle (1606)

Computer Engineering Associates . 7542
Machine control interface: operates Chyron SuperScribe titler. Circle (1607)

Comrex 1240
DXP, DXR: portable and rack-mount audio codecs; specifications meet 56/64kb/s digital circuits. Circle (1608)

Data Center Management 7051
Hardware upgrades: newsroom automation systems using Novell networking and RISC-based platforms. Circle (1609)

Decision, Inc 2041
Broadcast System III: Release 6.0; traffic, commercial scheduling, logging, sales

prospect management; copy/co-op management; avails; integration avoids redundant data entry; customized Lotus-style menus, Decision Query System. Circle (1610)

DYNAIR Electronics 4459
Series 450/460 HDTV: fiber transmission system; stand-alone links for RGB output from camera or remote graphics workstations to any destination. Circle (1611)
Series 1200: serial digital fiber transmission system for D-1 component signals; for distances to 1,300 feet. Circle (1613)

EDX Engineering 7155
CD-ROM-3: three arc-second terrain elevation data library contained on a single CD-ROM disc. Circle (1614)
MAP GRAPHIC: PC software package for drawing of maps. Circle (1615)

EEG Enterprises 4559
VDR-2: VBI data receiver Circle (1616)
TVCD100: VBI line-21 decoder. Circle (1617)

Grass Valley Group 5301
MCF series: multichannel fiber-optic system; includes digital and other distribution equipment. Circle (1618)

Harris Allied Broadcast Eqpt. . . . 1100
SatCue 500: Network cue switcher; programmable for 15 stop-sets; compatible with studio equipment through relay interface; by *Colorado Magnetics*. Circle (1619)

Intraplex 7632
System 4800 DDATLINK: discrete digital audio transmission link for 15kHz stereo audio channel at T1 interface; for radio STL applications. Circle (1620)
4500 MDAC: multichannel digital audio codec; 7.5kHz, 15kHz channels at RS-499 interface for satellite, terrestrial fractional T1 transmission. Circle (1621)

IRIS Technologies 7011
VC-Custom: custom software services for individual control applications. Circle (1622)

Leightronix 7644
PRO-16: event controller with integrated 16×4 video, stereo audio router; control up to 16 tape machines; PC-based event manager software; 1,000-event storage; log, listing printer output; for auto playback, recording, switching. Circle (1422)
C-VOICE: controls your video equipment through interfaces via telephone; voice prompts operator through setup procedure; password protection. Circle (1430)

Leitch Video 4009
ViewGuard 3200: scramble, descramble system; line dispersal with a standard NTSC bandwidth provides a high degree of video, digital audio signal security. Circle (1623)
ACD-5100 series: quiet studio clock; self-setting; sweep, step second display; configures to generate time code. Circle (1624)
UDT-5701 timer: 2-channel up/down timer; 1-RU, 5 GPI inputs, 4 GPI outputs; RS-232, -422 port; remote access functions; stopwatch-style operation mode; 20 programmable instant access presets. Circle (1625)

Louth Systems 6030
ARC: database archive system. Circle (1626)
VTRSERVE: VTR server. Circle (1627)

NewsMaker Systems 7050
System enhancements: interface for Chyron character generators; tape library software; remote workstations; machine control subsystem. Circle (1628)

Norpak 6021
TTX6X0 receivers: expanded family of teletext reception equipment; includes VCR with integral teletext receiver. Circle (1629)

Odetics Broadcast 4039
TCS90: format independent library management cart machine; for simultaneous use of different cassette sizes. Circle (1630)

Panasonic 4513
M.A.R.C. enhancement: dubbing, screening station; remote terminals; Informix database, file server operating on Ethernet LAN; cassette interactive communications to database; multistation concurrent operation spot playback. Circle (1631)
M.A.R.C. system: cassette library management, playback automation; equipped with digital and analog VTRs. Circle (1632)

Register Data Systems 1300
System Seven: advanced, multiple user general ledger package including sales, traffic, billing, accounts receivable/payable and payroll. Circle (1633)
System Six: multi-user sales, traffic, billing, accounts receivable. Circle (1634)

Schmid Telecommunication 2004
RESCO: network monitor, controller, fully automatic; fault-tolerant, surveillance functions via ethernet, leased lines, switched telco, packet-switched or ISDN network; monitoring of analog and digital parameters; full redundancy. Circle (1635)

SISCOM Satellite Information System 7204
Archive system: video image storage and archiving product. Circle (1636)
Machine control: for equipment associated with the newsroom. Circle (1637)

Sony 4401
LMS software: enhanced software for library management systems. Circle (1638)

Tel-test 5439
ACC: air channel control advanced automation system. Circle (1639)
ACA: air control automation. Circle (1640)

Texar . . . . . .N.A.
Facilities controller: master unit with expandable subsystems for control of radio, TV broadcast plants. Circle (1641)

Time Logic . . . . . .
APDU-200/E: enhancements to automatic tape control system. Circle (1642)
Ensemble: enhanced editing control system includes *Scene Manager* with on-line database. Circle (1643)

Trompeter Electronics 5239
TDSX-3/4 cross connect: links DS-3, DS-4E, DS-4 transmission signals. Circle (1644)

Videomedia SED 6807
V-LAN-II: expanded V-Lan system; time-code reader, generator; downloadable VTR drivers; rack-mount package. Circle (1645)

Vortex Communications 1240
Intelligent Time-code Clock: driven by EBU/SMPTE time code; sets to correct time; integral clock driven by battery if external signal fails; auto correction when drive returns; silent models for studio; various faces, hands, movement choices; may also connect to pulse clock. Circle (1646)

Support Products

S2: Signal distribution

- Routing switchers
- Distribution amplifiers
- Audio, digital formats

Avitel Electronics 7805
Model DJF 1080: 10-bit digital video patch panels. Circle (1647)
VSW 3250: modular VBI utility video switcher; in 8×1 or 16×1 forms. Circle (1648)

BAL Components 5751
2880MAT: 8×1 video router. Circle (1649)

BTS 4032
CP-3000PL: sixteen category router control panel; party-line control. Circle (1650)
Serial Digital Router: designed for use with D-1, D-2 format signals. Circle (1651)

Datatek 5625
Model D-872: RS-232/RS-422 conversion module. Circle (1652)
Model D-2454: desktop control panel for routing switchers. Circle (1653)
Model D-2422: for distribution of RS-422 data signals. Circle (1654)
Model 2421: stereo router, left-channel/right-channel reversal. Circle (1655)
Model D-2457: 10-destination LED alphanumeric display. Circle (1656)
Model D-2459: under-monitor, LED alphanumeric display system. Circle (1657)
D-804: video DA for D-800 10×1 switcher modules; 2-channel 1-in×4-out. Circle (1431)

Di-Tech 5733
Model 5217: wideband router; 16×16 matrix for 100MHz signals. Circle (1658)
Model 5216: expandable 16×16 serial D-1, D-2 digital video router. Circle (1659)

Digital Processing Systems 6536
Series 9500: signal DAs. Circle (1660)

Dwight Cavendish 6629
VP 738: 10×10 video, audio router for duplication systems. Circle (1661)
VS 617: 5-group duplication remote-control system. Circle (1662)

DYNAIR Electronics 4459
Dyna Mite HDTV: compact router for RGB HR graphics; 2-RU with integrated alphanumeric control; composite, key, audio, sync, TC follow, break, split. Circle (1663)
Dyna Mite Composite D-2: compact serial D-2 router; modular 10, 20, 30×10; 2-RU space required for video, audio and control; cards can also be used in DYNASTY system to expand the input/output or bandwidth characteristics. Circle (1664)
MP-9230 Control: integral floppy disk, keyboard, display with non-volatile storage of system parameters; eight level control of router system. Circle (1665)
Dynasty MP-9200D control: multistandard, VBI switching, restricted sources, multi PC control, simultaneous salvo; connect panels by bus, home-run with coax, fiber; panels for X-Y, multibus, single-bus control, lock, memory functions. Circle (1666)

ESE 4233
ES 8AV1: 8×1 audio follow feature on utility video switcher. Circle (1667)
ES 16V1, ES 16A1: 16×1 video, audio utility switching systems. Circle (1668)
ES 244: audio level, impedance interface. Circle (1669)
DS-246: quad 1×6 audio DA; balanced inputs, outputs via terminal block or optional XLR connector; transformerless design; individual section gain control. Circle (1432)

Harrison by GLW 1440
ARS-9 router: audio distribution expands to maximum of 256 inputs with 256 outputs; transformerless, differential connections at all inputs, outputs; directly interconnects to SeriesTen B automated console for flexible control in multiroom facilities. Circle (1670)

HEDCO 4009
HD-16×1 series: 30MHz bandwidth 16-input, 1-output; local, remote control; can link to 16× routers, with its own protocol; expands to 256×1. Circle (1671)
Pro-Bel HD: digital video router; can pass multiple digital standards simultaneously; 16×16 to 256×256. Circle (1672)
16x enhancement: expansion to 32×32 with input, output frames. Circle (1673)
Pro-Bel HD series: digital audio router, AES, EBU spec; meets 44.1kHz, 48kHz sampling; 64×64 to 256×256 matrices. Circle (1674)

Image Video 5906
SDR 128: RS-232/-422 serial digital routing switcher; 128 bidirectional input, output ports available. Circle (1675)
Model 9540: 40×20 video routing switcher; 3-RU space required. Circle (1676)
Model 9541: 40×20 dual audio routing system; 4-RU space required. Circle (1677)

Innotech Systems 5438
CH/27, CH/20: stereo and monaural audio distribution systems. Circle (1678)
RM1010: source selector. Circle (1679)

IRIS Technologies 7011
MX 3200VLR-B: 22×32 switcher for video, balanced audio control. Circle (1680)
MX 816, MX 168: 8×16 video, audio switcher with touch-sensitive screen control; also 16×8 router with control. Circle (1681)

JEM-FAB 7018
Model One: D-Patch panel, RS-422 protocol; distribution, machine control. Circle (1682)

Leitch Video 4009
DigiBus 6000: modular frame for handling of several digital and analog formats in one frame. Circle (1683)

Miranda Technologies 6348
SEL-522: 10×2 selector switching; for D-1, D-2, DX signal types. Circle (1684)
SEL-511-XD2: D-2, DX selector switching; 5×1, 10×1. Circle (1685)
DDH-512, DDH-524: dual, quad distribution amplifiers; 1-input, 5-output. Circle (1686)

Omicron Video 2501
Model 330: D-1 component video distribution amplifier. Circle (1687)
Model 887: HDTV component video distribution amplifier. Circle (1688)
Model 558: D-1, D-2 parallel 5×4 routing switcher. Circle (1689)

Pacific Recorders/Engineering . . . 1134
LS-5, LS-10, LS-20: audio line switcher, available for 5-in/4-out, 10-in/2-out, 20-in/2-out configurations. Circle (1690)

PESA America 6016
MVDA series: miniature video distribution amplifier; spec'd to 150MHz. Circle (1691)

Sierra Automated Systems 1362
Model ANC-8: 8-character alphanumeric control panel for SAS-32000 series routing switchers. Circle (1692)
GPI-1600 SI: salvo interface sequencer; enables up to 1,200 user-programmable

Booth 4513

AQ-20 3-CCD
DIGITAL PROCESSING CAMERA

WV-F250 3-CCD
COLOR VIDEO CAMERA

AJ-D310 HALF-INCH
COMPOSITE DIGITAL CAMERA/RECORDER

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Circle (149) on Reply Card

switcher, relay sequences. Circle (1693)
Model AXC-8: 8-character alphanumeric X-Y control panel for SAS-32000 series routing switchers. Circle (1694)

Sierra Video Systems 7121
Model 44C: component video router; serial control; 4×4 matrix. Circle (1695)
Model 44: 4×4 video, stereo audio router; operated via serial control. Circle (1696)
Model 82: 8×2 video and stereo audio router. Circle (1697)
Model 161: video with stereo audio routing system; 16×1 matrix. Circle (1698)

Sigma Electronics 4577
Series 2188: 8×8 audio-video routing switcher system. Circle (1699)

Tel-test 5439
UDC series: universal device controller, for all control applications. Circle (1700)

Telex Communications/Pro A-V . . .4359
SAP612: source assignment panel; provides 6 inputs, 12 outputs. Circle (1701)

360 Systems 1900
AM-16/R: remote control system for AM-16/B routing switcher. Circle (1702)

Vistek Electronics 7044
ARRAY router series: serial digital video distribution switchers; available for D-1, D-2 signal formats. Circle (1703)

Whirlwind 6100
presspower: active press box; 2-input, 12-mic output; AC-DC operation. Circle (1704)

Wohler Technologies 7630
ARS series: audio routing switch; for 20 mono, stereo inputs; route to independent, ganged balanced buffered outputs; balanced, bridging inputs; level, phase indicator options, audible alarm. Circle (1705)

Support Products

S3: Test, monitoring

- Meters, tools
- Signal generators
- Power filtering, conditioning

Advent Communications 7041
AAV 2001: video, audio signal monitoring package. Circle (1706)

Anritsu America 7349
Model ME 4510B: digital microwave system analyzer. Circle (1707)

ASACA ShibaSoku 3048
Model VS12CX: NTSC/PAL sweep signal generator. Circle (1708)
TP18C6: HDTV TFZP zone plate pattern generator. Circle (1709)
TG71AX: digital NTSC/PAL test signal generator; fully programmable. Circle (1710)
TG70A6: programmable HDTV/NTSC test signal generator. Circle (1711)

Audio Precision 2211
FASTest: high-speed audio channel test system; for network, short-interval on-air and general audio use. Circle (1712)

Portable One: audio test set, portable package; twelve tests accessed with one button; comprehensive distortion, noise, phase, crosstalk measurements. Circle (1713)

Conquest Sound 7353
CT-8: A-V rack-mount cable testing system. Circle (1714)

Consultronics Limited . . . . . N.A.
SIAT: short interval audio test sequencer; 5s on-air test of audio circuits. Circle (1715)
PG3000: stereo signal generator; companion to PC3000 analyzer. Circle (1716)

Control Concepts 5246
Isolatron series enhancements: additional models for AM/FM and TV equipment and facility protection. Circle (1717)
SUPERTRAC: new series of protection devices for computers. Circle (1718)

Digital Processing Systems 6536
DPS-285: sync and test signal generator. Circle (1719)

Dorrough Electronics 1604
Model VLM-1: video level monitor; displays average, peak, sync in scaled arc on video screen; may combine with audio meters for modulation monitoring. Circle (1720)

Gennum 7242
GT4122 video multiplier: two video inputs at 25MHz, -0.1dB variation over bandpass; one 30MHz control input; optimized for desktop video designs. Circle (1721)
GS9006 D2 cable equalizer: 8-pin DIP package; patented automated EQ circuit for cables to 300m; ECL outputs. Circle (1722)
GY4102A fast SPDT toggle: 8-pin DIP video switch; 25-35ns action; low diff. gain, phase signal paths of 0.05%, 0.05°; channel isolation to 85dB at 10MHz. Circle (1723)
GS4883 sync separator: 8-pin DIP device; adaptive stripping technique, 50% slicing level; sync gating for noise immunity; composite, horizontal, vertical sync out; scan rates to 130kHz. Circle (1724)

Innotech Systems 5438
RM1040: bar graph meter. Circle (1725)

Leader Instruments 6716
Model 435B: high-resolution video generator; monoscope patterns at 1,000-line resolution, color bars, crosshatch, pulse-bar; for RF/VCR circuit diagnostics. Circle (1726)
Model 5100: waveform monitor; component, NTSC-PAL composite, HDTV 1125/60; 4-channel output of RGB transcoded from YC_RC_B input; features 4-channel overlay, 3-channel parade, *shark-fin* color timing indications. Circle (1727)
Model 5860D: D-2, D-3 waveform monitor. Circle (1728)
Model 408P: PAL standard multiformat generator; gen-lock mode. Circle (1729)

Leitch Video 4009
D2 DigiPeek: provides 1Vp-p analog video output; monitors D-2 signals. Circle (1730)
SPG-/TSG-1302: modular generators providing D-2 sync and analog NTSC functions; housed in one frame. Circle (1731)
TSG/CTG-1510P: PAL test systems; *TSG-* for PAL signals with precision SC/H phase; *CTG-*

for components, including RGB, color difference, 2-wire. Circle (1732)

Magni Systems 7201
Software Version 4.0: for Magni 2015, 2021; permits a signal module to be viewed from the transfer window and switching of signals from channel to channel. (Available from Magni BBS.) Circle (1733)
Signal Creator options: audio module option; analog, digital audio, voice capture; sweep, zone plate option. Circle (1734)
Magni Monitor: compact waveform, vector monitor for NTSC, PAL or component standards; remotely controlled; waveform on standard picture monitor. Circle (1735)
500 series enhancement: remote-control panel option; complete 1-button access to memory settings in 500-series waveform monitor. Circle (1736)
Frame Descriptors: class for writing Frame Descriptors for 2000 series products (19-20 April); learn to define test signals, other features not available through the standard menuing structure. Circle (1737)
Model VS531DS: dual-standard vectorscope; SC/H phase test mode. Circle (1738)

Neutrik USA 2107
Model A-7: audio measurement test set. Circle (1739)

PESA America 6016
DG 5250: test signal generator for both D-2 and analog applications. Circle (1740)

Philips Test & Measurement/BTC . 5324
PM 5664 WFM: component and composite video waveform monitor; STAR display shows timing and amplitude errors; vector, parade and overlay display modes; DIFF shows algebraic subtraction; menu-driven operation. Circle (1741)
PM 5643 generator: component test signal and sync pulse generator; outputs for RGB, EBU/SMPTE, Betacam, MII, 2-wire and 3-wire formats; more than 100 special design tests; locks to external sync source; 525-line version also provides NTSC composite signals; 1kHz audio output. Circle (1742)
PM 5644 generator: color test pattern source; RGB, YC_RC_B; available for NTSC, PAL or SECAM; optional text/clock output with clock driven optionally by station LTC time code or a 1Hz signal; logos programmed into pattern on request. Circle (1743)

RF Technology 5833
SIL filters: *Faraday Technology* video filters in in-line IC-type package; Gaussian to near CCIR 601 characteristics; selected cutoff from 1-30MHz with 1.4 cutoff rate; 40dB stop band attenuation. Circle (1744)

SESCOM 4308
Hand-held series: audio test instruments for audio professionals. Circle (1745)

Sigma Electronics 4577
TSG-2000: portable test signal generator; AC/DC operation. Circle (1746)

Tektronix 4339
TSG-130 Multiformat: low-cost test signal generator; outputs in NTSC; Y-C; Y/R-Y/B-Y for Betacam, MII, CTDM formats; stereo audio output. Circle (1747)

1730D monitor: digital waveform display, featuring serial digital input and eye measurement. Circle (1748)
VM700A measurement set: Options: *Opt 1G* for measuring routing of white, black, 2T-pulse echo, per German White Paper requirements. Circle (1749)
VM700A measurement set: Options: *Opt 1, 11* dual standard set for NTSC, PAL; *Opt 20* Teletext signal quality measurements; *Opt 30* component measurements, Lightning, Bowtie signal forms; *Opt VMREMGR* remote graphics program for near realtime display of VM700A screen on a PC. Circle (1750)
1720-SCH/1721-SCH: vectorscopes for NTSC, PAL; all features of 1720, SC/H-phase, color framing indication. Circle (1751)
TSG-120 Y-C/NTSC: produces outputs in NTSC, Y-C, Y/R-Y/B-Y and stereo audio outputs for maintenance. Circle (1752)
Model TSG170D: digital composite NTSC source; serial digital output. Circle (1754)
TS-130 option: black burst output. Circle (1755)

Tentel 4223
TQ-300M: motorized dial torque gauge for on Betacam systems. Circle (1801)
T2-H5-SLCB: Teltelometer tension gauge; for MII format systems. Circle (1802)

Videotek 4053
BTG-100: hand-held portable SMPTE color bar generator. Circle (1756)
TVM-710 series: combination waveform monitor and vectorscope instruments; facilities include cursors, line selection, SC/H phase measurements. Circle (1757)

Wohler Technologies 7630
MSM series: multi source metering; LED bar-graph arrays in various groupings; select VU, PPM ballistics; Phase indicator options; one unit houses 16 displays; links to MSM for remote monitoring. Circle (1758)

Support Products

S4: Cases, racks

- Storage systems
- Studio furnishings
- Acoustical products

Advance Products 7145
VP6-30: video projector table. Circle (1759)
AVUL 458, AVUL 459: UL-listed 49″ tall tables; 5″ directional casters; safety belt secures load to table. Circle (1760)
PMOH29: overhead table with folding shelves. Circle (1761)

Alpha Audio 3075
Acoustical Solutions: portable audio booth. Circle (1762)
Azonic: ceiling tiles. Circle (1763)

AMCO Engineering 4201
FBX series: monitoring system cabinets with low silhouette pedestal bases, sloping front or vertical frames; 19″, 24″ widths; pedestal and sloping front units with writing surface options. Circle (1764)

Calzone Case 6613
Ultime Series: aluminum extruded sample cases. Circle (1765)
Titan series cases: Fiberglas laminate on 3/8″ plywood. Circle (1766)
Studio series: rack-mount cases; for CCTV, audio equipment. Circle (1767)

Emcor Products 2201
Enclosure accessories: various models of fan trays, fan panels. Circle (1768)

K&H Products 5953
Audio Cases: storage, transport containers for audio equipment. Circle (1769)
Rain Slickers: protective cover-ups for camcorders. Circle (1770)
SACK PACK: general purpose production case; in three sizes. Circle (1771)
Shoulder Case: lightly padded for Sony BVW 200, 300, 400 cameras. Circle (1772)

Nalpak Video Sales 5527
TP 1460: extra large size TuffPak designed for grip equipment. Circle (1773)
RP series: molded rack cases. Circle (1774)

Peerless Sales 6007
JYM000: jumbo yoke mount for monitors to 35″ diagonal screens. Circle (1775)
CLW 000, CLC 000: consumer line wall and ceiling mounts. Circle (1776)

Storeel 5433
RS2/10: ABS tape storage. Circle (1777)
DS4/16: double-drive mobile tape storage system. Circle (1778)

Telepak San Diego 6331
T-D2: soft case for DVR-2. Circle (1779)
T-Hip: hip-pack for accessories, batteries, phone, etc. Circle (1780)
T-Lens: lens covers. Circle (1781)

The Express Group 1912
Series 2000: studio furniture; a touch of elegance with budget pricing. Circle (1782)

Winsted 5139
Slide kits: rack-slide mounting kit, adapts to Panasonic M-II with adjustment t hold equipment in any position for maintenance purposes. Circle (1783)
Model 69001: D-2 tapecube, storages S-size D-2 format cassettes. Circle (1784)

Support Products

S5: Interconnections

- Wire, cable, fiber optics
- Connectors
- Patch panels, cords

Arcor Engineering 7757
DZ2202CLR: clear-jacketed, 2-channel audio cable. Circle (1785)

Canare Cable 6040
BCJ-XJ-TR: converts *DAT* digital 110Ω XLR-I/O to 75Ω BNC interface; permits long-line, low-loss transmission paths of serial digital audio data on coaxial material. Circle (1786)

Chester Cable/Alcatel NA 6319
EF audio series: single, multipair jacketed cables; high tensile strength, smaller OD than PR, PRJ types; shield bonded to inner jacket; ripcord for stripping, termination preparation. Circle (1787)

Video 20CL2 cable: 0.325″ OD, solid-core, double-braid shield; PVC jacket; precision 75Ω; use KC-59-299 connector. Circle (1788)

Connectronics 3073
One-Piece: audio adaptors. Circle (1789)

Conquest Sound 7353
SVS-1: Super VHS cables. Circle (1790)
OPTIMA: "high-definition" audio, mic and video cables. Circle (1791)
CVWS: Conquest Video Wiring System. Circle (1792)

GEPCO International 7802
2121B: digital video cable, 12½-pair for extended distance connections. Circle (1793)
GA724-M: 24ga multipair audio cable; extra flexible shield per pair. Circle (1794)

Nemal Electronics International . . 1451
ENG series: multi audio, video cable combinations for ENG. Circle (1795)

Neutrik USA 2107
NJ3FDH: ¼″ stackable jacks. Circle (1796)

Switchcraft 2226
Mini-DIN: series of miniature connectors and plugs. Circle (1797)
PQC connectors: series ST, RA types for PCB mounting. Circle (1798)
¼″ ***RA jacks:*** standard phone jack for PCB mounting. Circle (1799)
DC power jack: mounts on printed circuit board. Circle (1800)

Trompeter Electronics 5239
UPLRN connector: 90° BNC connector; in 75Ω, 50Ω; ranges to 4GHz. Circle (1803)
BNC, TNC plugs, jacks: straight, 90° plugs, cable racks, patch plugs for 724, 728, 734A, 735A, K19224L2 cable; splices for 728-735 and 734A-735A interfaces. Circle (1804)

Union Connector 6728
2H+G/C: 208V stage pin connectors; for currents from 60-100A. Circle (1805)
polybox: main switch panels - company switch with S.I.S. output. Circle (1806)

Support Products

S6: Recording media

- Analog, digital
- Audio, video
- Film, film maintenance
- Tape, tape maintenance
- Label materials

Ampex Recording Media 4301
#467 R-30, R-46 cassettes: 30-minute DAT media in DATpak package; unlabeled, bulk configurations; 45-minute unit reconfigured to R-46 length. Circle (1456)

DIC Digital 7733
MMT-400: "Middor Master Tape" for Otari TMD duplication systems. Circle (1807)

Lipsner-Smith 3100
Model CF3000-MK V: ultrasonic film cleaner for motion picture film; reduces solvent costs; quick, efficient operation produces cleaner film, allows less solvent and fume leakage into surrounding air. Circle (1808)

3M Pro A/V 4501
Hi8 MP: videocassette. Circle (1809)
#996: mastering tape for analog audio material. Circle (1810)

Research Technology Int'l/RTI . . 3100
Model 211: dropout counter for D-2 recording media; printer creates record of dropouts/interval, cumulative dropout from two independent counters; 1-24dB depth of dropout depth threshold. Circle (1811)
TC490M: videotape cleaner, inspector for MII format media; cleans, polishes; requires about two minutes to determine status of 90-minute cassette. Circle (1812)

United Ad Label 7507
Label stock: additional colors, materials for tape labels. Circle (1813)
Software: labeling software package from *Power Up*. Circle (1814)

Support Products

S7: Facilities

- Design, construction
- Fixed, mobile units
- Consulting services

BAF Communication 6907
ENG/EFP-SD-22: ENG/EFP medium-sized production vehicle; 22-foot unit includes four racks. Circle (1815)
CF-8000E: 32-foot satellite news vehicle; 8-rack facilities for equipment. Circle (1816)
CF-7000C: expanded production satellite news vehicle. Circle (1817)

Dataworld 1609
Service enhancements: coverage population density, terrain shadowing maps; received signal level maps. Circle (1818)
3 arc-second terrain data: Circle (1819)

Shook Electronics USA A220
MOD-20-27KU: Ku-band production vehicle; combines Ku uplink with a small format production facility; capacity for four cameras and four Betacam VCRs. Circle (1820)

Video Design Pro 7331
Autodesk 3-D Studio: use with VidCAD, AudCAD to create 3-D still images, animations of studio facilities designs, and other graphic presentations. Circle (1821)

Support Products

S8: Program services

- Music, effects libraries
- Promotional materials
- Weather services
- Satellite relay services

Audio Action 7131
New music releases: from Josef Weinberger Soundstage, KOKA, Primrose, DI Music, Baton, Beat/Fronitcetra, Image Music, K-VOX, Kosinus, Campion. Circle (1822)

Comsat World Systems 2057
High speed data: 56kbit mobile data services; high-quality audio by satellite from transportable terminals; also slow-scan video, photo transmission. Circle (1823)

Cycle-Sat 7309
Satellite Shuttle: high-speed delivery service of TV commercials, video from production centers in NYC, Los Angeles to 21 cities; delivery within two hours. Circle (1824)

FirstCom 1062
Music libraries: "New FirstCom Library," "Personal Music," "Chappell Recorded Music," "Sound Ideas." Circle (1825)

Focal Press 7200
Electronic Media Guides: series of books, each focusing on a particular topic or issue of the communications field. Circle (1826)

HLC/Killer Music 1526
Killer Tracks: production music elements. Circle (1827)

Production Garden Library 1115
100 series: broadcast production library; 1,200 cuts on 12 CDs. Circle (1828)
200 series: "AV" production music library; 10 CDs include sound effects. Circle (1829)

Signature Music Library 7030
Volumes 1, 8, 9: new CDs with inspirational, contemporary, corporate, Americana, action musical themes. Circle (1830)

TRF Production Music 2712
New releases: Bosworth, TeleMusic, MP-2000, Carlin Production Music. Circle (1831)
DAT format: classical items. Circle (1832)
RCA label: BMG production music library. Circle (1833)

Video products start on page 217

Now You Can Create Your Broadcast STL From Our Field-Proven Line Of Broadcast Radios.

With one broad stroke we've positioned Microwave Networks as the industry's premiere video supplier. By using video technology from Rockwell International Corporation, we have added 2, 6, 7, 8, 11 and 13 GHz video radios to our line of MicroNet products. Microwave Networks can now meet all your Studio-to-Transmitter Link (STL) requirements.

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The MVR-1000 Series of microwave video radios are manufactured under license from Rockwell International Corporation.

Circle (153) on Reply Card

Continued from page 36
tions and its transmitting power has increased by more than 300%. Many provinces and cities have established stereo and hi-fi broadcast stations and more than 8,900 ground satellite stations, 30,000km-long microwave links and 600 relay stations have been built. Despite the complexity of its geography, 75% of China's population is entertained by 170 million televisions.

FCC to begin FM technical proceeding

The National Association of Broadcasters (NAB) asked the FCC to initiate a technical process to establish realistic definitions for FM directional antennas.

In its filing, NAB also urged regulators to examine certain technical assumptions about FM signal characteristics to help the FCC accurately determine FM radio station service and interference.

Directional antennas may permit radio stations to place transmission towers more closely together, but broadcasters say there are technical concerns regarding the interference consequences of such moves.

Also seeking FCC action is the consulting engineering company of Hammett & Edison. Both groups asked the commission to decide which, among the 40 measured FM antenna patterns, the FCC considers "directional." NAB's filing, supporting the Hammett & Edison petition, said clarification is needed because the signal patterns from omnidirectional FM antennas show drastic distortions when mounted at various locations on supporting towers.

Broadcasters hope this action will minimize interference when an FM station locating a transmitter tower chooses not to comply with traditional "minimum distance standards." The NAB urged the FCC to review its regulations because they rely on the performance of directional antennas to prevent interference, and because they do not adequately consider pattern distortions caused by side-mounting antennas on towers.

FCC urged to prevent AM interference

Supporting the combined efforts of industry and government to improve the AM band, the NAB has urged the FCC to take further steps to prevent interference and ease ownership rules for the AM band.

In its filing, NAB reiterated its strong support for most of the FCC's AM improvement proposals. Among these measures are the adoption of more demanding technical interference standards, allowing existing AM stations to "homestead" on the expanded AM band, developing less rigorous AM-AM local duopoly restrictions, and establishing a new "reference receiver" program for AM radio receivers.

But two FCC proposals, viewed as a financial threat to the future of AM broadcasters, drew NAB criticism. Broadcasters said they oppose the re-imposition of AM-FM non-duplication rules, because they would restrict program simulcasts. In addition, NAB voiced its opposition to a proposal that would require AM stations to broadcast in stereo. NAB urged the FCC to provide incentives to encourage voluntary broadcasting in AM stereo.

On other issues, the NAB said it "finds great merit" with a commission proposal to grant tax certificates to stations choosing to reduce interference on the AM band.

DRB news continued from page 22
from the Electronics Industry Association (EIA) revealed that they have formed a DRB subgroup, and invited a CDRB representative to attend the next meeting. The NRSC also announced at this meeting the formation of its own DRB study group.

Another CDRB open meeting took place at the SMPTE/AES joint conference in Detroit on Feb. 2. The discussion concerned the current maturity of data compression and channel coding technology, the results of Eureka 147/DAB system tests under way in the United Kingdom, and the consequences of multiple generations of data compression being performed on the same audio signal as it passes through the broadcast-to-consumer chain. The establishment of a computer bulletin board on DRB was also proposed. CDRB's next open meeting will occur at the NAB convention in Las Vegas.

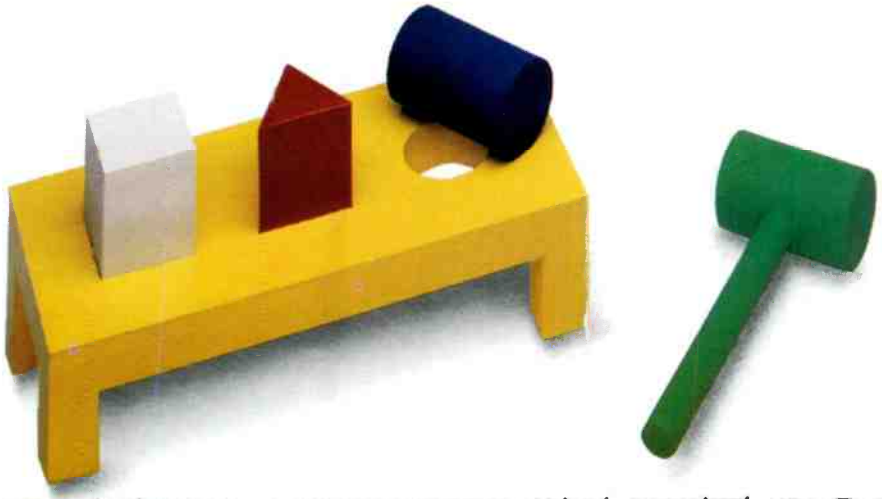
Gannett unveils new system

Gannett Radio has announced an "in-band" DRB system, which it plans to demonstrate publicly at the NAB Convention in Las Vegas, April 15-18. The format, called *coded polyvector digital modulation* (CPVDM), has been developed jointly with Stanford Research Institute International (SRI) and Corporate Computer Concepts, along with significant input from Tony Masiello of CBS. At present, CBS has not included itself as an official partner in the venture, but may yet do so. The partnership calls the effort "Project Acorn."

The system employs the MUSICAM coding algorithm to produce CD-quality digital stereo audio at 256kbit/s, and combines it with 128kbit/s of auxiliary data and error correction overhead. This datastream is placed into the RF path of a standard FM signal downstream of the FM exciter, putting the digital signal 30dB below the FM carrier. (A second-generation MUSICAM system expected soon will take advantage of the commonality of the two channels in a typical stereo audio signal, and reduce the output data rate to 192kbit/s. This will allow more spectrum in this application for auxiliary or additional error-correction data.) Similar methods are proposed for AM station use.

Because the system uses an in-band approach, no new transmitter or antennas are required, and the proponents claim that little or no regulatory approval seems necessary under current rules. Upheaval of the broadcast marketplace would also be minimized compared to other DRB proposals, according to Paul Donohue, engineering vice president for Gannett Radio. He predicted implementation costs for an FM station to run below $20,000.

Although each FM station's digital signal would still only operate within its 200kHz authorization, multipath research undertaken by Masiello and others has shown that frequency domain diversity across this much spectrum will be sufficient to combat most multipath occurrences. Typical multipath in urban environments causes nulls as deep as 50dB, but these are normally only on the order of 15kHz wide. In mountainous terrain, dips of 120kHz width are found, but these typically reach a depth of only 20dB. Project Acorn's system for multipath elimination is said to be able to combat both of these types of occurrences, using frequency diversity, and implementing a simplified form of techniques used in military and secure radio systems to recover an RF signal hidden below another stronger transmission. A full mobile demonstration of the system is scheduled for the Radio '91 Convention in San Francisco this fall.



FIND THE PERFECT FIT FOR *COMPONENT VIDEO SIGNALS*

4-Channel Display

Precise, comprehensive 4-channel monitoring of component signals —and *more* — that's what you get from Leader's new Model 5100 Component Waveform Monitor. The additional fourth channel allows for expansion into combined component-composite or YRGB facilities. Monitor all four signals singly or simultaneously in both overlaid and parade forms. For side-by-side observation of signals, choose the parade display. To compare levels and timing, select the overlaid display so that all signals are superimposed.

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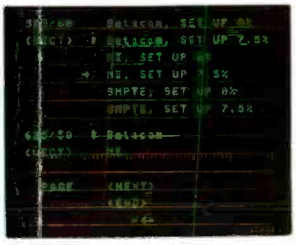
In tandem with our Model 425 Component Signal Generator, the 5100 displays relative timing errors in Leader's unique "shark-fin" pattern. Of course the unit can also employ the conventional "bowtie" pattern. An easy-to-read component vector display, with precision electronic targets, reveals errors in the chroma channels at a glance.

NTSC, PAL, and HDTV Compatibility

To meet the needs of video production for test equipment adaptable to varying standards around the world, the 5100 has been designed and built to operate in 525/60, 625/50, and 1125/60 HDTV formats. To encompass the latter, vertical bandwidth extends to a full 30 MHz in each of the four channels.



Easy Operation

Besides its comprehensive diagnostic capabilities, the user-friendly 5100 employs cursor measurements for both amplitude and time. And menu-driven operation allows for quick and easy adaptation to match signal formats and monitoring needs.

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The versatile 5100 accepts power from a wide range of sources (90 to 250V ac) and works on 12V dc for field use as well. For more information or our full-line catalog, in NY call 516 231-6900. Or call toll free:

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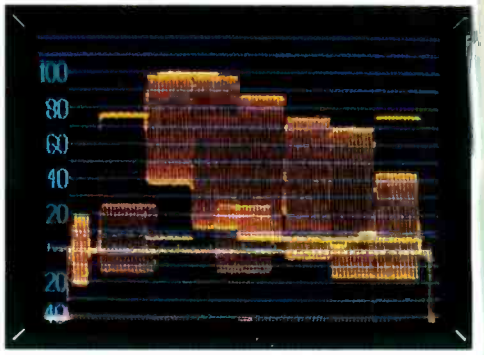
Circle (106) on Reply Card for product information.
Circle (105) on Reply Card for product demonstration.

New at NAB: video products

Less is More:

Magni Monitor



- Display signals on standard picture monitor or compact LCD screens—no more special CRTs!

- Waveform or vector monitoring
- Remote control
- SC/H Phase indicators

- Display emulates CRT look and feel
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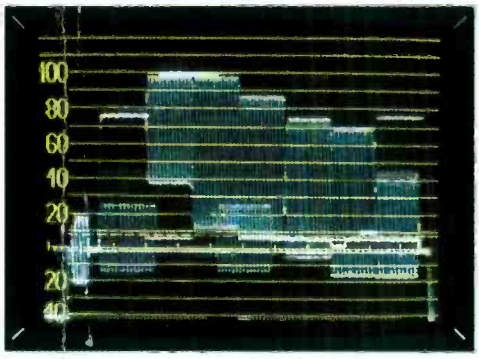

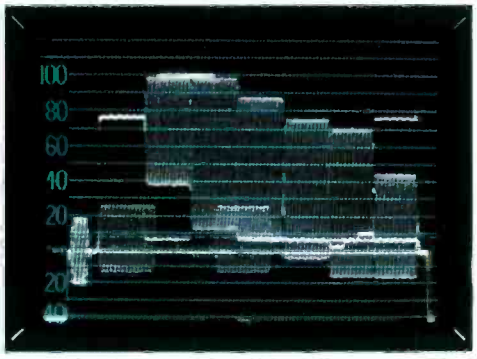

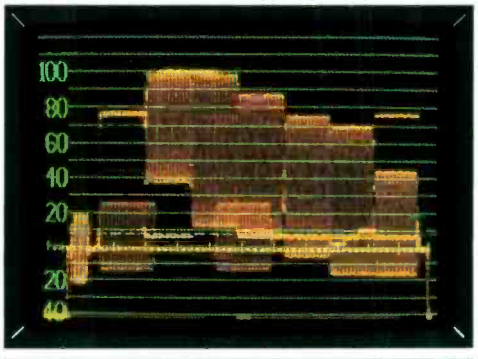

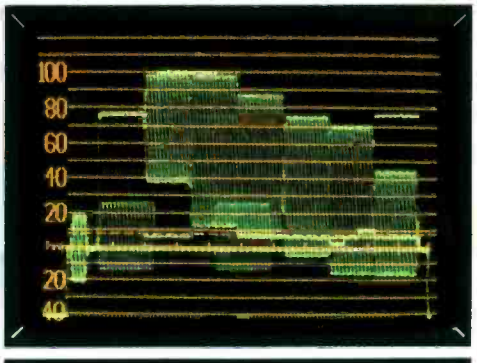

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Circle (107) on Reply Card

New at NAB:
video products

Video Products

V1: Video cameras

- Lenses, control systems
- Tripods, pan/tilt heads
- Pedestals, automation

BTS **4032**
LDK-9: studio camera with FT-5 frame transfer CCDs; more than 700-line resolution (806 pixels/line); with *9000* remote control, mix with LDK-91s, LDK-910s; dynamic white shading removes prismatic color artifacts at certain focal lengths and apertures; 8-position filter cassette. Circle (1834)

Canon Optics **5913**
Canon J33: 33× internal focus lens; for field production, ENG. Circle (1835)

Cinema Products **5334**
Steadicam IR: stabilizer for 8mm, Hi8, VHS, VHS-C camcorders; integrated video monitor, Obie light. Circle (1836)
Steadicam EFP enhancement: active matrix color display; for cameras to 24 lbs; options for NTSC, PAL. Circle (1837)

Comprehensive Video Supply . . . **5863**
Bilora tripods: camera, light support products; model 1473 head. Circle (1838)

egripment **7810**
Model 192/E: electric lift column option for Dino dolly system. Circle (1839)
Model 148 Skymote: extension unit for the Piccolo crane series. Circle (1840)
Dinky Dolly 156: portable 4-wheel, steerable dolly. Circle (1841)
#205 mini head: remote-control camera head for lightweight cameras. Circle (1842)

FGV Panther **7631**
Motorized mini Panther: 1-speed, variable control dolly; motorized unit. Circle (1843)
Pickup Panther: heavy duty, light weight, crabsteer dolly. Circle (1844)
Panther MultiGlider: allows camera movement of six feet at any angle. Circle (1845)
Studio mini Panther: pedestal version of the mini version. Circle (1846)

FOR-A **5901**
HMC-2010: high-resolution multicam real-time color camera; with 1,000×1,000-pixel CCD array. Circle (1847)
HMC-1040: HR multicam RGB image capture system; 525/60 operation. Circle (1848)

Geocam **7525**
4/4.2 OB: matte box mounts directly to lens; 12 oz. overall weight. Circle (1849)
GeoFX: lightweight filters for Matte box use; 15 grams. Circle (1850)
GeoFocus: follow-focus; 3-speed forward and reverse. Circle (1851)

Hitachi Denshi **5001**
SK-F750 upgrade: studio camera using FIT CCDs; 450,000-pixel array. Circle (1852)
SK-F350: FIT CCD studio camera; 450,000-pixel array; RGB triax cable. Circle (1853)
SK-F300: CCD studio camera; FIT-type device for 400,000-pixel array; features RGB triax cable. Circle (1854)
FP-C10, FP-C10F: IT and FIT CCD-design cameras for ENG. Circle (1855)
CU-F300 CCU: control unit for triax, multicore operated cameras. Circle (1856)
SK-F600 camera: IT-CCD unit for studio operation. Circle (1857)

Innovision Optics . . . . . **.7639**
Probe Lens: 19″ long, 1″ diameter; interchangeable lenses. Circle (1859)
Mini-Probe lens: 15″ long, ¾″ diameter; adapter; provides three different angles of view, internal light source. Circle (1860)
Mini-jib arm: portable camera support for tabletop work; 63-pound unit breaks into two parts for transport; precision movement for closeup use. Circle (1861)

JVC . . . . . **.5327**
RM-P300U, RM-P900U: adaptors for multicore, triax remote-control capability of KY-35U, KY-90U cameras; *-P300U* for multicore to 300 feet; *-P900U* triax to 1.5km; base station included; Y/C-358, component, composite outputs; compatible with RM-LP821U RC panel unit. Circle (1862)

Karl Heitz . . . . . **.3019**
Model 280: fluid head, 90° side tilt, quick release; loads to 12 pounds. Circle (1863)
Model 180: fluid head, 90° side-silt, quick release; loads to 10 pounds. Circle (1864)
Model 380: fluid heads, drag for both fluid motions, quick release, shift plate for cameras to 15 pounds. Circle (1865)

Matthews Studio Equipment . . . . **.4349**
Mojave Desert Dolly: camera dolly and support system. Circle (1866)
MC 88 crane. Circle (1867)
ITE support systems: T/H 500, T/H 600, H700, H800 for ENG, studio. Circle (1868)

Miller Fluid Heads (USA) . . . . . **.6801**
#403: 2-stage tripod. Circle (1869)
#104: 20 series II fluid head. Circle (1870)

O'Connor Engineering Labs . . . . **.4139**
#5-15: fluid head for cameras to 20 pounds; adjustable counter balance. Circle (1871)
Model 25-75 prototype: fluid head for larger cameras to 80 pounds. Circle (1872)

Panasonic . . . . . **.4513**
AJ-D310: ½″ digital camcorder. Circle (1874)

Sachtler . . . . . **.6701**
Model 1800L: Video 18 III; lightweight ENG fluid head. Circle (1875)
Model 2000L: Video 20 III; new lightweight ENG/EFP fluid head. Circle (1876)

Sony . . . . . **.4401**
DXC-151 camera: single-chip RGB color; HAD imager with 460-line resolution; maximum sensitivity at 25 lx, F/1.4; electronic shutter; used for industrial, telecommunications applications. Circle (1877)
Hyper HAD: enhanced performance *hole accumulated diode* technology; increased sensitivity, low-noise, high-resolution imager; for all Sony cameras. Circle (1878)
DXC-327 camera: ½″ 3-CCD using HAD sensors; increased chip sensitivity, enhanced detail; 700-line resolution with 60dB S/N, F/5 sensitivity; recording output configurable for U-Matic/SP, Hi8, S-VHS; standard output for VBS, Y/C (S-video), optional RGB; 5-speed shutter. Circle (1879)
DXC-107 camera: 1-chip design produces 470-line color images from 9 lx at F/1.2 maximum sensitivity; electronic shutter; special purpose camera for surveillance, educational, telecommunications systems; electronic exposure control. Circle (1880)

Thomson Broadcast . . . . . **.5045**
TTV 1542F: studio camera featuring FIT CCD devices. Circle (1881)

Thomson Electron Tubes & Devices **6342**
THX 898: 1″ camera tube for HDTV; Primicon photoconductive layer; electrostatic deflection, magnetic focus; integrated focus coils; LED bias light; 40% transfer function at 700 TVL; limiting resolution greater than 2,000 pixels per line. Circle (1882)

Thomson Video Equipement **5045**
Camera enhancements: FIT sensors for TTV 1647 ENG/EFP family, TTV 1542 studio camera; improved sensitivity, resolution, highlight handling. Circle (1883)
HD 1250 Proscan enhancement: triax cable for studio camera. Circle (1884)
HD 1250 Light: portable version of HD 1250 Proscan HDTV camera. Circle (1885)

Toshiba/Consumer Products . . . **HDTV**
HSC-100: HDTV camera; CCD sensors with 2-million pixel array. Circle (1886)
TSC-100: Hi8 camcorder; ½″ CCDs with 700 TVL resolution in 413,000-pixel array; 14W drain allows batteries to record up to two hours; light weight package. Circle (1887)

Toshiba/Video Systems Group . . . **6000**
IK-M40A camera: high resolution color; Y/C S-VHS output; 470-line resolution; electronic shutter to 1/10,000s; ½″ CCD provides 420,000-pixel array; to 15 lx at f/1.6. Circle (1888)

Total Spectrum Mfg . . . . . **.6427**
ACP-4000: portable camera control system; uses touchscreen concepts. Circle (1889)
Camera CCU control: for Autocam ACP-8000 touchscreen control. Circle (1890)

Video Products

V2: Recording systems

- Analog, digital
- Tape, solid-state
- Magnetic, optical disk
- Still-stores
- Editing controllers
- Time-code products

Adams-Smith . . . . . **.2702**
Zeta-Three EM: upgrade to system with *transport emulation*. Circle (1891)

Adrienne Electronics . . . . . **.7818**
AEC-BOX-80: serial interface for parallel VTRs. Circle (1892)
PC-VLTC computer card: LTC, VITC reader, generator functions on one board for IBM PCs. Circle (1893)
AEC-BOX-50: Ampex-to-Sony serial protocol converter. Circle (1894)
AEC-BOX-30: LTC data inserter for serial control VTRs. Circle (1895)

Ampex Corporation 4301
ACE 25 option: internal video switcher for ACE 25 editor; A/B bus with 23 wipe patterns; 3-VTR control, three auxiliary sources; extensive cut, wipe, dissolve, edge and border controls. Circle (1896)

ASC Video/Case Editing Systems . 7010
ASC Clean & Trace: automatically identifies list formats; menu system assists an editor through all processes for reduced operator confusion. Circle (1897)

Aston Electronic Designs 6514
Wallet Two: expanded still-store with capacity to 700 image on-line. Circle (1898)

Avitel Electronics 7805
TGE 3280: modular time-code generator; LTC or VITC signal forms. Circle (1899)

Axial Corporation 5245
Axial On-Line: editing controller system. Circle (1470)

Calaway Editing 5401
E-to-E Preview: software upgrade for CE series videotape editing systems; eliminates need for connections of an external preview switcher. Circle (1900)
Prototype: high-end editing system to be shown. Circle (1901)
Model CD 100A/D: expanded 4-VTR CE-100; uses ASCII coding and provides numerous dedicated keyboard options. Circle (1902)

Cipher Digital 5347
CDI-1200: time code reader with character inserter. Circle (1903)
CDI-1000: VITC reader, translator and character generator package. Circle (1904)
CDI-1400: time code generator. Circle (1905)

CMC Technology 4549
Betacam SP: VCR, VTR upper-head drum refurbishing service. Circle (1906)

CMX 5545
OMNI 1000: editing controller; assignable device ports with 9-of-22 active simultaneously; X-Windows graphic user interface; ESbus protocol; dedicated keyboard includes search knob, *tracball* for transport, cursor location and function control device; Sync Group Window, source roll; cut-and-paste EDL editing. Circle (1907)

Comprehensive Video Supply . . . 5863
CUTTER: cuts-only editing controller; complete system package includes keyboard, two CVNET interfaces, master controller card, software, cables. Circle (1908)
List Master: EDL utility software package integrates list cleaning, management, tracing, translation. Circle (1909)
Edit Master: full-featured editing package, now available for Macintosh; optional control knob, CVNET rack-mount. Circle (1910)

Digital F/X 7035
Soft F/X: low-cost video editing package for use with Macintosh II; disk-assisted editing; may be used as off-line editing decision making system, with final assembly on companion Video F/X system. Circle (1911)
Video F/X: integrated video, audio editing, and graphics system; Macintosh control of desktop video production; create scripts or storyboards; import, edit video, graphic, audio with automatic assembly to execute a finished program. Circle (1912)

Dwight Cavendish 6629
Copymaster 350: computer-controlled quality control system. Circle (1913)
VS 618: control panel for Panasonic AG-684 recording system. Circle (1914)

Editing Machines Corporation . . .6303
Enhanced EMC²: removable media, C-cube video compression for high resolution; *V-Hless* image with doubled picture size; open architecture. Circle (1915)

Evertz Microsystems 2101
Model 4015K: film footage encoder; time-code generator links telecines, external bar code readers; for Keykode numbered film stock. Circle (1916)
Model 7200/VPR-2B: e^2 intelligent interface for serial control of VPR-2B transports from editing control units. Circle (1917)

Fast Forward Video 6445
Model F30: time-code generator, reader, inserter; 1/30-10× play forward, reverse; drop-, non-drop-frame, 24fps, 25fps formats; jam sync; converts SMPTE to MIDI code; supers code onto video; RS-422 control port, GPI output. Circle (1918)
Model P2: portable time-code generator; RS-232, MIDI interfaces. Circle (1919)

Grass Valley Group 5301
VPE-241: mid-price editing control; extends VPE-141; four EDL bins, 8,004-line EDL; SWAP second floppy disk drive; software includes *409* and *TRACE*. Circle (1920)
VPE-131 controller: edit with six device ports (four VTRs); choice of protocol, full function keyboard, jogger; 1,001-line EDL, on-board disk drive; *Super Edit* software; for small on-line, off-line suites. Circle (1921)

Gray Engineering Labs 5848
DTR-313: time-code reader, generator; EBU, SMPTE spec; independent LTC, VITC read, generate functions. Circle (1922)
VR-321: dual-standard, safe-title, safe-action video reticle generator; size, position control, crosshair, crosshatch, key capability; store and recall functions. Circle (1923)

Hitachi Denshi 5001
VL-D500 recorder: enhanced D-2 digital composite video recorder. Circle (1924)

Horita 7541
VT-50: palm-size, time-code translator converts SMPTE VITC to LTC; used with Horita WG-50 for window dubs, with audio synchronizers, edit controllers; also in rack-mount, field packages. Circle (1471)
CGB-50: color bar source; full-field, split-field, black-burst, composite sync; auto switch from bars to black after 30s or 60s for striping of master tapes. Circle (1473)
TRG-50PC, PC-LOG: time-code reader, generator, window inserter, RS-232 serial output; tape log with EDL software; TRG-50PC supports industry standard TC modes; PC-LOG runs on IBM compatible, files compatible with CMX, GVG, Convergence, Calaway EDL, DBASE format. Circle (1495)

JVC 5327
RM-G860U: production units; A/B roll videotape editing controller; 45-pin, 9-pin connectors match numerous VTRs for control; assembly, insert, V-A split edits; two GPI outputs for switcher, audio mixer; TC, CTL-track reference. Circle (1925)

Leitch Video 4009
Gateway Film Transfer: utility; greater accuracy, speed of color balance; comparison wipes, windows, cut-paste, pixel value determination. Circle (1926)
DSF-3120 Gateway: digital Still File interface between component, composite equipment; networking option for configuration to multi-user system; D-1/CCIR 601 4:2:2, 4:2:2:4, 4×4 formats; to maximum of 10,000 stills on line. Circle (1927)

Leightronix 7644
LGX-DUB: PC-based duplication controller; CRT shows configuration of duplication system; job keys, mouse for input to control 10 master decks, up to 80 slave VTRs; automatic switching of sources to slave decks; run seven jobs simultaneously. Circle (1549)
LGX-P232TC: machine control interface with SMPTE time-code reader; directs VHS, S-VHS VCRs for multimedia, desktop video, remote control; 32 interfaces from one serial port; complete software. Circle (1599)

Montage Group 7611
Montage System III: all-digital, non-linear editing system; configured in a portable, desktop approach using picture-oriented editing. Circle (1612)
System II-H: enhanced off-line system; user selects analog, digital playback with proprietary video compression. Circle (1753)

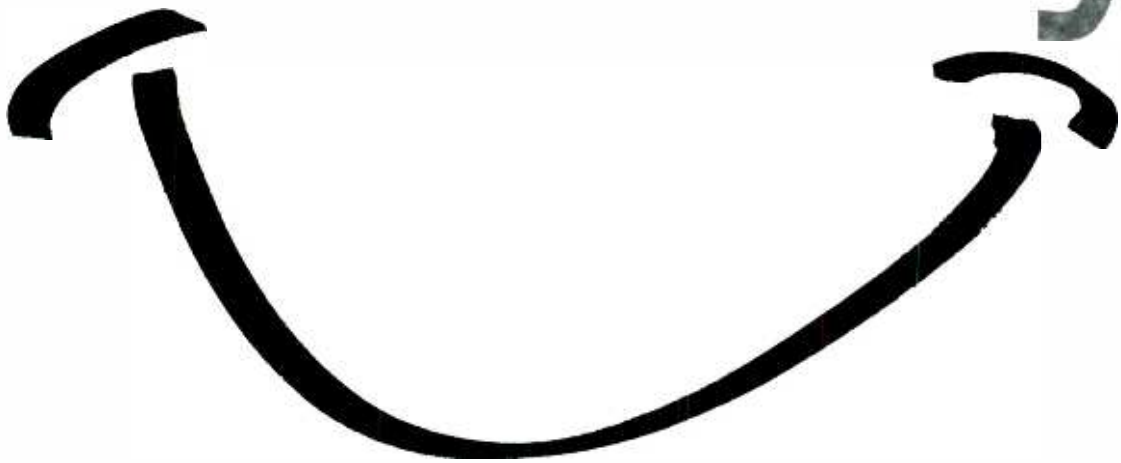
Paltex 6514
Abner/2: low-cost A/B roll editor; EDL, auto-assembly capabilities. Circle (1928)

Panasonic 4513
AJ-D350: ½" digital VTR. Circle (1929)
AG-7650: S-VHS player. Circle (1930)
AU-410: dockable MII VTR. Circle (1931)
AJ-D320: ½" portable digital VTR for field use. Circle (1932)
WV-F700 editor: digital processing camera; 750-line resolution. Circle (1933)
AU-62, -63, -65: MII format studio players; *-63* has auto-tracking feature. Circle (1934)
AU-520: portable MII VTR. Circle (1935)
AG-A770: multievent editing for cuts-only; 128-line EDL. Circle (1873)
AG-7750 S-VHS: Hi-Fi, editing VCR; integral TBC, digital noise reduction; RS-422A serial interface; capstan servo, full-loading stop, high-speed search to 32× play speed with viewable pictures; 400-line resolution; laminated amorphous heads. Circle (1936)

Quantel 6500
Flash Harry: an extension to existing Harry editing system design. Circle (1937)

Sony 4401
SVO-140, SVO-160 VHS: mono, stereo HiFi VCRs for professional applications; tape stabilizer for minimized jitter; digital tracking; high-speed rewind; *Rapid Access* transport with automatic repeat; *Double Azimuth* 4-head design. Circle (1938)

Real-time, real friendly.



The CG4733 respects your creativity and is extremely responsive to your artistic inspirations. It doesn't overexpose you to a blizzard of menus and pushbutton manipulations. It's simply sophisticated and a true ally during on-air panics and posting deadlines with your nervous client.

The CG4733's intuitive software, 10 MIPS Digital Signal Processor, 4:4:4:4 architecture, and easy to use, menu-free operation set the stage for a lasting relationship. And there are many more qualities you'll like when you get to know the CG4733...

• Instant character resizing (with edge effects) from 8 to 512 lines. • Antialiasing with 4.6nS resolution and real-time rendering of 10 standard typeface masters—over 1500 URW typefaces available. • Three microprocessors with 32 bit processing, 40 MByte on-line storage, and local area networking capability. • RGB/YP$_r$P$_b$ inputs/outputs or optional D1 video I/O capability. • Only 3RUs. Keyboard is 1RU and slides into a 19″ rack.

Graphics Plane Option. • High performance unit with dedicated graphics processor. • 32 bits/pixel frame buffer with 2 picture memory, real-time frame grabber, 16.7M color palette with full paint facility. • Digital linear keyer and dual channel capability.

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NAB Booth 6016

The CG4733 Character Generator with graphic plane option. Real-time...real friendly

PESA

Over 100 CG4733s will keep pace with the 1992 Olympians in Barcelona.

Circle (164) on Reply Card

Editor system enhancements: software upgrades for expanded features for BVE-9000; *System Pacs* turnkey editing packages using BVE-9000, BVE-910. Circle (1939)
DVTR enhancements: for D-1, D-2 video recording systems. Circle (1940)
D-2 options: serial interface (BKDV-105) for transmission of video, 4-channel audio on single coaxial cable; audio pitch correction (BKDV-110) with time compression/expansion capability with range of ±15% normal play speed. Circle (1941)
EVW-325 camcorder: combines DXC-325 camera with EVV-9000 VCR; Hi8 format with 400-line resolution; separate Y/C video inputs; time-code generator. Circle (1942)
All digital serial edit suite. Circle (1943)

D-2 software version 3: introduces animation edits for graphics on DVR-10, -18; edits of constant duration or film with 2-field/3-field sequence; pre-read control; auto audio mute in still mode. Circle (1944)
VA-90 adapter: connects any camera to portable Hi8 VCR. Circle (1945)
BVW-50: Betacam SP VCR with 90-minute capacity; portable unit can be used for field editing. Circle (1946)

Telcom Research 7115
Model T102: SMPTE/EBU generator, reader; RS-232-C control; jam-sync, continuous jam-sync; portable unit operates drop, non-drop, 24-, 25-frame; EDL, TC-LOG, electronic front panel software. Circle (1947)

Time Logic . . . . . N.A.
Scene Manager: on-line data base for Ensemble editing packages. Circle (1948)

Toshiba/Consumer Products . . . HDTV
HV-8900: ½" analog HDTV VTR. Circle (1949)
TFS-500: HDTV digital framestore; 72-frame capacity. Circle (1950)

United Media 5021
UMI 9600: edit controller, host system integrator sharing of information, data, equipment hardware and other resources by an integrated system. Circle (1951)
UMI 450: A/B roll edit controller with serial switcher, mixer control. Circle (1952)

VideoLab Para Technologies 7000
Time Code Processor: read, generate LTC, VITC; VITC edit mode; MIDI code output; auto-log data output for printer or computer; TC phase meter. Circle (1953)

Videomedia SED 6807
Micron-S: editor control with full switcher control; list management. Circle (1954)

Video Products

V3: Processing systems

- Encoders, decoders, TBCs
- A/D, D/A converters
- Synchronizers, video/pulse delays
- Keyers, compositers
- Standards converters
- Sync, VID generators

A.F. Associates 6401
AVS TK 3:2: image transformation system; converts U.S. 24-frame film to NTSC 525/30 or PAL 625/25 standard; interruption of a 3-field sequence causes switch to 4-field motion-adaptive conversion until a correct 3:2 sequence is re-established. Circle (1955)
SIGMA: video processor. Circle (1956)

ALTA Group 5401
TBC/effects: dual-channel TBC; integrated wideband composite and Y/C component switcher; digital effects functions combined in single package. Circle (1957)

AVS Broadcast 7640
Sigma: video processor operates as a synchronizer; image correction, format interchange, proc-amp functions; converses in 525-, 625-line standards as composite, component, RGB/YUV, Y/C formats; 16dB noise reduction based on triple filtering block; motion adaptive processing. Circle (1958)

BAL Components 5751
DIGISTREAM 3: parallel-serial interface for CCIR 656 specs. Circle (1959)
Series 7: submicro video filters meeting 4:2:2 specifications. Circle (1960)
Synchrotime: frame synchronizer with interface. Circle (1961)
NanoDel series: subminiature delay modules for HDTV. Circle (1962)
DIGICOMB DDN200: digital comb filter decoder for NTSC. Circle (1963)

Broadcast Video Systems/BVS . . . 5221
MASTERKEY: series of four downstream linear keyers. Circle (1964)

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Circle (166) on Reply Card

TDT-200: time, date, ID source. Circle (1965)
Decoders: *D-100* NTSC decoder with digital, adaptive comb filter; *D-101* is a dual-standard NTSC, PAL decoder. Circle (1966)

CEL Electronics 6316
P171 encoder: encodes 4:2:2 digital to PAL, NTSC composite; processing in digital domain; adaptive comb filter reduces cross-color, cross-luminance. Circle (1967)
Model 165-50: feature for *TETRAplus* standards converter; 58 individual test patterns including zone plate, multiburst, SMPTE bars; 525-/625-line, component, composite NTSC, PAL, SECAM. Circle (1968)

Digital Processing Systems 6536
DPS-2200: TBC/synchronizer. Circle (1971)
DPS-295: TBC/framestore. Circle (1972)
PC plug-in: TBC on Amiga PC card; composite, Y/C inputs for S-VHS, Hi8 sources; broadcast signal out; used with *Newtek Video Toaster* and other PC-based video production units; card may be used with any IBM-compatible PC. Circle (1973)
DPS-375: TBC/framestore, based on PAL standard. Circle (1974)

Ensemble Designs . . . . . .
Model CP10: 10-channel control panel for the TC400D system. Circle (1975)

Faroudja Laboratories 5934
Model LD-1: *SuperNTSC* line-doubling, digital scan converter for HDTV, computer-related sources; changes video from 525- to 1,050-line structure; digitally compensated motion anomalies; interlaced or non-interlaced modes. Circle (1976)

FOR-A 5901
FA-310: full-frame S-VHS TBC/transcoder; motion-compensated noise reduction; dropout compensation. Circle (1977)
FA-220: full-frame TBC; motion-compensated noise reduction, DOC feature; standard video format. Circle (1978)
EVM-1000: event memory enhancement for CCS-4360 color-correction unit; provides 10 storage registers. Circle (1979)
FA-720 dual TBC: two full-frame TBCs; independent operation; S-VHS, composite interface; transcoding, motion compensated noise reduction with DOC. Circle (1980)
UDP-1000: universal digital signal processor; combines time base corrector, encoder, decoder, 3-D motion-compensated noise reduction features. Circle (1981)
MVP-2200: multivideo processor; scan processing provides interface for PC, Mac computers. Circle (1982)
CT-120: component transcoder; bidirectional RGB and YC_BC_R. Circle (1983)
Y/C 688 TBC. Circle (1984)
Frame sync: compact unit. Circle (1985)
CT-110: component transcoder; Y/C to YC_BC_R conversion. Circle (1986)

Grunder & Associates 3024
Feral C-100: synchronizer/TBC; full-frame S-VHS, composite signals; direct serial control capability. Circle (1987)
DTC 2604: standards converter, from *Video International.* Circle (1988)

Intelvideo 7436
IV-8: low-cost professional quality NTSC color video encoder. Circle (1989)
IV-6W: wideband NTSC encoder; digital modulation with comb filtering for reduced composite artifacts. Circle (1990)

Laird Telemedia 2027
CKM-4: multilayer keyers; generates, stacks four layers in any order. Circle (1991)

Leitch Video 4009
SPG-1500P: PAL master sync generator; 1-RU space; no warm-up, high-stability oscillator, SC/H phase; test signal options available in SPG-1510P. Circle (1992)
DFS-3002 synchronizer: full-frame synchronizer; inputs, outputs in analog NTSC, D-2; 10-bit processing for analog, 8-,10-bit in D-2 form; 4-field memory; comb filter for freeze-field, freeze-frame. Circle (1994)

Lyon Lamb Video Animation 7243
ProVAS: complete video animation system with controller, encoder and RS-170A sync generator. Circle (1995)

Magni Systems 7201
VGA-Producer/PAL: video encoder for VGA graphics to 800×600 resolution, 256 colors; PAL standard; remotely controllable transition features. Circle (1996)

Nova Systems 2051
Nova 920SP: wideband Y/C time base corrector; effects functions. Circle (1997)
Nova 950: transcoding TBC; multiformat operation, enhancement, noise reduction, black stretch functions; 4×1 input selection among component, Y/C, composite inputs, outputs; wideband processing for all component formats. Circle (1998)
Nova 8 series: models 800, 810 full-frame TBCs; for servo, non-servo VCRs; corrects all formats with infinite window; *810* includes subcarrier feedback for U-matic/SP; Y/C(3.58) provides wideband 5.5MHz bandwidth for S-VHS, Hi8. Circle (1999)

Paltex Imaging Systems 6514
DYAD/D1: digital D-1 video component mixer/keyer. Circle (2000)

Prime Image 7745
6.5 P series (#6510): wideband synchronizers for PAL standard; models with and without digital effects. Circle (2001)
RGB option: enhancement for HR600+ and 7.5MHz series TBCs; RGB input, output capability. Circle (2002)

Sigma Electronics 4577
DEC-1.0: decoder for NTSC/S-VHS to RGB signal format. Circle (2003)
SLI-2000: signal line identifier; designed for remote station checkout. Circle (2004)

Sony 4401
BVX-D10: digital color-correction system; direct editor control. Circle (2005)

Tektronix 4339
SPG-1000 HDTV sync generator: multiformat signal source; supports HDTV production environment; master, slave capability for different input, output formats (i.e., PAL in, HDTV out). Circle (2006)

Television Equipment Associates . . 3041
TBW series: Brickwall video filters; remove subcarriers at 4.83MHz. Circle (2009)
CS 048: video filter for HDTV. Circle (2010)
TCL series: video filters; to remove subcarrier signals at 5.7MHz. Circle (2011)
ECD series: video delays. Circle (2012)

Thomson Video Equipement 5045
A/D, D/A converters: for HDTV/EDTV studio; up-, downconverters, distribution interface products. Circle (2014)

Ultimatte 6010
System-6 High Definition: video compositing system for 1125/60 and 1250/50; programmable for other possible HDTV parameters; includes *screen correction* feature of standard systems. Circle (2015)
System-6 ITA: *Interface to Anything* ties the System-6 with editing; permits routing switchers to load files from System-6, synchronize camera switching. Circle (2016)
PC Remote with GPI: IBM-compatible computer with menus emulates System -6 remote control. Circle (2017)
Smartstore: for *screen correction* by compositing system, even when no clean frame of a backing color exists; Frame Builder memorizes all backing areas revealed to build a clean frame. Circle (2018)
System-6 transcoder: 2-channel, bidirectional; links compositing system with any component recorder. Circle (2019)
Disk drive, Link: external disk stores, loads System-6 settings, time-code data; 3.5″ drive connects to system by RS-232; *Link* stores files with a PC via RS-232; permits files to be transported between computer and Ultimatte-6 disk drive. Circle (2020)

Video Associates Labs 3059
MicroKey/Genlock: locks signals from MicroKey/A or MicroKey/AV output to external video source. Circle (2021)
MicroKey Digitizer: video-to-VGA digitizer; windowed video preview on fixed-frequency VGA monitor. Circle (2022)

Video International Development . 6017
Model DTC 1504: 4-field, 4-line standards converter system; low-cost design for quality without the price. Circle (2023)

Vistek Electronics 7044
Vector Motion Estimator: near transparent standards conversion with *Vector V4401*; Vector Motion Compensation reduces motion-produced artifacts in conversion processing. Circle (2024)
V4301: frame synchronizer; component, composite, Y/C, D-1; 4:2:2 CCIR 601/656 spec; TBC, freeze, grab features; correction for video gain, black level, chroma gain, chroma/luma delay. Circle (2025)

Yamashita Engineering Mfgr/YEM . 7443
CVS-980: autolock scan converter; for scan frequencies from PCs to workstations; zoom capability. Circle (2026)
CVS-960: autolock scan converter; designed for high resolution, such as interlaced workstation in CAD/CAM, simulator, medical products. Circle (2027)

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Circle (167) on Reply Card

Video Products

V4: Graphics, effects

- Paint, titling, animation
- Software, hardware
- Image effects, manipulation
- Weather graphics displays
- Integrated production systems
- Peripherals

A.F. Associates 6401
Manuscript: production model of graphic titling system; RISC-based; dynamic resizing of anti-aliased fonts; linear keying, character set supports 47 languages. Circle (2028)

Accu-Weather 5552
UG 386AT: PC-based weather graphics; features high-resolution images. Circle (2029)

Alden Electronics 5237
LPATS: lightning location, tracking plots cloud-to-ground strikes. Circle (2030)
WS5500: weather workstation; display for NEXRAD radar, weather and weather chart images. Circle (2031)

Alias Research 2026
Animator: compute software for 3-D modeling, rendering, animation, video integration; production package includes Silicon Graphics Personal IRIS workstation; leasing programs available. Circle (2032)
PowerAnimator: 3-D graphics animation; parameter-based digital, video integration; operates on S.G. Personal IRIS workstation; time-line animation warps sequence durations; field rendering standard; VideoFramer machine control with Videomedia V-LAN interface. Circle (2033)

Ampex Corporation 4301
ADAPT: composite digital layering device; connects to AVC Century, Vista and other switchers permitting analog switcher with two D-2 signal mixing; four composite digital, six analog sources; layers two for key or mix between backgrounds. Circle (2034)
ADO 100 upgrade: 2-channel capability includes Warp Speed effects. Circle (2035)

Aston Electronic Designs 6514
Model 1250: HDTV-compatible titler, character generator. Circle (2036)

Aurora Systems 5545
AU/300: 3rd generation paint/animation software. Circle (2038)
AU/250GT: 50% improvement over AU/250; multiplane animation, powerful design aids; total redesigned CPU. Circle (2039)

AVS Broadcast 7640
Integra: integrated digital mixer, 3-D effects; FlexKey composites four key levels with background in one pass; 4:2:2:4 architecture offers perspective and advanced 3-D effects as options to standard 3-D effects with key channel. Circle (2041)

BASYS 6415
System 21: closed-caption and prompting system. Circle (2104)

CEL Electronics 6316
Model P195: 3-D image manipulator effects package. Circle (2042)

ColorGraphics Systems 5401
Version 5.1: for DP 4:2:2, DP/MOSAIC, with 3-D and Morph modules. Circle (2044)
Workbench: video clip processing for DP 4:2:2 and D/MOSAIC systems. Circle (2045)
68040 processor: upgrade for LiveLine 5, ArtStar 3-D Plus systems. Circle (2046)
Version 6.4: software for LiveLine 5, ArtStar 3-D Plus graphics systems. Circle (2047)

Comprehensive Video Supply 5863
CUE MASTER upgrade: teleprompting package with handheld controller, through-the-lens monitor. Circle (2048)

Computer Engineering Associates .7542
Rundown module: includes variable auto script timing, user-defined display formats, automation computation of back, elapsed and cumulative timing. Circle (2049)
Multilingual prompter: 9-language prompt capability; multilingual with split-screen editing in two languages. Circle (2050)
Multiprompter control: three separate scripts may be shown on separate prompting monitors at the same time from a single controller. Circle (2051)

Computer Prompting 6933
CPC-1000D: flat screen teleprompter display; weighs 8 lbs. Circle (2052)
CPC-1000N: prompting, closed-captioning software includes an interface to electronic newsrooms. Circle (2053)
CPC-500 Plus: closed-captioning system with time code. Circle (2054)

Dubner Computer Systems 5301
30-KWN WeatherWatch: weather data gathering, display system. Circle (2055)

Dynatech NewStar 5401
Machine control: interface to Chyron 4100, Super Scribe and BTS Vidifont graphic titler systems in the newsroom; multimedia integration capabilities. Circle (2056)

Echolab 6116
Tempest-900: production model digital effects with 3-D manipulation from mouse user interface. Circle (2057)

Electrohome 5308
ENSEMBLE retrofit: early JAZZ products upgrade to Ensemble level. Circle (2058)

Enterprise Electronics 5566
Radar data: auto time lapse, multicolor map overlays and underlays. Circle (2059)
386 PC upgrade: enhancement with high-resolution display, new radar control for DWSR-90CTV weather graphics; replaces RDP-8800 control. Circle (2060)

FOR-A 5901
MF-3000 Multifex 3D: digital effects processor; includes perspective, rotation, curve manipulations. Circle (2061)

Getris Images 7145
Venice PAINT: enhancement to 4:4:4:4 architecture graphics system; multiple VTR control. Circle (2097)
Venice ANIM: digital compositing, animation on 11 framestores; digital effects; menuless operation for live video. Circle (2063)
Venice enhancements: expanded control for two VTRs or Abekas A60s; mix three D-1 or A60 signals; eight-GIP in/out, synchronized setup; menu management for easy control of RGB, 4:2:2 inputs, linear keying. Circle (2064)
Venice DIGITAL: production system; three 4:2:2 inputs, 4:0:0 linear key; 4:2:2 output with 4:0:0 linear key; includes Abekas A60 control; provides software compatibility with automatically adjustment of video input, output specifications. Circle (2065)

Grass Valley Group 5301
Interface: links Dubner Graphics Factory, Kadenza, Kaleidoscope; create 3-D animation and graphics, transfer to Kaleidoscope for picture manipulation; requires no hold-back mattes, keys, traveling masks; automatic combining of video. Circle (2066)
DPM-700 manipulator: 3-D effects with rotation, perspective; low-cost, upgrade from DPM-100 available. Circle (2067)

Intelligent Resources 7452
Video Explorer: Macintosh add-in NuBus card; performs transitions between multiple sources including effects; 32-bit resolution in capture and processing, true 24-bit color images produced. Circle (2068)

JVC 5327
KM-D600U: digital effects generator with dual, independent TBCs; Y/C inputs only for S-VHS editing; paint, mosaic, strobe, freeze, slide, compress, inverse video features; GPI port for editor control. Circle (2069)

Knox Video/GML Grove 6321
Studio 40: desktop system, post-production functions; high-resolution, multifont character generator; keyer; fader; 2-input switcher with audio-follow; S-VHS, Hi8 and composite compatible. Circle (2070)

Laird Telemedia 2027
Model 1590: upgrade for 1500 titler to a Legend system. Circle (2071)
Legend fonts: collection of 600 *alias controlled* typefaces for Legend series; apparent resolution of 19ns. Circle (2072)

Listec Video 4558
A-6000 Personal: PC prompter program for the PC providing professional prompting results from PC. Circle (2073)
A-5501 Scrollbox-Plus: electronic prompter; on-air script editing. Circle (2074)
A-4250 Shoebox: miniature prompter weighs three pounds; 4" CRT readable to eight feet distance; CRT removable from mirror/hood assembly for hand-held or desktop direct viewing. Circle (2075)
A-4175 Displaybox: field/studio prompter; electroluminescent panel display operates on 12VDC; power supply may be used as counterbalance; script image readable up to 20 feet. Circle (2076)

Lynn Greenberg Electronic 7014
Telescroll PC: prompter software; full color, multifont; word processing, margin control; efficient operation. Circle (2077)

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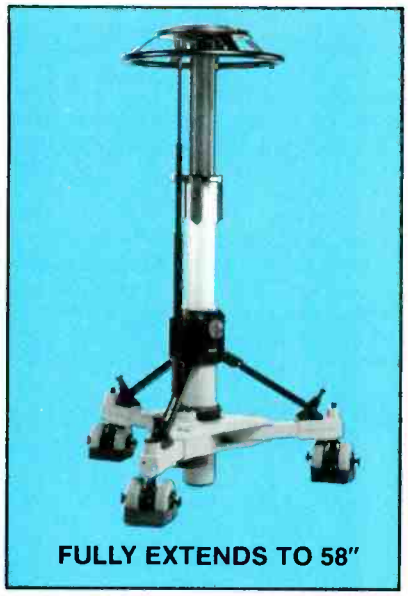

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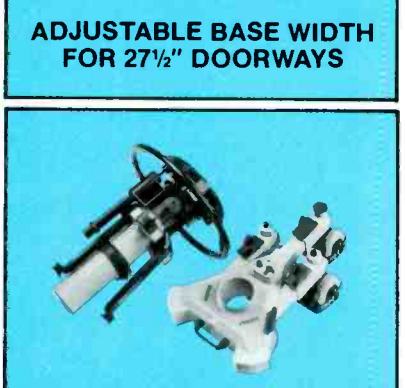

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Circle (168) on Reply Card

Microtime 5633
IMPACT family: variable image transformer; full upgrade capability from series 2, 3, 4; includes flexible image manipulation functions. Circle (2078)
UT-100: universal transcoder; use with Impact equipment, gives freedom of signal formats for inputs and outputs. Circle (2079)

Midwest Communications 6536
ProPaint 32: software-based paint, graphics system. Circle (2080)

PESA America 6016
CG4733: anti-aliased titler with graphics plane. Circle (2081)

QSI Systems 5845
Model 800: portable image inserter, logo generator; 760×480-pixel resolution from non-volatile and reprogrammable CMOS IC device; adjustable matte level; TTL mirror output of image as key; overlay capability with RS-170/A source. Circle (2082)
Model 8000: image generator, inserter; captures picture from camera, titler; overlay RS-170/A source for TTL output of image as video key; adjustable matte level; EEprom programmer burns CMOS ICs for use in portable 800 inserter units. Circle (2083)

Quanta 5401
Orion SE: new series of the Orion character generator. Circle (2084)
Delta LC, Delta SE: additional versions of the Delta I series; one at a reduced cost (LC), the other offering various improvements to the original Delta I system. Circle (2085)

Shereff Systems 7454
ProVideo VGA: titler software. Circle (2086)

SISCOM Satellite Info. System 7204
Editorial: text editor system. Circle (2087)

Sony 4401
System G models: production versions of *DME-5000, DME-9000* digital video effects equipment. Circle (2088)

Symbolics/Graphics Div . . .7437, HDTV
XL workstation: D-1 input, output; renders to NTSC, PAL, HDTV; combines PaintAmation, SL Animation in unified graphics environment; 4:4:4:4 internal processing; 2-D, 3-D elements; supports D-1 tape, disk, compositing systems; imports, exports key signals with images. Circle (2089)
High-Definition PaintAmation: for all current proposed, defined HDTV systems; also serves NTSC and PAL. Circle (2090)

Telescript 4332
Monitor prompter: 17″ screen, weighs 22 pounds. Circle (2091)
Amiga software: computer prompting program. Circle (2092)
LAN package: Novell newsroom, production system support. Circle (2093)

Thomson Digital Image/TDI 5045
TDI Explore V2.3: 3-D animation software for video production. Circle (2094)

Toshiba Information Systems 6000
HPE-1000: video effects system for HDTV; includes 3-D manipulations. Circle (2095)

Video Access Software 2204
BL9-BL-14: teleprompting unit. Circle (2096)
LT3500+: laptop teleprompting computer. Circle (2062)

Video Associates Labs 3059
MicroKey/VA: audio-video system for AT and compatible PCs; consists of two boards, software for digital audio record, playback; VGA-to-video encoding in NTSC, PAL; full-screen, windowed video display; RS-232 video player control. Circle (2098)

Video Products

V5: Display/presentation

- Video monitors
- Video projectors
- Video walls
- Hard copy printers

ASACA ShibaSoku 3048
CM321H, CM361H: 32″ in-line gun, 36″ delta-gun HDTV color monitors. Circle (2099)
CM201N, CM141N: 20″, 14″ high-resolution color monitors; in-line dot with automatic setup feature. Circle (2101)

BARCO Industries 7601
CVM 2000 series: *intelligent* grade 2 monitor; 14″, 20″ CRTs, auto kine bias for stability; communicates with MMRC multimonitor remote or single controller; light probe option for automatic setup; PAL, NTSC, PAL/SECAM decoders, Y/R-Y/B-Y, RGB/s inputs. Circle (2102)
HDM 2048, HDM 2081: 20″, 32″ high-definition monitors; features include multiformat operation with auto setup. Circle (2103)

Brabury/Porta-Pattern (BPI) 5839
Monitor options: video component inputs for GPM-37 color monitor; Y/C, YC_RC_B and serial/parallel digital inputs; sound-in-syncs detection option. Circle (2105)

Electrosonic Systems 7822
PICBLOC III: videowall. Circle (2106)
ProCUBE: video projector. Circle (2107)

I•DEN Videotronics 7655
IVW-400: videowall control; one input, four RGB outputs; for 2×2, 1×4, 4×1 matrices; integrated motion interpolation; picture freeze feature. Circle (2108)

Mitsubishi Electric Sales 4017
CP-10U: color video printer. Circle (2110)
SMR-2601R: 26″ Step Scan monitor, receiver. Circle (2109)

MZB/Gray 5815
SuperProjector: from *Philips VidiWall*; multiple screen large display. Circle (2111)

Panasonic 4513
PT-4590VY projection system: monitor, receiver system with 155-channel cable tuner; three each S-VHS, video, stereo audio pairs; image formed by liquid-cooled, optically-coupled CRT/lens systems; unified remote control. Circle (2112)

CT-3190VY: 31″ color monitor, receiver; 500-line resolution with S-VHS input; flat square, data-grade CRT; full-function remote control with learn capability; surround sound feature. Circle (2113)
DT-2700MS: multiscan monitor. Circle (2114)
BT-H1350Y: 13″ color monitor, receiver; 500-line resolution on S-VHS input; flat square, data-grade CRT; full-function remote control with learn capability; surround sound feature. Circle (2115)

PESA America 6016
BM4400: grade 1 monitor; precision display with auto setup system. Circle (2116)

Sony 4401
BVM series enhancement: expanded input capability includes D-2 and serial D-1 signal displays. Circle (2117)
Widescreen demonstration: 16×9 aspect ratio on 36″ diagonal CRT. Circle (2118)
GVM-1305TS Trinitron: 13″ monitor with MultiScan sweep, touchscreen control; for interactive multimedia uses with composite video, Y/C and analog/TTV inputs; 0.25mm dot pitch CRT optimized for graphics, video images. Circle (2119)
RVP-6000Q projector: 60″ diagonal, rear-screen; integral audio; multiscan sweep, optical coupling of lenses, CRTs; single-mirror optics reduces light loss; Fresnel and 0.6mm pitch lenticular screen structure increases viewing angles. Circle (2120)

Thomson Electron Tubes 6342
HDTV projection CRT: 9″ tubes for front-projection system; screen brightness of 200cm/m^2 on 100″ diagonal screen at 1,500-TVL resolution. Circle (2121)

Toshiba/Consumer Products 6000
HC-1600U: color video printer uses dye sublimation thermal transfer; 203 DPI resolution; to 16 images on a page; RS-232 control; RGB in; S-video inputs, outputs; memory expanded for factor of four. Circle (2122)
P500SR1: 50″ rear-screen type HDTV projector. Circle (2123)
P32H100, P36HD00: HDTV monitors; in 21″, 30″, 34″ CRT diagonals. Circle (2124)

Vistek Electronics 7044
GM7500 series: modular monitors; optional tri-stimulus analyzer for auto-alignment of black, white, saturation, color balance; dark current stabilization; assignable inputs for multiple analog, digital component, composite signals; 14″, 20″ CRTs. Circle (2125)

Video Products

V6: Cine/film

- Cameras
- Telecines
- Film-to-Tape

Arriflex 5933
Support system: 35mm/16mm camera and accessory package. Circle (2126)
ARRI 535: 35mm motion picture camera; microprocessor-control. Circle (2127)
Zeiss 65mm: a prime lens with T/1.3 transmission stop rating. Circle (2129)
VariCon: variable contrast control system. Circle (2128)

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BTS 4032
Film-to-tape transfer system: includes a color-correction feature. Circle (2130)

Cinema Products 5334
ZBL lens drive: silent motor operation; lightweight, powerful, guaranteed minimum backlash. Circle (1969)
VIDIFLEX 35 camera: integral video viewer for Steadicam or other remote operation; 2-60fps speeds; mount accepts PL, BNCR, Panavision lenses; supports SteadiMag, ARRI film magazines. Circle (1970)

Eastman Kodak . . . . . .HDTV
Hybrid products: advanced technologies bringing concepts from film and video into closer coordination. Circle (2131)

Gray Engineering Labs 5848
FDG-345: film data generator; time-code generator tach-locked to telecine produces VITC film data. Circle (2132)

Leonetti Company 7117
Video Assist for ARRI 3: combines 8mm videorecorder and 8″ color monitor; case, two 1-hour tapes supplied; Arriflex 35-3 body, rotating video door, controls, magazines, lenses, cables. Circle (2133)

Steenbeck 6418
ST-7310: film transfer unit includes sound dubber module. Circle (2134)
MFL-Combo: mobile magnetic sound recorder; in 19″ flight case. Circle (2135)

Video Products

V7: Video switching

- Studio production
- Master control

Alpha Image 2011
Alpha-500: D-1 component post-production switcher; *Super Layers* with linear keyers, mask controls, stores. Circle (2136)

Ampex Corporation 4301
AVC Century upgrade: additional switcher configurations include AVC 215-P 2M/E 16-input; AVC 235-P 2M/E 32-input; AVC 335-P 3M/E 32-input; AVC 235-B 2M/E 32-input and AVC 335-B 3M/E 32-input; *-P* models for production, post-production; *-B* models for broadcast. Circle (2137)

FOR-A 5901
PVM-525: video production mixer; 8-input, *4 Plus* layer features. Circle (2138)
VM-1000: video mixer for A/B editing; for use with AM-100 audio mixer. Circle (2139)
DVM-300: digital video mixer; includes multiple source and key inputs. Circle (2140)

Grass Valley Group 5301
Key-Link, Key-Layer: functions from Model 110 switcher, DPM-100 effects combine into video production system. Circle (2141)
Model 200-2 enhancement: Peripheral Bus; control system integrates switcher into a production system. Circle (2142)
Model 3000: production switcher; analog features with composite digital processing; fine line processing, key in for every video inputs; layering capabilities. Circle (2143)

Grunder & Associates 3024
Feral 6119, 6119YC: 6-input switcher; composite, separated luminance and chrominance designs; 3-bus architecture in either version. Circle (2144)

Sony 4401
Production switcher: digital, available in component, composite; links to DME effects, BVE-9000 editor. Circle (2145)

Tel-test 5439
MC^{2}SS: video and audio master control switcher. Circle (2146)

Thomson Video Equipement 5045
Digital mixers: IMPULS, serial digital unit; TTV 5650 full facility production, post-production mixer. Circle (2147)

Toshiba/Consumer Products . . . HDTV
TSW-1000HD: analog video signal HDTV switcher. Circle (2148)

Toshiba/Information Systems 6000
HSW-1000: HDTV digital video switcher; full feature for production, broadcast; component format. Circle (2149)

Videotek 4053
Prodigy C: video production switcher for component analog video. Circle (2150)

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Video Products

V8: Power, lighting

- Batteries, chargers, analyzers
- Studio, portable instruments
- Lamps, accessories
- Grip products

AMX Corporation 7025
PRO-2000: Prodigy dimmer. Circle (2152)

Anton/Bauer 4322
Magnum intelligent battery: digital circuitry assists in monitoring, display of remaining battery capacity on the battery and in the camera viewfinder. Circle (2153)
CMQ2 charger: 2-position, 4-hour unit for Compact Magnum batteries; 8-hour charge of full-size Logic Series unit. Circle (2154)
ULTRALIGHT 2: compact *built-into-the-camera* lighting product. Circle (2155)

Arriflex 5933
Softlights: Soft 2000 2kW and Soft 1000 1kW lighting instruments. Circle (2156)
Compact HMI lights: 575W, 1.2kW, 2.5kW rating; single-ended socket. Circle (2157)
Ballasts: electronic design with flicker-free operation. Circle (2158)

Bencher 7345
Enhanced M3 stand: upgraded copy stand; new lights, extended column, baseboard. Circle (2159)

Dedotec USA 6337
DCOOL: high-intensity light for high-speed photography, motion analysis. Circle (2160)
DLH-150: high-intensity, low-voltage optical lighting fixture. Circle (2161)

DN Labs 7248
6kW Par: uses standard 6kW AC par lamp. Circle (2162)
DC HDI 1000W, 5000W: 1kW, 5kW HMI systems using DC HMI lamps. Circle (2163)
Model F320W: 320W dimmable fluorescent light system; eight 40W lamps. Circle (2164)

Frezzolini Electronics/PAG 5801
BC30SF: smart charger. Circle (2165)
MF-12PT: mini-fill lighthead; miniature banana jack, plugs, power tap. Circle (2166)
FSP-18: solar panel charger. Circle (2167)
M8000: 24V, 2Ah battery; per BB-542/U MIL communications spec. Circle (2168)

GE Lighting 5229
Complete line: high-voltage stage and studio products, designed for specifications of European market. Circle (2169)

Leonetti Company 7117
4-Way Power Box: power distribution to 20A for stage, studio lighting; with pin connectors, standard pin or full stage paddle plug; *MaxLoc* non-metallic, water-tight cord grip; 20A indicating fuses. Circle (2170)
Sunray 2500: 2.5kW light head with overlapping ring for maximum convection cooling; Philips/Osram single-ended HMI lamps with Mogul bipost. Circle (2171)

Lowel-Light 5844
Tota-Shade: barndoor attachment for Tota-Light series; clips onto light fixture without blocking ventilation. Circle (2172)
Blips, Hollywood-Strip: light-and-shadow lighting effects devices. Circle (2173)

Sachtler 6701
Model 575D1: lightweight, compact daylight lighting instrument; applicable for studio, location use. Circle (2174)

Teatronics/Lighting Innovations . .6828
MTR 9600: on-location modular dimmer system. Circle (2175)
Echelon: memory lighting control console. Circle (2176)

Vantage Lighting 7153
DTY: 10kW halogen lamp. Circle (2177)

Videssence . . . . . N.A.
Portable Lighting: small ionic light fixture with equivalent output of a 750W tungsten lamp. Circle (2178)
Color Wall illuminator: high-intensity, seamless ionic light source; for special matte production effects without visible hot spots. Circle (2179)

Bryston BP-1 pre-amplifier

By Dennis R. Ciapura

With the proliferation of CDs in radio broadcast, analog phono systems may have slipped from the limelight for a while, but that doesn't mean conventional disk reproduction quality has a lesser priority. In fact, most stations still play a considerable amount of program material that is not yet or may never be available on CDs, and these cuts often play back-to-back with digital source material. Therefore, whether played direct from disk or from cart transfers, phono reproduction quality is more important than ever. Surface scratches, noise and gritty audio are far more detectable to listeners in the present broadcast environment. With this in mind, we decided to take a look at a state-of-the-art phono pre-amp to see what level of performance is attainable with the latest technology. The test sample was a Bryston BP-1 pre-amplifier.

Bryston works out of Ontario, Canada, and has a good reputation among audiophiles for high-quality pre-amps and power amps. The BP-1 is designed specifically for professional applications and features rugged rack-mount construction and XLR outputs.

Pro-design version

The pre-amp design embraces the current performance philosophy of splitting the equalization and gain requirements into two gain blocks to avoid the inevitable compromises involved in achieving 40dB of gain, low-frequency boost and high-frequency rolloff all in one stage.

The first stage of the pre-amp is a non-inverting custom discrete op-amp that provides the required RIAA boost below 500Hz and about half the midband gain. The second stage, another discrete op-amp operating in the inverting mode, provides the RIAA rolloff above 2,120Hz and another 20dB of midband gain. A third discrete op-amp stage functions as a balanced line driver.

The non-inverting input stage provides lower noise and a stable input characteristic vs. frequency above 500Hz to simplify phono cartridge matching. The inverting second stage allows more accurate de-emphasis because it can go below unity gain allowing extension of the rolloff well beyond the audio band. The result is a more accurate EQ at the top end of the band. Spreading the gain over two stages also results in lower distortion — a sevenfold reduction according to the company.

The discrete op-amps used in the BP-1 and other company products are interesting designs. Today, you would wonder why anyone would go to the trouble of fashioning discrete op-amps when high-performance chips are available. The design employs special circuit topology and matched transistors for extreme linearity, which is consistent with the company's maximum performance philosophy. But does all of this attention to detail make a difference?

Measured performance

To get an idea of the signal-to-noise ratio (S/N) capability of the BP-1, we first tested the input overload level and line driver output limits. The 1kHz input overload point was 240mV (1% THD), which provides 32dB of headroom above the 5mV level produced by typical records and cartridges. This is approximately 6dB more headroom than provided by a typical high-performance pre-amplifier. Figure

Ciapura is senior vice president, Noble Broadcast Group and president of TEKNIMAX Telecommunications, a San Diego-based technical management consulting company.

Performance at a glance

- *Frequency response: +0.1dB, 20Hz—20kHz*
- *Accuracy: +0.1dB, 20Hz—20kHz*
- *Distortion: less than 0.005% IM or THD, 20Hz—20kHz*
- *Rated output: 27dBm rms 600Ω* balanced, 21dBm rms 600Ω unbalanced
- *Rated noise: phono, −80dBA high-level, −95dBA*
- *Balanced XLR outputs*
- *Cartridge load adjustment*

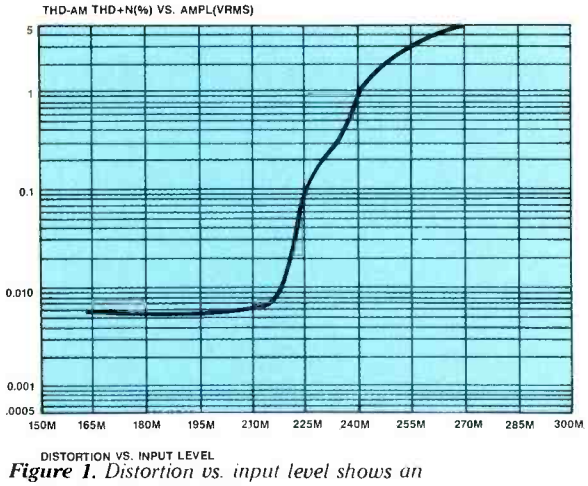

Figure 1. Distortion vs. input level shows an overload point of 240mV.

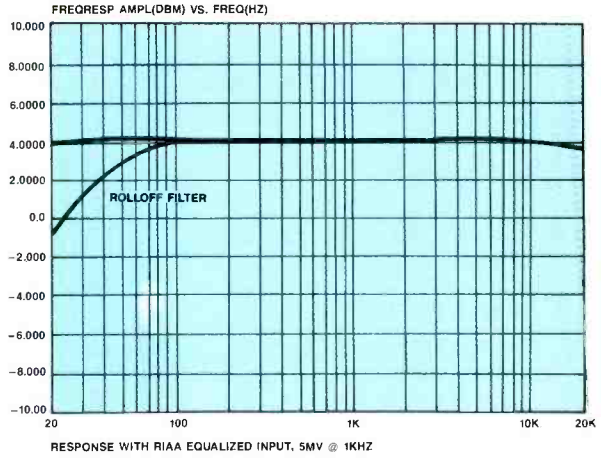

Figure 2. The upper curve shows the frequency response with an RIAA equalized input. The low-frequency rolloff curve also is evident.

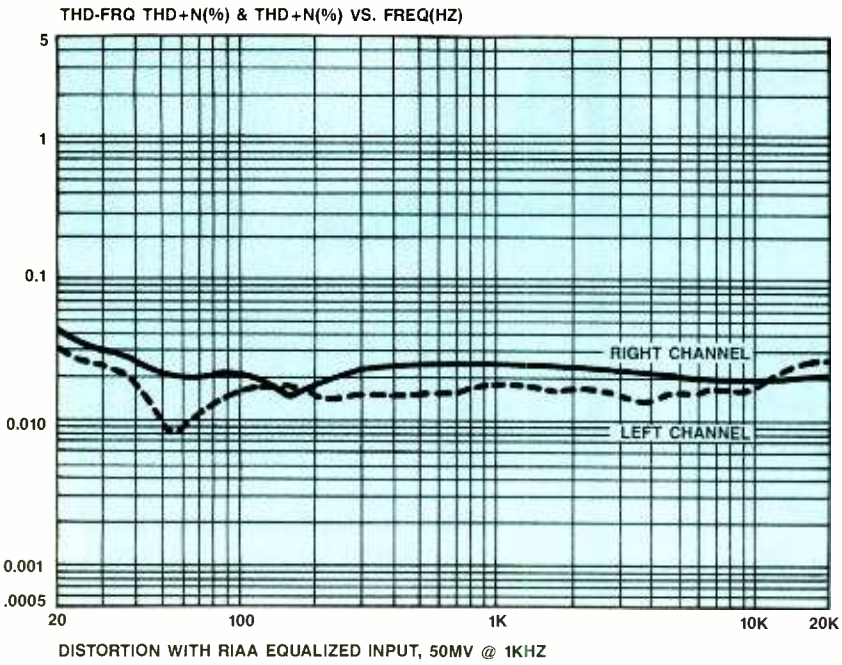

Figure 3. Distortion vs. frequency at 50mV input level.

1 shows an expanded plot of the THD+N vs. input level at 1kHz. This test run also confirmed the manufacturer's claim of 0.005% THD and indicates a wideband overload/noise ratio of 85dB. The maximum line driver output level was close to +30dBm and THD+N was less than 0.01% at the rated +27dBm output specification.

Next, we set up the unit as it would be used in a typical broadcast application, 5mV input for +4dBm output into 600Ω, and ran some response and distortion tests. Figure 2 shows the frequency response with an RIAA equalized input. The BP-1 performance is within the company's 0.1dB specification across the entire band.

The low-frequency filter response is superimposed on the graph. It is interesting to note that this curve is compatible with the IEC modification of the RIAA low-frequency standard, but still provides good attenuation in the infrasonic region.

Distortion vs. frequency measurements with equal input levels aren't meaningful for phono pre-amps because that's not the kind of spectral distribution that comes out of a phono pickup. A much better simulation is an RIAA equalized sweep.

A tough test is a sweep at 20dB above operating level. Figure 3 shows the THD+N performance under these conditions. The 1kHz level was 50mV and both channels are shown. With an average THD+N of 0.02% from 50Hz to 15,000Hz (mostly noise), the pre-amplifier had a midband overload point of 240mV and a +27dBm output capability. It should be impossible to get the BP-1 to distort in any imaginable application.

With a 5mV input and the output controls set for maximum, the gain was 60.8dB and the A-weighted noise was 60.3dB with the input shorted, for an equivalent input noise of −121.1dB. The output level produced was +17dBm, making the S/N ratio 77.3dB. This noise level is within a few decibels of the theoretical limit.

Although these are standard test conditions, pre-amps are seldom operated with inputs shorted and gain wide open. With the output controls set for +4dBm with the same 5mV input, the A-weighted noise with a 600Ω source was −65dBm for a 69dB S/N ratio.

No sound is good sound

At this point, a consumer audio review might lapse into a paragraph or two about sonic impressions, but a phono pre-amp is part of a system that includes the cartridge, stylus and tone arm, and you would hope that the pre-amp element is a soundless gain block, and that quite simply describes the unit. It is virtually distortionless, unconditionally stable, impervious to overload and extremely precise in its EQ. The Bryston BP-1 pre-amplifier is a top performer, and considering the construction quality, it represents an excellent value for broadcast users.

Editor's note: The field report is an exclusive *BE* feature for broadcasters. Each report is prepared by the staff of a broadcast station, production facility or consulting firm.

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

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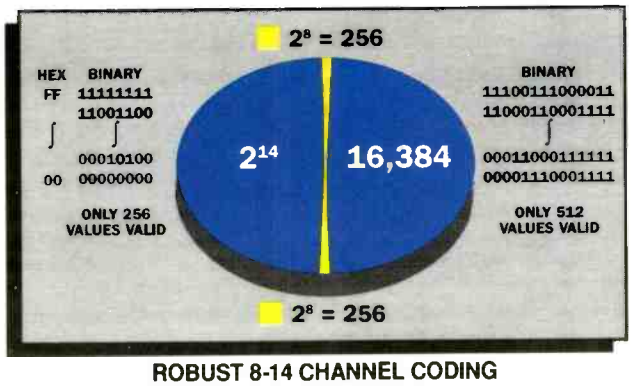
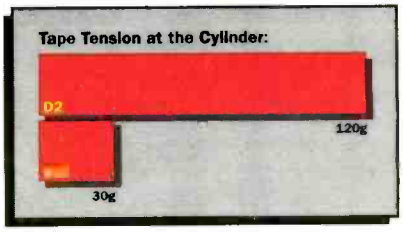


ROBUST 8-14 CHANNEL CODING



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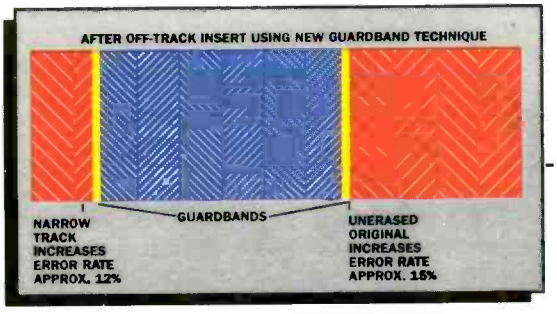


GREATER EDIT PRODUCTIVITY

PANASONIC HALF-INCH COMPOSITE DIGITAL RECORDING SYSTEMS

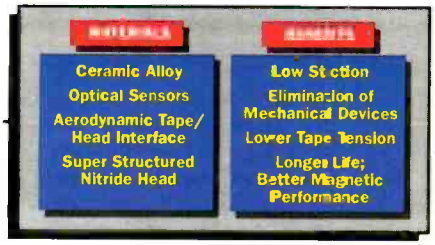
Panasonic's Half-Inch Composite Digital is the first *complete* digital recording system. From a one-piece all-digital camera/recorder to a digital M.A.R.C. cassette library system, Panasonic's system is digital from start to finish. Using today's advanced electronic designs and materials, Panasonic's Half-Inch Composite Digital system includes recorders designed specifically for each application.

The Half-Inch Composite Digital field VTR is truly portable. Its dimensions fit comfortably into today's mobile production and ENG vans.The AJ-D310 one-piece camera/recorder has a 64-minute cassette capability. The AJ-D350 studio VTRs handle cassette lengths up to three hours. The Half-Inch Composite Digital M.A.R.C. cassette library system can control up to seven standard Half-Inch Composite Digital recorders.

Audio editing with Panasonic's Half-Inch Composite Digital is as it should be. A flying erase head and a new approach to audio recording allow true cross fades and perfectly natural audio search in post. All Half-Inch Composite Digital recorders support 4-channels of PCM audio.

Panasonic's Half-Inch lives up to the technical reliability and economic promise of digital. It employs a new 8-14 channel coding method for lower tape consumption with a packing density 2.5 times that of D2.

AT WORKS.



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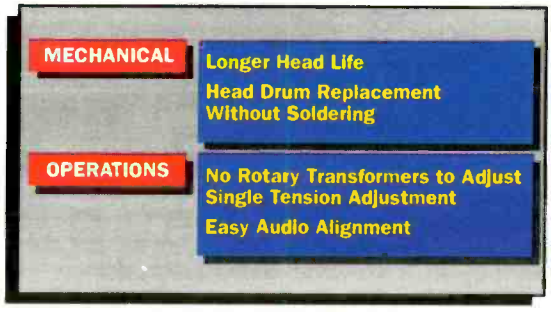
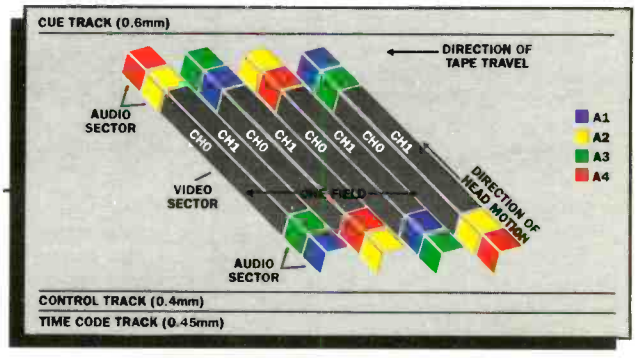


EASE OF MAINTENANCE



AUDIO EDITING AS IT SHOULD BE

Improved error correction techniques feature 8 inner check bytes by 8 outer check bytes, greater resilience to burst errors, and new algorithms. Half-Inch Composite Digital's amorphous head design increases HF output and maintains high carrier/noise ratio. Post production performance includes search speeds up to 100x normal (with picture) and an edit guardband system for greater accuracy.

Panasonic's Half-Inch Composite Digital provides compatibility in every sense of the word. The VTRs provide composite digital and NTSC inputs and outputs as well as an optional D1 interface. Its read-before-write techniques maximize cassette interchange capability. Half-Inch Composite Digital uses the same transport design as Matsushita's proposed component digital and HDTV recording systems.

Selected this past Spring by the Comité Organizador Olimpico Barcelona '92 (COOB) to be the official broadcast equipment system for use at the 1992 Olympic Games in Barcelona, Pansonic Half-Inch Composite Digital is already the choice of broadcasters here and abroad.

The right way to make a digital video system that works from start to finish is to build it brand new, top to bottom.

Panasonic

One Panasonic Way, Secaucus, NJ 07094

For more details call: 1-800-524-0864

Circle (180) on Reply Card

Rohde & Schwarz model EMFT precision TV demodulator

By Scott Barella

No matter how you look at today's wonderful, sophisticated RF test gear, one thing remains unchanged: It can get expensive. Test gear today offers a lot of bang for the buck, especially the new spectrum analyzers, generators and other integrated video and audio test packages. Precision TV demodulators, on the other hand, usually aren't too flashy, but they can still be expensive.

For years, one popular demodulator has enabled engineers to "fine tune" some of the most difficult transmission parameters. "Testing and Using Synchronous Demodulators," an application paper by Charles Rhodes concerning this procedure, is as valid and useful today as the day it was written. However, as popular as the "old standby" is, it costs plenty. Furthermore, an engineer who is responsible for transmitter tuning may also be responsible for tuning repeaters. These can operate on various frequencies, which require the test demod to be frequency agile. This can boost costs even further.

The unit gets straight to the point; the manufacturer wasn't wooed by needless software gadgetry.

Tuning our 60kW UHF transmitter using many of the inexpensive demodulators has met with limited success. Recently, a precision test demodulator, the Rohde & Schwarz model EMFT, was auditioned. This demod is a quality product intended for serious broadcast use. It has a synthesized tuning section that tunes the entire TV band, including CATV frequencies.

The unit gets straight to the point; the manufacturer wasn't wooed by needless software gadgetry. It also costs significantly less than some competing devices.

Using the EMFT

The unit has a well-organized front panel. It needs little explanation, particularly if you've already used a good demodulator. The synthesized tuner is straightforward. Users choose between three broad frequency bands — "air," "CATV standard" and "CATV harmonic." A search feature tracks the desired signal. There are also two arrow keys, one for each digit of the channel number. Unlike some analog tuning sections, there is no need to tune high or low of the selected station. Three LEDs on the control panel indicate the presence or absence of visual or aural carriers, or of MTS (stereo) programming.

The system includes an automatic attenuator. In one test, 60dB of external attenuation was inserted in the line, and then the unit was connected to the forward coupler of the visual transmitter. The demod meter showed that more input strength was necessary. The 60dB pad was exchanged for a 40dB pad, and the unit automatically added its own internal attenuation, an additional 10dB. After adding and subtracting external 10dB pads, it was found that the automatic internal settings are most accurate.

The demod uses type "N" connectors for RF input. For engineers who prefer BNC RF connectors, the unit allows 75Ω or 50Ω impedance. It is also possible to input an IF signal directly into the unit's IF section, bypassing the unit's RF to IF converter.

The unit has a series of default settings. The surface acoustic wave (SAW) filter is on, the zero reference pulse (also known as chopper pulse) is on, the sound trap is enabled, and the demod is set to the envelope demodulator mode. However, if users don't like the default settings, the unit remembers which settings were last used.

The high-level mode button boosts the RF input from 3mV to 10Mb to further improve the signal-to-noise (S/N) ratio. This is necessary for fine test measurements. When the high-level mode is on, the unit automatically incorporates an additional 10dB of padding adjustment. This produces a sharply detailed waveform.

The synchronous demodulator

Perhaps the most important and most expensive aspect of a test demodulator is the synchronous demodulator section. Stereo audio for television makes each adjustment more critical, especially those that affect intercarrier phase modulation (ICPM) parameters. Only a few demodulators have the ability to measure ICPM. ICPM testing requires an auxiliary quadrature (Q) output signal. (See Figure 1.) Applying this auxiliary Q signal to the external horizontal input in certain waveform monitors allows a vertical display of ICPM distortion. Special waveform monitor graticules are available for these ICPM measurements. Some minor modification to the waveform monitor may be required.

The unit has a well-organized front panel. It needs little explanation, particularly if you've already used a good demodulator.

The quadrature signal that this section produces is available in the front or rear of the unit. This signal can operate in two modes, "sampled" or "unsampled." The sampled position syncs the signal to the input signal's back porch. The unsampled position syncs the signal to the sync tip. Some users may find it annoying that the switch to toggle between these modes is inside the unit and not on the front panel

Performance at a glance

- Range: VHF_1, VHF_2, UHF, CATV standard and harmonic, 45.75MHz IF
- Noise figure: ≤10dB (VHF), ≤12dB (UHF)
- Return loss: (50Ω) ≥±12dB, ≤300MHz; ≥10dB, >300MHz
- Video S/N: ≥62dB for 3mV input
- Annunciators: No vision carrier, no sound carrier BTSC signal
- Dimensions: 17.7"×5.7"×20.7"; Weight: 36 pounds
- Selection: keypad, auto-search, remote via BCD code channel or (optional) IEEE-488

Barella is director of engineering, KTKA-TV, Topeka, KS.

Booth 4513

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Panasonic won an Emmy for the M.A.R.C. Cassette Library System, but that didn't keep us from improving it.

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- Multi-element cassettes allowing program playback and multiple spots per tape with no change in software;
- Up to seven remote terminals to access M.A.R.C. application software via an Ethernet TCP/IP LAN.

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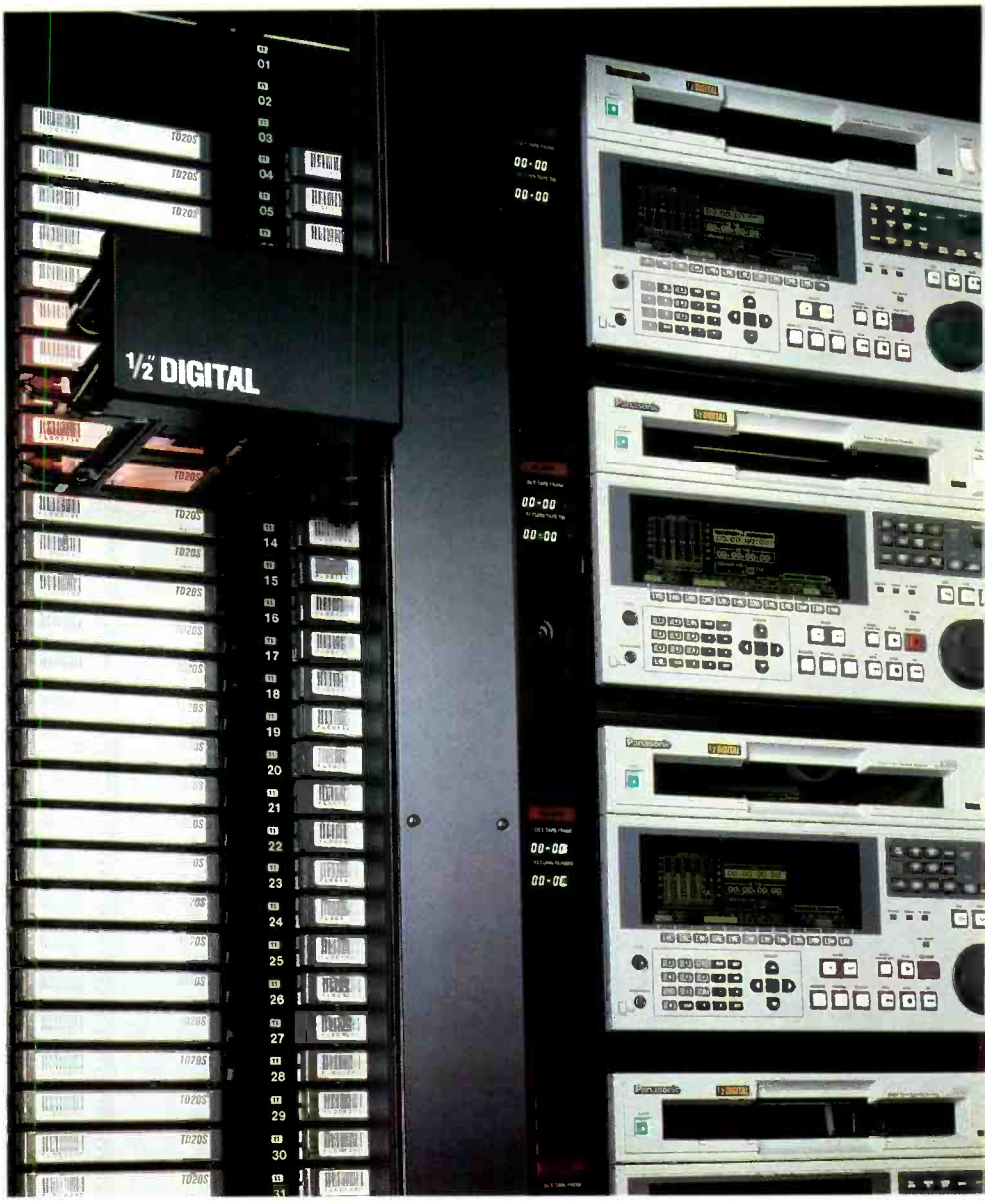

Find out what many broadcasters already know: 40,000 spots a day prove Panasonic's M.A.R.C. a winner, and real winners keep on getting better.

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For more details call: 1-800-524-0864

Circle (225) on Reply Card

The demod uses type "N" connectors for RF input. For engineers who prefer BNC RF connectors, the unit allows 75Ω or 50Ω impedance. It is also possible to input an IF signal directly into the unit's IF section.

this demodulator is its construction. The test gear is neatly organized. The designers purposely made the demodulator easy to align and service. This is clear from looking at the shielding, the arrangement of each individual section and the way things are labeled. The manufacturer has told me that periodic calibration requirements for these demods will be available in the United States.

The manual received with the unit is thorough but somewhat disorganized. For instance, the unit's specifications are given in the beginning of the manual, followed by a brief description of the unit's operation. However, other details are hard

The designers purposely made the demodulator easy to align and service. This is clear from looking at the shielding, the arrangement of each individual section and the way things are labeled.

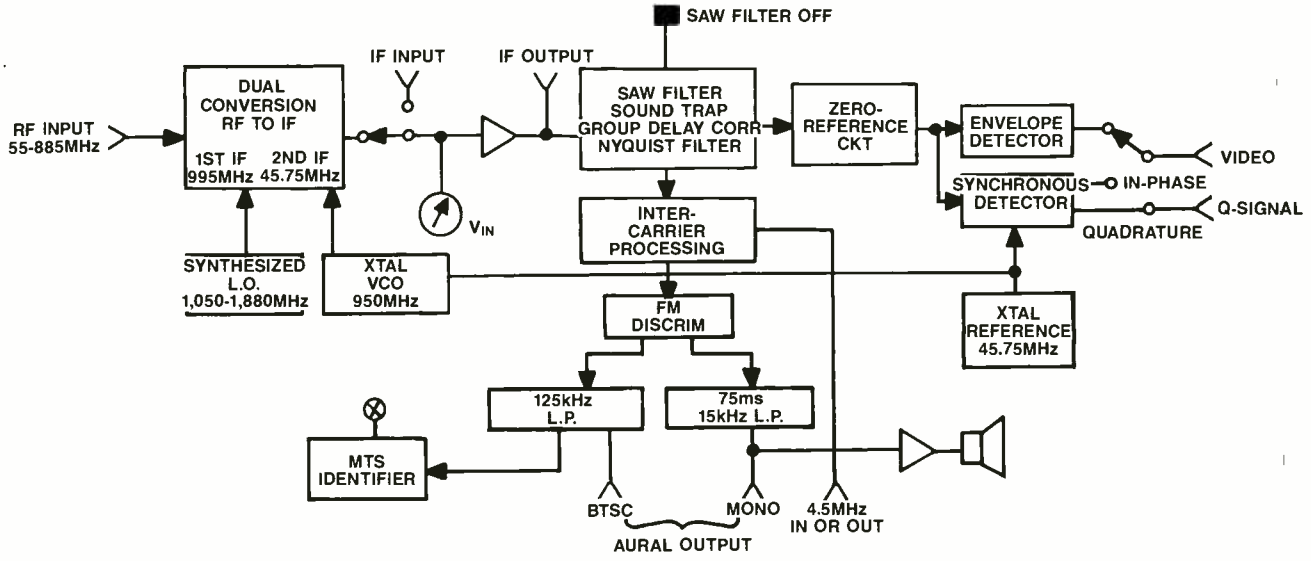


Figure 1. *An auxiliary "Q" output allows the EMFT to make ICPM measurements when used in conjunction with a waveform monitor equipped to create this display.*

Aural measurements

Some engineers will appreciate the ease of the digital tuning section. Others will prefer using an analog meter for making audio measurements. If the station uses an independent modulation monitor, the demod won't provide any new information, but it is convenient to have as another source. There are two different modulation scales, 50kHz and 100kHz deviation, for standard and MTS audio.

The unit supplies a wideband aural output, which was suitable for a stereo decoder. The standard monaural signal is also available in front, via the 1/4-inch jack, and from a BNC connector in the rear. A front-mounted speaker is handy for confirming the presence of an audio signal or for short-term monitoring of it.

Solidly built, shaky docs

Perhaps the most impressive aspect of

to find. It took a while to find the part about the "sampled" and "unsampled" switch in the synchronous demodulator section. It was located in the rear, in the discussion of each particular circuit.

Stereo audio for television makes each adjustment more critical, especially those that affect intercarrier phase modulation (ICPM) parameters.

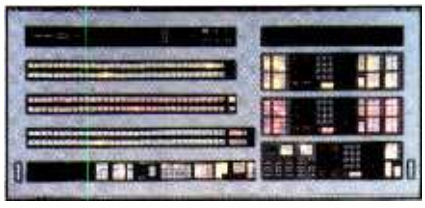
There is a lot of information on how to tune the instrument and appropriate spectrum displays, but not much is practical. Although several sections of the manual were missing, most of them were schematics, which generally are provided in the separate or all-inclusive service manual.

There is a fair amount of information on the IEEE-488 features and remote-control pinouts.

Overall opinion

The Rohde & Schwarz model EMFT is a quality instrument in every respect. It isn't an inexpensive product, but it is worthy of consideration. Tuning the transmitter using this product resulted in a much improved look. This should help engineers justify the unit's expense to those who know nothing more than what a good picture looks like.

Ampex AVC Century production switcher



By Greg Mattern

Prairie Public Television is a network of six stations serving all of North Dakota, some neighboring states and parts of Canada. The central production facility in Fargo for PPT is KFME. For several years, the station's central control room made do with an 8-input, single M/E switcher. Despite a budget crunch, the station finally decided to buy a more powerful switcher. It looked at several, but ultimately selected an Ampex AVC Century production switcher with 32 inputs and two M/E banks. The station installed the switcher in January 1989.

Flexibility was one reason for selecting the Century. The switcher has 164 standard wipe patterns, seven linear keyers, four QUAD bus outputs and up to 16 auxiliary video buses. A second reason was that the switcher provides tight integration with the facility's existing editing and effects systems. The station needs this capability because the control room doubles as the main editing facility.

Memory-able programs

The station produces a wide range of programs, including a weekly news review and regular pledge drives. One regular program, "Prairie Town Meeting," incorporates satellite feeds, microwave feeds, videotaped stories and audience participation in a lively 90 to 120-minute discussion. The show is taped without any breaks. The station also services outside commercial and industrial clients.

The technical director spends time at the switcher watching monitors, and must be able to do everything by feel. A certain comfort comes from knowing with a few glances what is on the air, what is on presets, and what will be coming next. This underscores the importance of computerized effects memories, including the switcher's SuperSTAR panel memory.

One section of the SuperSTAR memory determines what part of the memory the operator is storing or recalling. The other section accesses any of the 48 individual storage registers to which users can assign setups. This provides many levels of storage and recall. For example, a given production may require use of a previously-stored effect. The border color of a wipe, however, may not be right. Users can call up the effect, change the border color and store it back in the same register, without affecting the rest of the setup.

The switcher control system has 288 immediate macros and 288 timed macros. Using immediate macros, users can record a string of button pushes, and later recall them with a single button push or a GPI trigger. Using timed macros, users can record fader operations and button pushes, and later play them back in real time, also at a single button push or GPI trigger. Users can also link registers together to form sequences.

The ability to copy setups between M/Es also gives great flexibility. Occasionally, users may create an effect and then decide that they need another transition or key upstream of the effect. Using SuperSTAR, they can transfer the original setup to M/E 2, freeing M/E 1 to create the new effect.

Mattern was formerly production manager and technical director, Prairie Public Television, Fargo, ND. He is currently with Snyder Films, Fargo, ND.

Performance at glance

- *Two or three M/Es, 16 or 32 inputs*
- *Three full-capability keyers per M/E*
- *164 standard wipe patterns*
- *SPECTRAKEY keys over any color background with no halos*
- *SuperSTAR memory stores up to 48 switcher setups*
- *MACROs program button pushes/fader movements into single-button or GPI trigger*
- *Interfaces to Ampex digital effects and editing products*

Panel memory

Another powerful use of the panel memory is with the QUAD bus option. This option includes DA outputs designed to feed digital effects devices. Operators can assign each of the four QUAD outputs to either the A or B side of the effect device, or the A or B key inputs, and store these assignments in the switcher's memory. Recalling an effect can immediately cause the QUAD bus option to configure the effects device's inputs.

This can help head off trouble. Once, a VTR feeding one side of the digital effects system broke down during a show. Because the effect was stored in memory, it was easy to change the input assignment, without interrupting the production.

When the setup is the way the operators want it, they can store it in a specific register. This allows them to call it up again later. Sometimes, operators output the memory to the disk on the editing system. This way, they can give each setup an alphanumeric name, and can also take it with them so they can clear the register. The download is slow, however, and a more effective procedure would be to install the X-STAR dual 3.5-inch disk drive. The X-STAR stores macros, configurations and up to 480 complete setups on each disk.

There is also an auxiliary 60-button remote panel that fits into a standard 19-inch frame. The station uses the panel extensively to trigger macros designed for complex sequences. It can initialize moves on both M/Es with one keystroke, without affecting the rest of the M/E setup.

SuperSTAR panel memory allows quick recall of preset effects. (Courtesy of Ampex.)

Keys to success

Each M/E provides two background

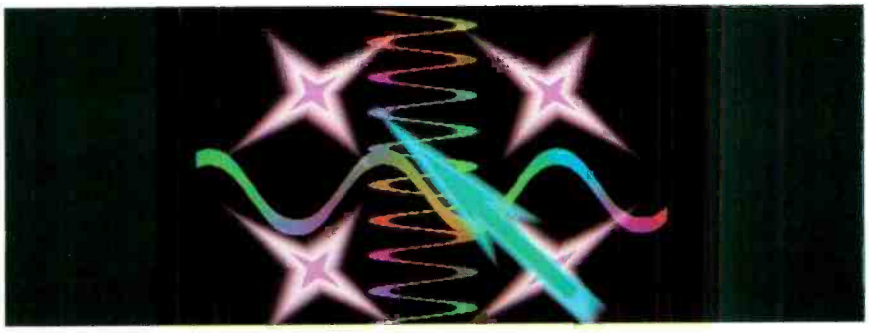
Each M/E has three full-capability keyers, one for each bus and an effects keyer. (Courtesy of Ampex.)

buses and three keyers. There are independent keyers for each background bus and a third effects keyer. Each keyer, including the downstream keyer, is capable of every type of key — linear, luminance, RGB, external and encoded.

Each keyer has its own independent masking system and matte generator. Users can control all three keyers independently. They can drop keys in or out with a button push, without having to change the background bus.

The Spectrakey feature provides realistic chroma-keys on any background color. Its unique chroma nulling process eliminates any blue or green halo. Spectrakey is internal to the switcher. It requires no external routing or special timing.

The switcher's key memory system makes complex adjustments easy to store and recall. Instead of each keyer having its own memory, as with some switchers, each input has four separate keyer memories. This can be a time saver in certain editing situations. For example, suppose a client wants a logo flown in using an effects system. He selects a blue color with a black drop shadow. After the operator gets the effect set just right, the client changes his mind. He likes the look, but he'd rather see it in green, with a white outline. After previewing each, the client eventually decides to use both looks in the spot. The different source key memories allow the operator to recall each logo on a different keyer, on a different M/E, with the results looking the same each time.



Colors and borders of any of the switcher's 164 standard wipe patterns can be changed and stored in memory. (Courtesy of Ampex.)

Easy driving

At the user's option, the switcher's program/preset bus can operate in A/B or flip-flop mode. In A/B mode, the source selected on the preset bus transfers to the program bus during the effect. The preset bus then awaits further input selection. In flip-flop mode, the selected sources on each bus trade places. Preset moves to program and vice versa. The M/Es operate in A/B mode.

Diagnostic display

The Century switcher's status/diagnostic CRT display shows every parameter of the switcher in bar graph form. (See Figure 1.) This multiformat, easy-to-follow display shows information such as fader positions, chrominance levels and operation messages. It is also useful to see a graphic representation of key masks. Each of the four key memories can have its own mask. This is an easy way to show what will be hidden or revealed by a given key. (See Figure 2.)

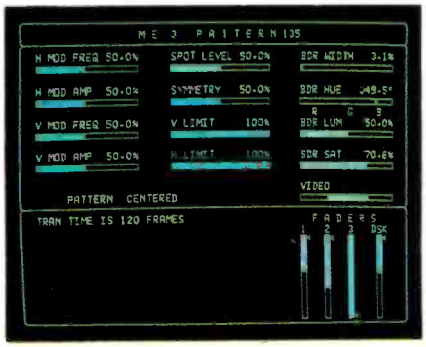


Figure 1. *The switcher's status/diagnostic CRT display graphically shows all switcher parameters.*

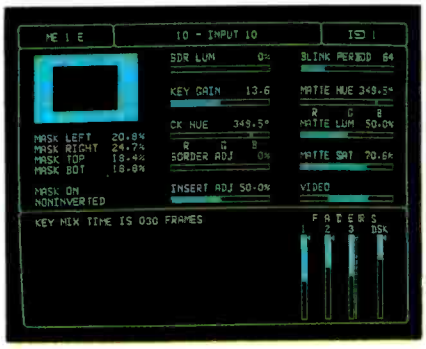


Figure 2. *The status/diagnostic monitor displays information on keyer parameters using bar graphs, and shows the shape of the key mask.*

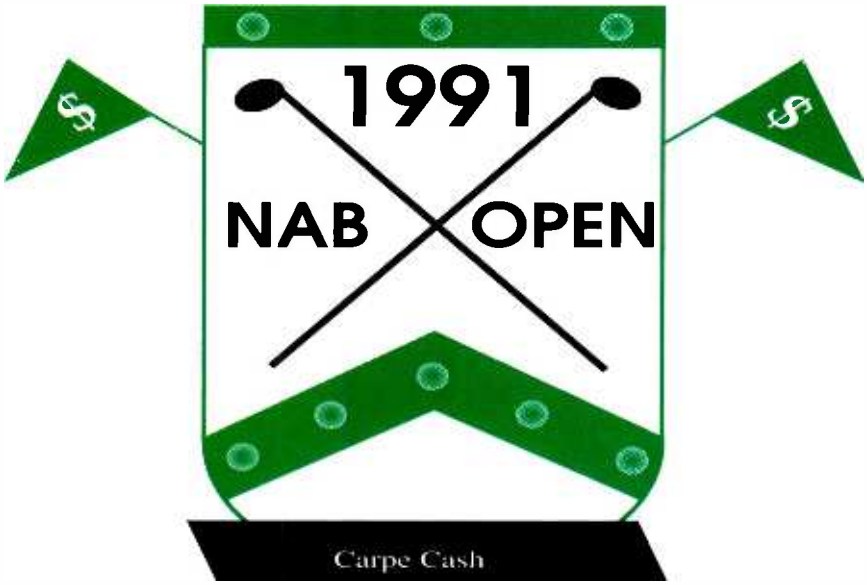
The Spectrakey system keys over any color without halos for a more realistic looking effect.

Reliability

The switcher has been running ever since its installation. There has been no downtime. However, protections are built in. The SuperSTAR, key and operating memories are protected for up to two weeks by a battery backup. There is also a second CPU with its own non-volatile memory.

The station has found its Ampex Century switcher to be a reliable, valuable investment. It will find usage in keeping the station's look state-of-the-art for years to come.

You can win! Thousands in cash prizes! Play our



While you're at NAB, take something home for yourself. Here's how.

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2. Play the round by presenting your game card to each participating manufacturer for validation.

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1 first prize – $1,000
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Game cards must be received at Tournament Headquarters by April 30, 1991. Upon completion of the round, mail your scorecard to Tournament Headquarters, Intertec Publishing Corp., 9221 Quivira Road, Overland Park, KS 66215.

The NAB Open –Tournament of Attendees

BROADCAST engineering

VIDEO Systems

People/ Business

David Roudebush, David Angress, Howard Mullinack, Jesse Maxenchs and **David Talbot** have been promoted to positions with AKG Acoustics, San Leandro, CA. Roudebush is corporate marketing manager. Angress is director of national sales for the dbx, AKG and Quested product lines. Mullinack is director of international sales. He is responsible for the Orban product line domestically, for the Orban and dbx product lines worldwide, and for all of the company's product lines in Central and South America. Maxenchs is international sales manager, Western Hemisphere. Talbot is national sales manager for the BSS Audio, Turbosound and Precision Devices product lines.

John Gluck has been appointed president of AMS North America. He is relocating from AMS U.K. to the Neve offices in Bethel, CT.

Albert K. Barton Jr. has been named product marketing manager for monitors for Sony Business and Professional Group, Montvale, NJ. He is responsible for developing marketing programs for Sony professional video monitors, for production and display applications and for the Sony GVM series of Multiscan monitors.

Thom Johnson, Scott Giles and **John Findlay** have been appointed to positions with DYMA Engineering, Los Lunas, NM. Johnson is vice president. Giles assumes a sales position, and Findlay is responsible for radio broadcast sales.

William G. Bakonyi has been named product marketing manager for MII's ½-inch video products for Panasonic Broadcast and Television Systems. He is responsible for promoting and supporting the marketing and sales of MII products for direct sales and Panasonic's dealer sales network.

William P. Mountanos has been named vice president of marketing and sales for Abekas Video Systems, Redwood City, CA.

Paul Hansil and **Ken Ellis** have been appointed to positions with Quantel, Stamford, CT. Hansil is senior vice president and is responsible for all Quantel sales, including broadcast, graphics and audio-video products. Ellis is vice president of operations.

Dave Walters and **David Fibush** have been named governors for SMPTE. Walters, a district sales manager for Tektronix, Beaverton, OR, is governor of SMPTE's southern region. Fibush, a marketing and engineering manager for Tektronix, is SMPTE western region governor.

Joe Bean has been promoted to regional manager, mid-America, for Studer Revox, Nashville, TN. He is responsible for the newly reorganized and combined Nashville north and Nashville south territories, comprised of the Midwest, Great Lakes, Southeast and Southwest regions of the United States. Bean supervises the direct sales staff in these regions and actively engages in the sales and customer support of high-end Studer products.

John Shepherd, Altec Lansing design engineer, has been appointed chairman of the NSCA safety group. He is responsible for the direction of safety standards relating to the audio equipment for UL and CSA and upcoming changes taken by the IEC in Europe for 1992.

Joseph W. Plonski and **Sheldon L. Liebman** have been appointed to positions with Symbolics, Burlington, MA. Plonski is director of North American graphics sales. Liebman is director of graphics marketing.

BTS to distribute Pinnacle workstations worldwide

BTS Broadcast Television Systems, Salt Lake City, has entered into a long-term agreement with *Pinnacle Systems*, Santa Clara, CA, to market its Prizm video workstations worldwide.

Outside of the United States and Canada, Prizm systems will be marketed to all systems installations clients. In North America, Prizm will be marketed primarily to networks and call-letter stations.

BTS and Alamar to market automation systems

BTS Broadcast Television Systems, Salt Lake City, has gained exclusive rights to market *Alamar's* automation systems.

BTS will sell Alamar products in the United States, Canada, Hong Kong, China and France under the Alamar name. Alamar will continue to market its automation systems through its existing sales channels.

Audio Services becomes Neumann service center

Audio Services Corporation (ASC), Hollywood, has become an authorized Neumann microphone service center. For more information, contact ASC at 10639 Riverside Drive, North Hollywood, CA 91602; telephone 800-228-4429; fax 818-980-9911.

Montage Group finalizes agreement with Avid Technology

Montage Group, New York, has concluded licensing agreements with Avid Technology, Burlington, MA.

Nucomm supports customers of former Nurad Radio

Nucomm, Hackettstown, NJ, has initiated a service program for equipment under and out of warranty that is owned by customers of the former radio division of Nurad. Nucomm will service all of the equipment owned by Nurad Radio customers, including transmitters, receivers, modulators and accessories. Owners of this equipment should contact John Delaney at 201-852-3700 for further information.

Acrodyne demonstrates digital TV transmitter concept

Acrodyne, Blue Bell, PA, has demonstrated its new digital TV transmitter concept for the editors of *Broadcast Engineering* magazine. Dr. Timothy Hulick, Acrodyne's vice president, demonstrated the prototype transmitter, which operates at 60W peak of sync power.

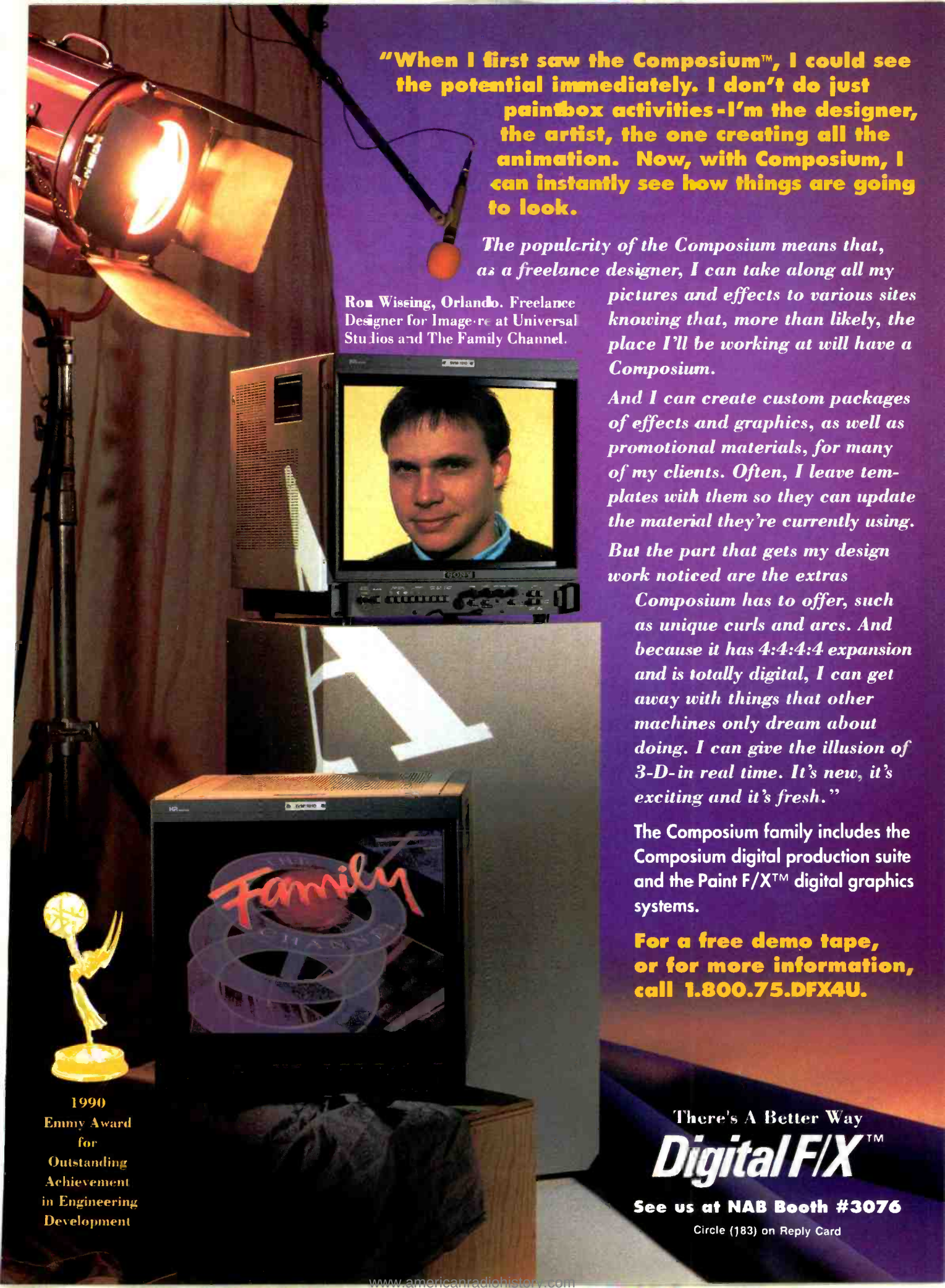
The design relies on all Class C amplifiers, which can greatly improve a TV transmitter's efficiency. Company officials reported that the transmitter typically will consume 50% less power than today's transmitters.

AMS and Neve join forces

AMS, Burnley, England and *Neve*, Bethel, CT, have joined forces following the acquisition of AMS by the Siemens audio-video group. AMS will draw upon Neve's resources in the areas of administration, accounting, sales/service and advertising/promotions. AMS will relocate its corporate offices in Petaluma, CA, to Bethel, CT.

DAR appoints SAV as French distributor

Digital Audio Research (DAR), Surrey, England, has appointed Paris-based SAV as the distributor for its SoundStation digital audio production systems in France.



New products

Product information
By Lexicon
• **Applications notes:** eight releases describe more effective applications of PCM-70, LXP-5 digital effects systems and MRC MIDI remote-control unit; also "Digital Domain Digest" newsletter discusses technical aspects of digital audio products.
Circle (371) on Reply Card

Digital audio for radio
By Media Touch Systems
• **Digital audio workstation:** integrated digital audio system for multiple users; Novell network environment with 80386-based PCs for recording, archiving, editing and playback of news and commercial material from central, digitized storage; interface to radio traffic system; touchscreen control technology.
Circle (372) on Reply Card

Product literature
By Microdyne Corporation
• **VistaLink II:** brochure describes a fully automated, satellite video receiving terminal; system controller, receiver and motorized antenna system are included; options include scrambler, CATV modulator, VTR.
Circle (373) on Reply Card

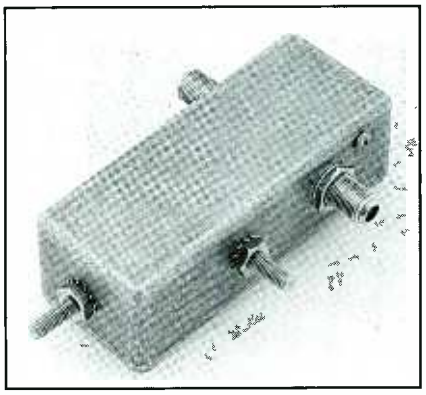
Product literature
By Microwave Filter Company
• **Filter data:** catalog C/87 describes CATV/SMTV/LAN filters and traps, co-channel elimination, bandpass filters; Bulletin 15 details LPTV sideband filters, V/A combiners; Bulletin 14 outlines FM harmonic suppression filters.
Circle (374) on Reply Card

Flexible signal correction
By Nova Systems
• **Nova 800, 810:** full-frame TBCs for capstan or non-capstan servoed VCRs; infinite window for use with all VTR formats; model 810 includes 5.5MHz wideband processing and subcarrier feedback mode.

Circle (375) on Reply Card

Computer monitor testing
By NTI/Network Technologies
• **MONTEST series:** three hand-held test models generate signals for adjustment and repair of most current computer color monitor formats; video, intensity, H/V sync, RGB, TTL and analog outputs are produced in four patterns; -D4, -A5D3 and -AD16 produce four, eight and 16 different scan formats to service IBM, MAC II, HP, Sun, MicroVax analog and TTL graphic system displays.
Circle (376) on Reply Card

Power protection products
By PolyPhaser Corporation
• **PRM-25E:** chemical ground rod system; package includes perforated copper tubing and distribution valve; tubing connects to PolyRod chemical container, distributing electrolytes to lower soil resistance and connection inductance for better grounding. In-Line series: AC line protector for 120, 208, 240, 480VAC with 100a or 200a per phase of usable power; EMI, RFI filtering; handles surges to 45ka; monitor panel with indicators, field replaceable components. 80kW hard line protector: fast turn-on, less than 14ns, with high turn-off; custom designs based on power level, frequency range of DC-500MHz and EIA flange size; 100ka surge current handling.



Circle (380) on Reply Card

Peak program meter
By NTP Elektronik A/S
• **PPM 477-100:** precision metering unit with microprocessor control; multiple function gas discharge display permits simultaneous bar and spot levels with six display modes; triple-color phase meter; high overload margin, extended scale to monitor fast peaks at high audio levels; PC communications with plug-in card.
Circle (377) on Reply Card

Post-production console
By Philip Drake Electronics
• **PD2000 mixer:** modular stereo audio console; maximum of 48 inputs mix to stereo subgroup or main output modules, a total of 12 mixing buses; balanced audio facilities; inputs can be mono, stereo or multitrack in-line; multiple clean feeds, mix-minus on all input modules; M-S feature uses two mono channels for mid-side mic technique.
Circle (378) on Reply Card

Wireless intercom
By Philip Drake Electronics
• **PD600 series:** in-band radio talkback units for camera operators, lighting crew, floor managers; 4-channel portable or base station units with permanent receive and push-to-talk feature; UT600 transmitter with UR600 receiver operates on 600MHz UHF frequencies.
Circle (379) on Reply Card

3-D sound
By Roland Corporation
• **RSS:** binaural digital processor allows user to manipulate localization of sound in space; internal transaural processor eliminates crosstalk; RSS-encoded recordings, played on conventional stereo systems, exhibit enhanced aural environment without additional hardware. SN-550 noise eliminator: 16-bit linear A/D conversion with 18-bit D/A conversion at 48kHz; single-ended system; dual-channel architecture features hum and 5-band noise cancellation processing.
Circle (381) on Reply Card

Flexible DMM
By Simpson Electric Company
• **Model 467 series:** several digital multimeter models featuring hands-free readings; design permits use as benchtop instrument or may be carried on strap around operator's neck or belt; displays precise digital readout with rapid analog approximation on LCD bar graph.
Circle (382) on Reply Card

Product literature
By BURLE INDUSTRIES
• **Power Tube catalog:** 51-page publication describes RF power devices and cavities for broadcast, communications and special purpose applications, ranging from DC to 1.4GHz with power levels to megawatts.

Circle (360) on Reply Card

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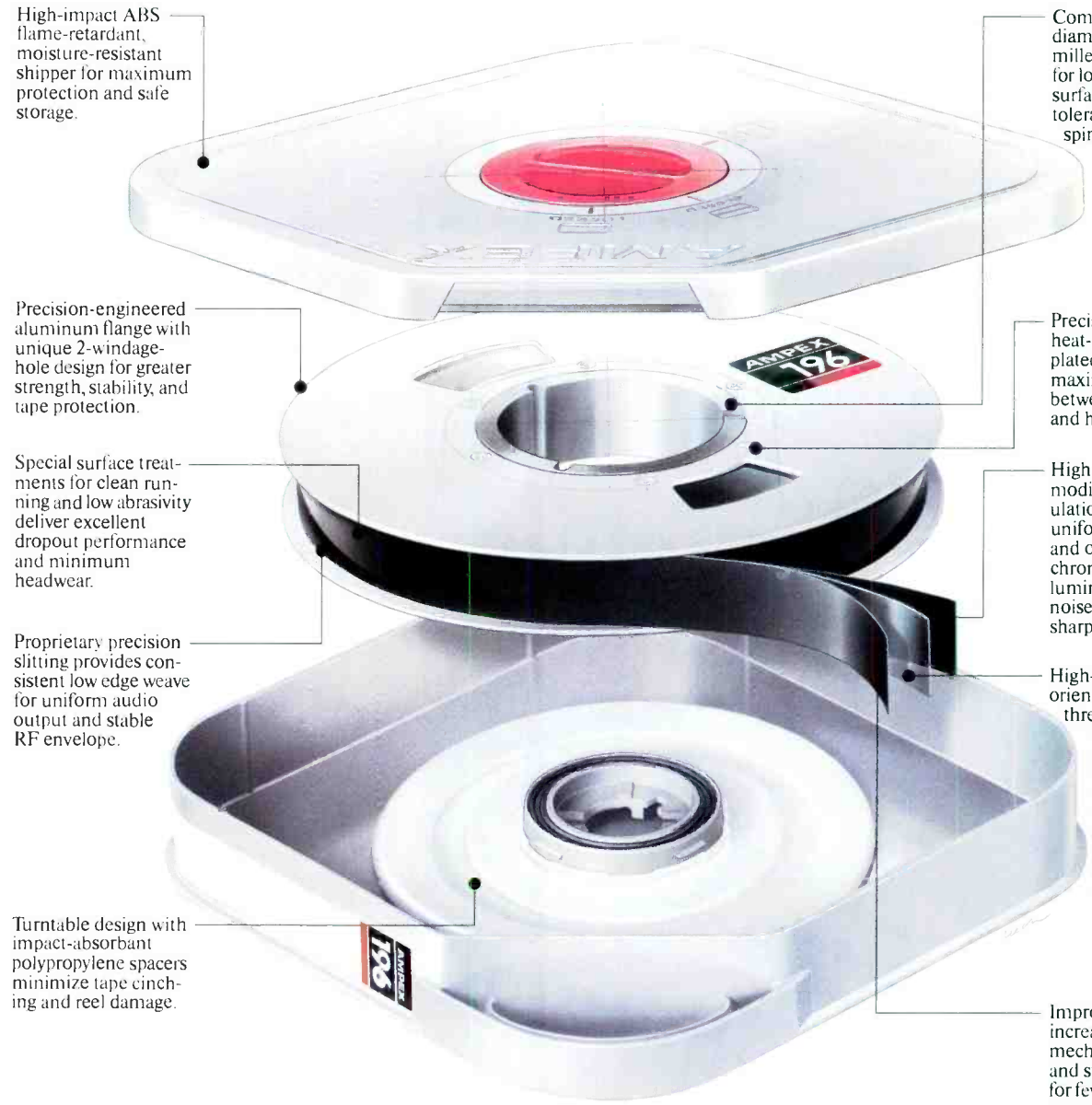

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Circle (184) on Reply Card

Miniature studio mic

By AKG Acoustics

• **Model C407:** vocal condenser instrument in AKG MicroMic series; 0.3-inch diameter with detachable tie pin, clip and removable windscreen; terminated with XL connector housing pre-amp and phantom power adapter or with plug for wireless body pack or B9 phantom power supply.

Circle (351) on Reply Card

Digital audio processing

By Digital Audio Research

• **DASS 100:** multifunction interface with synchronizer and signal processor; convert sampling frequencies, digital audio format; synchronize samples with digital sample clock referenced to video, AES/EBU, WSYNC, LTC sources; gain adjustment, digital signal mixing, time delay, pre-/de-emphasis features.

Circle (364) on Reply Card

Audio workstation

By Symetrix

• **DPR44 recording, editing station:** based on object-oriented concept; sound segments assigned to graphic objects on a color controller screen; graphics control tablet for transport control, shuttle, jog functions; 4-track random access recording, editing, mixing; Macintosh II for master ethernet control; full time-code interface, RS-422 serial ports.

Circle (383) on Reply Card

Time, logo generator

By Vistek Electronics

• **GM6004:** develops a digital clock with time in hours, minutes, seconds; front-panel selection of one of eight generated logos; X-Y positioning values for clock, logos and clock time are shown on remote-control unit LED displays; chassis and remote unit each require one rack unit of height.

Circle (386) on Reply Card

Technical publication

By Tektronix

• **Television measurements—PAL Systems:** reference manual describes more than 20 measurements for PAL standard per CCIR specifications; amplitude, timing, linear and non-linear distortions, noise and transmitter measurements discussed; appendices for timing diagrams, color bar and sinFD pulses, glossary of terms; companion to "Television Measurements—NTSC Systems."

Circle (384) on Reply Card

Reference monitors

By TGI/Tannoy

• **Studio monitor series:** speakers for critical listening situations; "differential material technology" avoids coloration of the sound caused by the cabinet or other associated monitor components; transducer sizes from 8- to 15-inch diameters using dual concentric drivers; System 215 DMT is dual 15-inch monitor in single cabinet.

Circle (385) on Reply Card

Remote power source

By Dynamote Corporation

• **SmartWave-2000:** 120VAC inverter; produces 2kW (18a) power from 12VDC battery at 90% efficiency; output regulation is ±5% at 120VAC with crystal-controlled frequency of 60Hz; high-frequency switching mode design; weighs 23 pounds.

Circle (365) on Reply Card

Cable maintenance
By Alpha Wire Corporation
• **AT-140/3:** cable stripping tool; performs three cuts at once on RG-6, -58, -59, -62; adjustable blade depth to reduce nicks; cable size adjustment.

Circle (352) on Reply Card

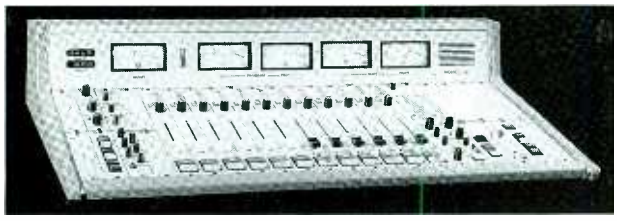
Connector installation
By AMP
• **Pro-Crimper:** uses interchangeable dies for use with various connectors for coaxial or fiber-optic connectors and insulated terminals and splices; FO die set for 2mm and 2.5mm single-/multimode threaded and 2.5mm bayonet multimode connectors; also available for subminiature-D pin and sockets.

Circle (353) on Reply Card

Feedline products
By Andrew Corporation
• **MACXLine coax:** rigid transmission line for high-power inner conductor operation; bellows construction at flange joints absorbs expansion and contraction to eliminate metallic particles caused by movement of typical rigid feedline.

Circle (354) on Reply Card

On-air mixer
By Auditronics
• **210 series:** radio broadcast console; four mainframe sizes for 6-, 12-, 18- and 24-input channels; numerous options in addition to standard 200 series features include 3-caller telephone module, headset amplifier with equalizer, VCA fader control.



Circle (356) on Reply Card

Critical listening units
By Audix
• **HRM-1:** high-resolution monitors; housed in natural or black oak finishes; 6½-inch polypropyline, curvalinear low-frequency driver with high-frequency polyamid dome tweeter; 24dB/octave, 3kHz composite crossover; expanded voice coil of larger driver serves greater power handling, extended low-frequency response for small-sized cabinets.

Circle (357) on Reply Card

VITC for editing
By AXON Digital Design
• **AVI-90 inserter:** displays VITC time-code information on the screen or inserted into the video; display may include user-bits data; insert position adjustable; 9-12VDC operation with connections for composite and Y/C (S-VHS) video signals.

Circle (358) on Reply Card

Product literature
By Cliff Electronics
• **Distributor catalog:** describes product line of audio components, jacks, sockets and cabinet hardware.

Circle (362) on Reply Card

Enhanced NTSC

By Faroudja Laboratories

• **LD-1 Line Doubler:** for Super-NTSC, 1,050-line pictures from RS-170 RGB input signals; includes digital compensation for motion anomalies; use outputs for interlaced or non-interlaced applications.

Circle (367) on Reply Card

High-intensity microphones

By Audio-Technica

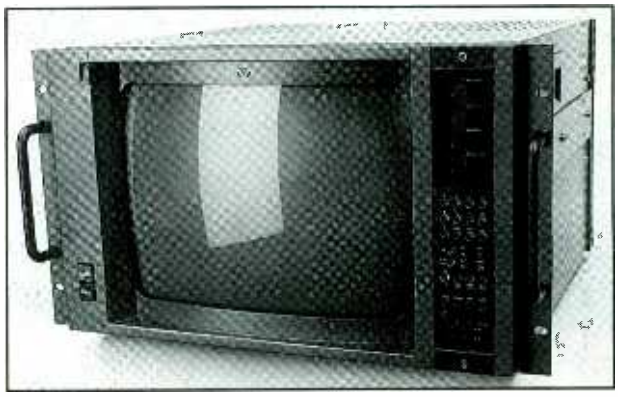
• **PRO 4C:** for close-up vocals; condenser element in ball-shaped protective screen; reduced wind noise, popping, distortion. PRO 25: hypercardioid dynamic type; low-mass diaphragm and voice coil assembly; effective for musical instrument pickup as well as voice; rugged construction for tour use.

Circle (355) on Reply Card

Color picture monitor

By Vistek Electronics

• **GM7500 series:** 14-, 20-inch video displays; assignable inputs permit multiples of standard analog signals as well as Y/C (S-VHS), D1 4:2:2 component, D2/DX composite; cabinet or rack-mount; dark current stabilization holds color balance, black level; optional tri-stimulus analyzer device for automatic alignment.



Circle (387) on Reply Card

Audio disk recorder

By Fairlight ESP

• **MFX post-production recorder:** 24-track emulation; hard disk provides 20 hours of on-line sound; 32Mbyte waveform RAM for six minutes of random access audio storage; color video display scrolls all 24 tracks for quick manipulation of signals and edit points; includes sampling, waveform processing, sequencing functions of previous Series III CMI system with external MIDI keyboard.

Circle (366) on Reply Card

Dynamics control

By dbx/AKG Acoustics

• **Model 160XT:** compressor/limiter; simultaneous display of input or output on 19-LED ladder and a 40dB gain reduction range; OverEasy or hard-knee compression; rms detector for frequency, time-dependent compression; stereo coupling available; ¼-inch and XLR type connectors for electronically-balanced inputs, outputs; continuously adjustable compression ratio.

Circle (363) on Reply Card

Audio interconnection
By Bec Technologies

• **AUDIOPLEX Elite:** fiber-optic snake; total capacity of 128 channels, each to 24kHz bandwidth, structured in 8-channel blocks; active inputs, outputs; to 64x oversampling in A/D and 256x in D/A conversion; outputs to drive 600-ohm load at 10V.

Circle (359) on Reply Card

Software feature
By Calaway Editing

• **E-E preview enhancement:** for CE series videotape editing packages; eliminates need to connect an external preview switcher; compensates for inaccuracies introduced by the record VTR head switching from playback to E-E modes.

Circle (361) on Reply Card

Time-code equipment
By Fast Forward Video

• **Model F22:** combination generator, reader and character inserter for SMPTE time code; reads from 1/30x to 10x forward and reverse; drop-frame, non-drop-frame, jam sync and code regeneration; SMPTE to MIDI converter.

Circle (368) on Reply Card

Product information
By Goldstar Technology/Semiconductors

• **IC brochure:** 8-page booklet notes linear, high-speed CMOS logic and bipolar digital IC devices as well as DRAM, video RAM and SRAM memory products.

Circle (369) on Reply Card

Interface solutions
By J. R. Hill

• **ISO-1:** 6 independent optically-isolated circuits in one package; simplifies connections between different "remote" control lines with varying voltage level range of 5-30VDC; avoids compensating resistor networks; CR-1 control relay module includes two independently-controlled 4PDT relays.

Circle (370) on Reply Card

Audio production system
By WaveFrame

• **CyberFrame:** multitrack recorder/editor; 8-channel system with modular disk storage, waveform display for editing; VITC/LTC slave sync; 16-, 24-bit modes; 10 levels of Un-Do, Re-Do capability; sound looping; scrub, locate, mark editing; options include magneto-optical recording, DSP-X 10x6 digital mixer, eight patchable EQ sections.

Circle (388) on Reply Card

Character generation
By PESA America

• **CG4733 titler:** anti-aliased system with 4:4:4:4 architecture; two 32-bit microprocessors, separate processor for font rendering; instant resizing of 10 high-resolution typeface masters; 40Mbyte, 1.2Mbyte drives, interfaces for additional storage; optional Graphic Plane comes with software, frame buffer for two 32-bit/pixel images.

Circle (406) on Reply Card

Underwater video

By Outland Technology/OTI

• **UWC-160, UWC-175P:** camera, control unit, recorder and monitor packages for special, underwater use; depth rating of 500 feet for −175P, to 1,500 feet for −160; single $^{2}/_{3}$-inch CCD with 510x492-pixel array has 1fc sensitivity; 340-line resolution; $^{5}/_{8}$-inch diameter cable uses polyurethane jacket to connect camera to control package; NTSC or PAL; helmet-mounting and underwater light options.

Circle (403) on Reply Card

Solder station

By PACE

• **ST(TM)-50:** dual station with IR-70 high-capacity iron; for thru-hole circuit boards with upgrades for SMD devices; ThermoTweez handpiece, V-SX SMT package, V-TP reflow/flatpack, ThermoPik hand-piece options with features including foot-pedal control.

Circle (404) on Reply Card

Audio patching

By Penny & Giles

• **JF2/1U jackfields:** compact construction permits 20, 24 or 26 $^{1}/_{4}$-inch jacks per row with two rows of jacks in the space typically used for a single row; front panel anolized in black or silver; integrated facility for two designation strips; noise-free connections.

Circle (405) on Reply Card

Signal distribution

By PESA America

• **System 5:** wideband routing system; 100MHz bandwidth for video; 512 video or 1,024 audio crosspoints per rack unit; meets HDTV, graphics and NTSC/PAL component and composite requirements; 16 separate switching levels each expandable to 1,024x1,024 matrices; Virtual Matrix Mapping software.

Circle (407) on Reply Card

Wireless talkback, console, routing

By Philip Drake Electronics

• **600 Series:** 4-channel radio transmitters, receivers with full-time receive and push-to-talk transmit; for floor managers, camera operators, lighting.

• **PD2000:** broadcast console for stereo television; production or on-air operations; 12 stereo buses, multitrack; dual input mic/line channels; on-board clean feed matrix; 4-band parametric EQ.

• **Series 9000:** 20-bit A/D, D/A digital router; to 128x128 matrix sizes; series of audio modules available for analog and digital domain; line-send, receive equipment; auto phase correction; analog video DAs with delay, EQ in component and composite forms.

Circle (408) on Reply Card

Audio router, converter

By Scantex Laboratories

• **ARS-410:** 4-level, 10-input switching system; styles offer follow only, follow and separate option, remote control; available with DB-25P-type balanced connections; 20Hz-20kHz response, 0, −0.25dB with −70dB crosstalk rating; 86dB S/N ratio; distortion less than 0.05%; 110dB range.

• **ABU-6S:** dual 12-channel, bidirectional differential to single-ended converter; low distortion, degradation on differential inputs to 24dB, unbalanced inputs to 18dB.

Circle (416) on Reply Card

RF display

By Microdyne

• **CSD-SDU spectrum display unit:** designed for satellite installation, alignment and system maintenance; for L-band 950MHz to 1,459MHz frequencies; applicable to C- and Ku-band alignments; LCD graphics screen is visible in high ambient light; bar graph mode with 24 bars shows dBm levels for each C-band transponder; spectrum mode shows entire L-band in 5MHz steps; oversampling mode removes fluctuations from vertical sync modulation; freeze-frame feature saves screen to memory for recall; rechargeable battery pack with 3-hour capacity.

Circle (396) on Reply Card

Multiformat processor

By Microtime

• **Tx5 TBC:** combines TBC functions for 8mm, ½-inch or ¾-inch VCRs with synchronizer features for remote feeds; 8-bit, 4:2:2 processing from S-VHS, composite and dub input and output signals; 5.5MHz luminance bandwidth; frame memory for field and frame freeze.

Circle (397) on Reply Card

Ku-band amplifier

By Microwave Solutions

• **Model MSH-7402202-WM:** 30dB gain unit for 11.7-12.2GHz range with power output of +7dBm minimum; 2.1dB maximum noise figure; operates from +15VDC and 150mA; other noise figure, power output and gain options available.

Circle (398) on Reply Card

Titling, DTVP system

By MPB Technologies

• **System 7:** combination graphics titling system with desktop video production capabilities; PC/AT base with 40Mbyte, 1.2Mbyte disks; MS-DOS; NTSC or PAL encoding, single or 2-channel graphics channels; 4-channel keyer-mixer with two NTSC inputs, two graphics inputs, mixing, fading, wiping capabilities.

Circle (399) on Reply Card

CD production music

By Omnimusic

• **PBS 1014 Zapfile 1:** an additional disc in the professional broadcast series with copyright-cleared material for video and radio; stingers, bumpers, logos, news bulletins, special effects; four sections for quicker searches.

Circle (400) on Reply Card

Microwave system

By OpTex

• **E-band link:** miniature video-audio transmitters, receivers; intended for ENG/EFP with operation from the camera battery; single audio channel with video in E-band (2.44-2.68GHz); three of four models provide preselectable channels in a 50MHz range; 12VDC operation produces 0.5W to 1W ERP.

Circle (401) on Reply Card

Network, spectrum analysis

By Rohde & Schwarz

• **Model FSBS:** spectrum and network analyzer system; sensitivity to −15dBm from 100Hz to 5.2GHz with 170dB measurement range; tracking generator permits frequency offsets to 1GHz.

Circle (414) on Reply Card

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Preview

April...

AUTOMATION — TYING IT ALL TOGETHER

- **Implementing PC-Based Automation**

A station doesn't have to spend millions to obtain some of the features offered by automation. This article looks at some improvements available with PC-based systems. Today's systems are a far cry from the error-prone systems of yesterday.

- **Planning for a Library System**

Video library systems are taking over many tape rooms. However, because the systems are extremely complex, proper implementation requires careful planning. This feature will examine the process that must be undertaken to realize the benefits these systems offer.

- **Engineering Profit Center**

Station engineers become part of the profit picture when they show their managers how to use digital technology to generate new financial opportunities for their stations.

May...

ANNUAL RF TRANSMISSION SPECIAL ISSUE

- **Directional Antenna Assessment**

Many of today's AM stations have antenna systems that need thorough evaluation. The problem is that doing so requires special knowledge and expertise. This article shows how to perform a complete analysis of an AM RF system. It also gives insight on how the station engineer can tune the system for maximum performance. This feature is the RF guidebook for AM station engineers.

- **Measuring Earth Station Antenna Performance**

Earth station antennas are often selected based on size and the assumption that "x" meters will produce the needed performance level. Unfortunately, that belief often can result in excessive costs or disappointment in the actual results. This article outlines specific steps and calculations to follow the selection process.

- **Solid-State vs. Tubes in TV Transmitters**

It is no longer so easy to decide between tubes and solid-state, even in TV transmitters. This article looks at both sides of the issue.

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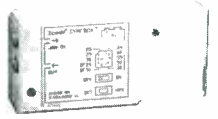

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