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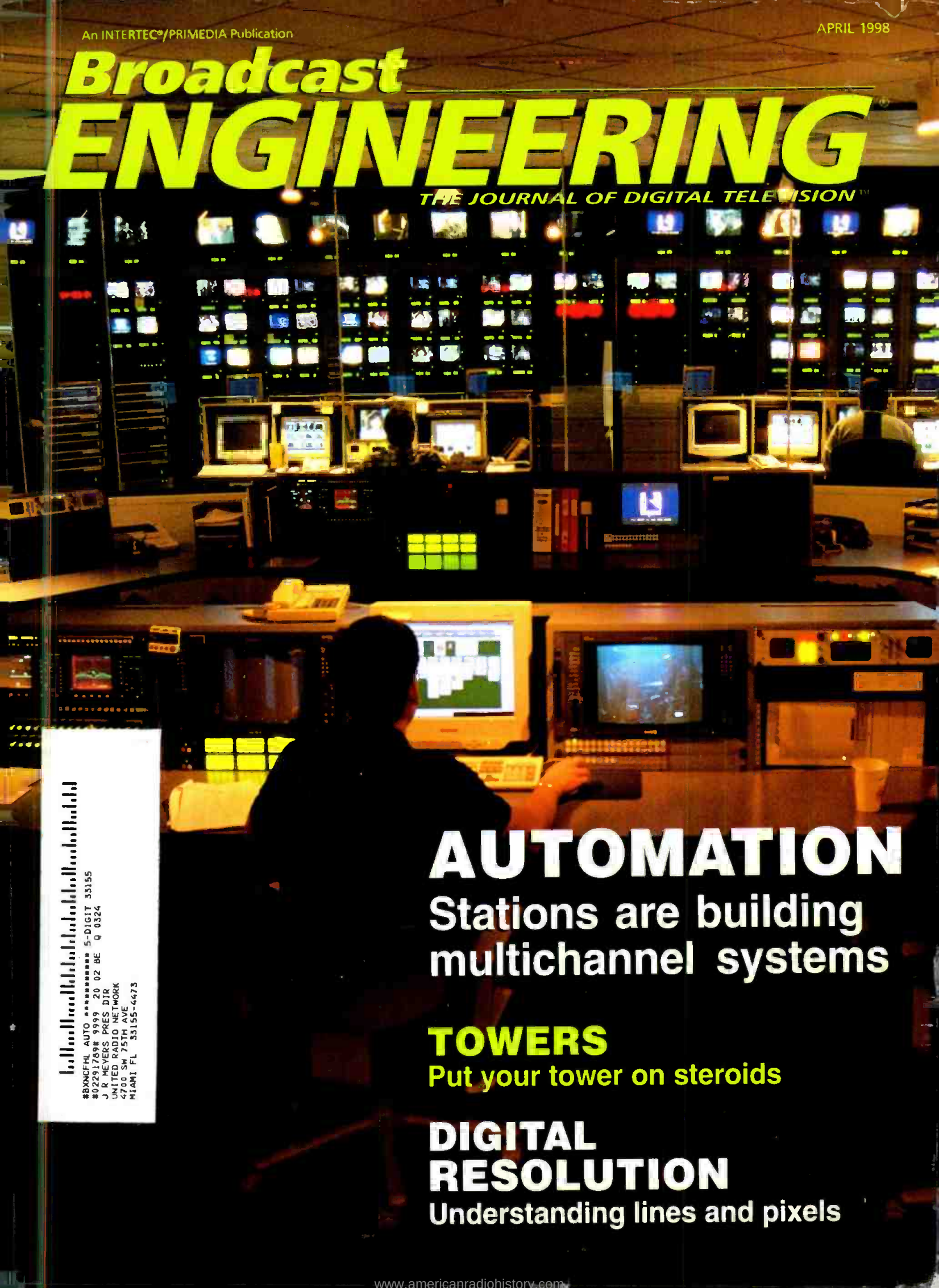
APRIL 1998

Broadcast ENGINEERING

THE JOURNAL OF DIGITAL TELEVISION™



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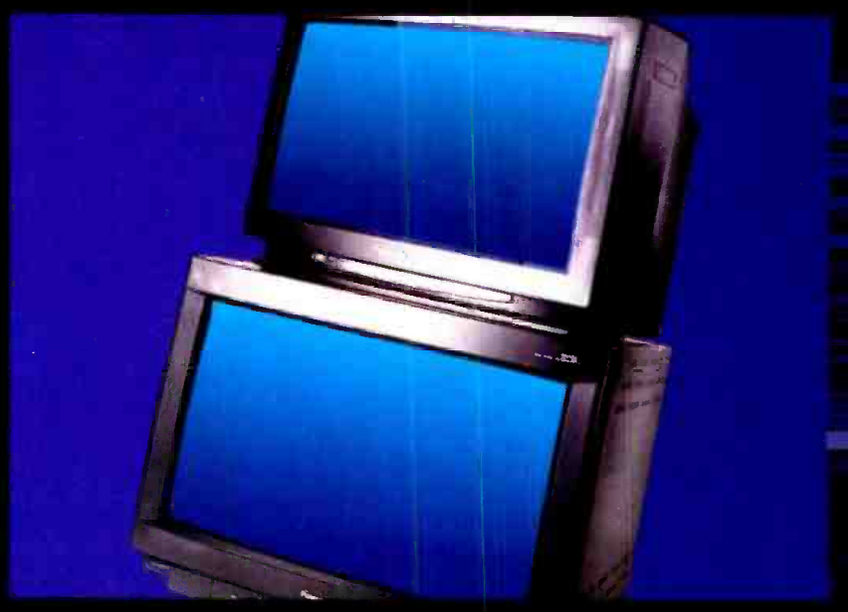

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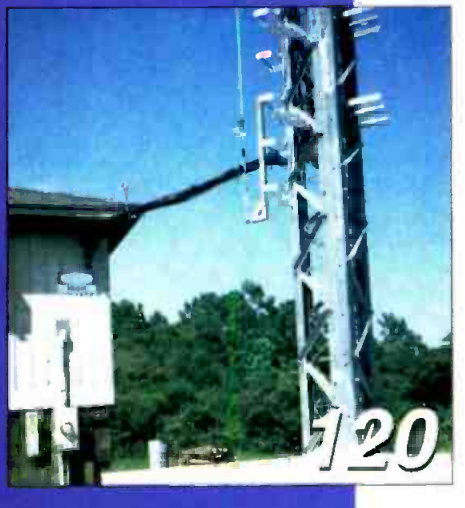

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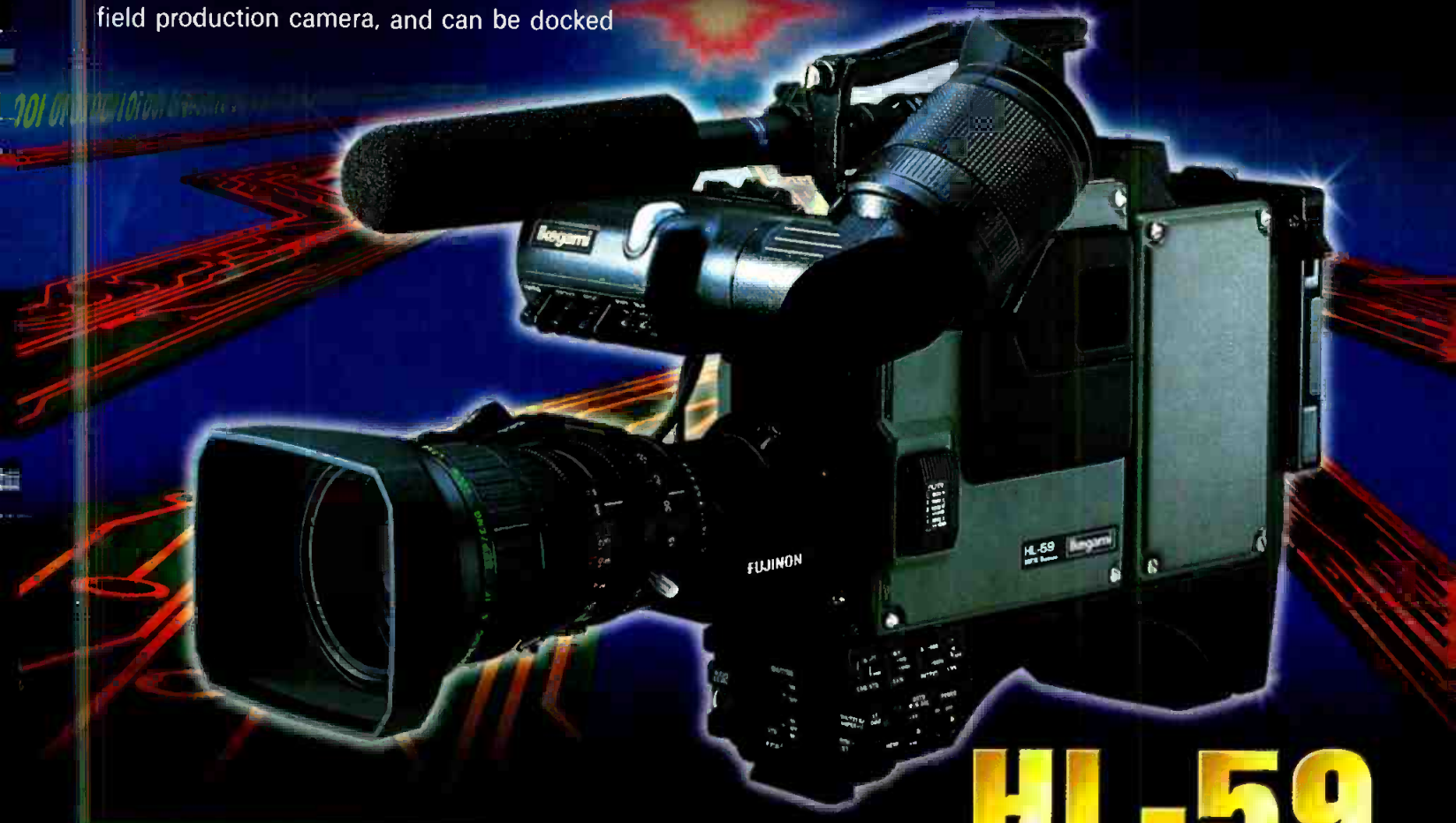

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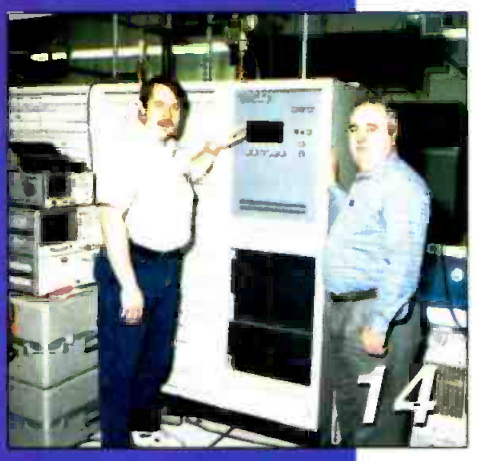

ON THE COVER: *TCI's 32-channel pay-per-view control room. In the background is the system's network response center and quality assurance monitoring area. Photo by Doug Schwartz photography.*

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FREEZE FRAME

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Do you remember?

This famous Midwest tower and its station were highlighted in November 1967 *Broadcast Engineering*. What station is it?

Answer: Correct entries received by May 15, 1998 will receive a photocopy of the original article, complete with photos of the station's equipment dating back to 1934. Fax entries to 913/967-1905 or e-mail: brad_dick@compuserve.com

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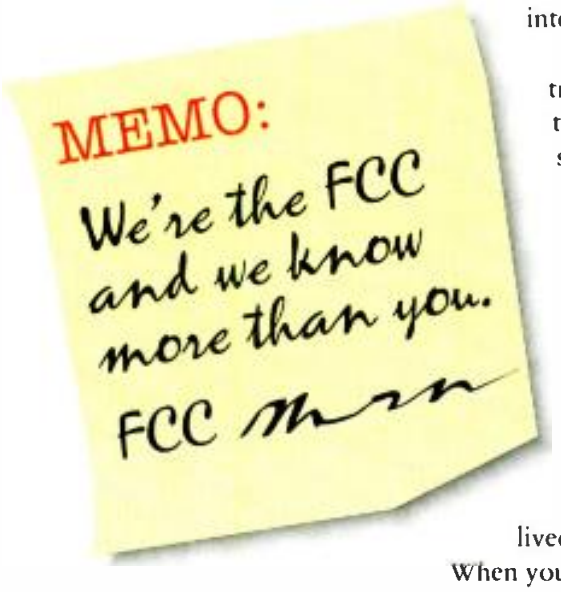
Editorial

Screw the laws of physics, we're the FCC

New technology often brings as many problems as it does solutions. By now most have heard about the rather serious incident that occurred when WFAA-TV fired up its new DTV transmitter in Ft. Worth, TX. Unbeknownst to them, at the point the transmitter went on-line, all of the portable heart monitors at Baylor University hospital died. Fortunately, it was only the heart monitoring system that died, not the patients.

The engineers at WFAA worked cooperatively with the hospital technicians, but the solution required installing new portable heart monitors. The expense and trouble was something the hospital never planned for. This event may represent just the tip of an iceberg where interference is concerned.



Over the next few years, we're going to be putting a lot more new transmitters on the air. In the interest of generating useless information, I tried to calculate how many gigawatts of power all of these new DTV stations will be generating and I ran out of zeros. Needless to say, one result of all these new transmitters will be enough interference problems that you won't be able to keep track of them.

It's easy for the FCC to make laws and issue regulations, even assign channels and power levels on paper. Unfortunately, it's the engineers charged with implementing the rules that usually catch hell when something doesn't work. Frankly, there was no excuse for the WFAA/Baylor incident. Washington bureaucrats dropped the ball with frequency coordination — big time. If a member of my family had died as a result of this action, I'd have wanted someone's head over the matter.

The lack of frequency coordination symbolizes the commission's long-lived practice of ignoring engineering expertise in favor of attorney stupidity. When you stack the FCC with enough attorneys to sink the Titanic, we shouldn't be surprised when the entire broadcast system runs aground.

This incident reminds me of my days in college when I was researching the FCC. I marveled at how ineffectively it dealt with early frequency interference issues. Early commission rulings seemed totally ignorant of the laws of RF propagation. The FCC often seemed to believe that RF stopped at state lines. A Kansas City, KS, radio station couldn't possibly interfere with a Kansas City, MO, radio station. After all, they were located in different states. Unfortunately, that belied the possibility that the sites themselves might be only two miles apart; they just happened to be on opposite sides of the Missouri River.

All of this means that TV station engineers need to be aware of the possibility of interference, at all times, but especially when putting their new DTV systems on the air. For those early adopters, you should be prepared to take the slings of arrows as you interfere with users that before had a free ride, at least as far as interference. Those that begin DTV broadcasts later may suffer fewer problems because those sharing the same frequencies might have moved on to new channels or improved their systems by then. Unfortunately, with the lack of planning by the FCC, it's going to be up to the station engineer to prevent and correct any interference issues that develop.

Brad Dick

Brad Dick, editor

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Reader Feedback

Total recall

Unless this was an incredibly early version of this machine, it (the Ampex disk recorder) was designated HS-100 (also A, B and C versions) and recorded only 30 seconds. (See, "Do You Remember?" February, p. 8.) If you look at the clocks on the two controllers and the monitors in the picture, you can see there are two separate systems of 30 seconds each. The trick as an operator was to see how much video you could preserve as the game progressed, without missing subsequent plays. It was actually an entertaining machine to operate, if a little bit temperamental. I'm glad it was never my job to fix one.

MARK GOLDSMITH
FOX SPORTS
OHIO

About audio

The January article from Don Barto at Big Shot Studios was awesome. (See "Lately In Audio Post," January, p. 62.) He has a great sense of a non-linear board.

I'm interested in finding more articles written by him and would love to see a regular column from him. Any chances of that?

Thanks again. I really enjoy reading your magazine.

DAVID RONA
IN2WISHN@YAHOO.COM

History revisited

The new-style *Broadcast Engineering* looks great. Too bad that the article "History of Remote Broadcasting" contained two fundamental errors of fact. (See January, p. 86.)

Fact: Forget "50 years of remotes." Remember the newsreels of Jesse Owens at the 1936 Olympic Games in Berlin and the TV camera with a monster lens? That was covered by live electronic television about 62 years ago.

And, the 1937 coronation of King George VI in London was covered by electronic television. Even David Sarnoff used a live remote to launch electronic television in the USA at the World's Fair — and that was back in 1939.

Fact: "The zoom lens didn't exist until the mid-1950s." Gosh, we've been hoodwinked and all those pre-war books and articles on the zoom lens must be cunning fakes! In fact, BBC Television introduced a Watson 5:1 zoom in 1951 for sports telecasts and even they were beaten by you Yanks.

According to Rudy Bretz's *Techniques of Television Production*, Zoomar lenses were first used for TV in the USA back in 1947 on football games.

The old pictures were great, though; let's have more of them to remind us when rigging cameras kept you fit!

ANDY EMMERSON,
TV WRITER AND HISTORIAN
MIDSHIRES@CIX.CO.UK

Andy — leave it to a Brit to correct our history lesson.

re: Lip sync in HDTV

Mr. Bloomfield raises several interesting points in his article, a few of which the Grand Alliance may have headed off at the pass. (See "Is Lip Sync in HDTV Going to be a Problem?" February, p. 18.) The situation regarding voice-overs is a case in point. The ATSC standard lists six audio channels in addition to the 5.1 we discuss so often. One of those is VO. Its purpose is to allow the local station to make those critical announcements over incoming audio without the hassle (and probable quality loss) of putting it through a decode-encode cycle. The viewer's receiver will be instructed to lower the program volume by up to 24dB and the local station can inject its announcement without fuss. Presumably, the affiliate will have invested in the six-channel associated service adapter from Dolby for this purpose.

I suspect that all of these audio enhancements will be a larger headache than this simplified explanation might suggest, but once the wrinkles are ironed out, it shouldn't be any more troublesome than the present lash-ups. On the other hand, I haven't actually seen this adapter yet . . . maybe at NAB.

KIND REGARDS
JIM HEIM
JHEIM@DIVI.COM

Wireless Video Sender modifications

I would like to see an article on Henry Ruh's modifications to the Wireless Video Sender, including what modifications were made, what type of external antennas were used and what FCC waiver was needed. (See, "In response to the October Digital Basics --- A TV station for less than $150," January, p. 12.) There are many of us who would love to teach our students about the wonders of live shots on ENG links but can't afford the $35,000 price tag.

LEE BYERS
BYERS@SUU.EDU

Never mind the truth, we're the FCC

Dear Mr. Bloomfield:

I have reviewed your story and, although you are right that we (the FCC) do not share the same point of view, I do not think you have said anything that is inaccurate or misquoted from the item.

Thank you for taking the time to run this by us. *(Editor's note: For the story the FCC didn't like, see "Beyond the Headlines" in this issue on p. 14.)*

HELGI WALKER
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News

Not all broadcasters are equal under the law

BY LARRY BLOOMFIELD

Is the FCC fostering religious discrimination? Such would appear to be the case with the action taken by the FCC on Feb. 25, 1998, when the FCC modified its EEO enforcement policies for religious broadcasters in Report No. MM 98-2. According to the FCC, religious broadcasters may establish religious belief or affiliation as a job qualification for all station employees.

The commission said, "It is reasonable to conclude that it is appropriate for all employees of religious broadcasters to share a common commitment to a licensee's basic religious objective and mission." Furthermore, "The new approach would end the need for the current practice of engaging in case-by-case analysis of particular job categories to determine if they involve espousal of the licensee's religious views."

The question raised, however, is this government-sanctioned religious bigotry? The commission has long been a vanguard of equal employment opportunity rights as part of its trust to be the watchdogs of the public trust — the airwaves.

Harold Furchtgott-Roth

With this erosion, the commission maintains that "this action does not create a blanket exemption from the FCC EEO rule and does not permit religious broadcasters to engage in employment discrimination against women and minorities." The question is, if the particular station's religious philosophies teach discrimination based on race, color, national origin or gender, where do the exceptions end?

Despite this, the new policy states, "When vacancies occur, religious broadcasters will still be required to recruit without limitation on the basis of race, color, national origin or gender from among those who share their religious affiliation or belief."

It would appear that the commission is shoving under the carpet an area of responsibility it finds uncomfortable and would not care to have to address. The commission's action responds to concerns by religious broadcasters that its prior approach excessively entangled the government in the affairs of religious entities.

To clarify and justify this action, the commission defined a religious broadcaster as "a licensee which is, or is closely affiliated with, a church, synagogue or other religious entity, including a subsidiary of the religious entity. Specific determinations of whether a licensee is a 'religious broadcaster' will be made on a case-by-case analysis."

Apparently, commissioner Harold Furchtgott-Roth's crystal ball is working better than the rest of the commissioners. In a February statement, he said, "I write separately simply to highlight several important points that this item leaves unaddressed." Furchtgott-Roth's statement is available on the FCC's web page at www.fcc.gov.

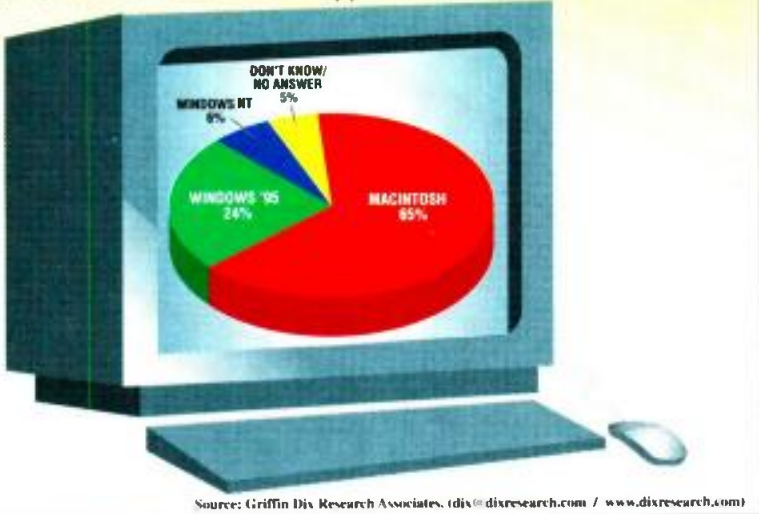
This action could help the unemployment problem because the commission will have to hire droves of help to keep this situation sorted out. It is said that if we don't learn from history, we will be forced to relive it. For more information, go to www.fcc.gov/Bureaus/Mass_Media/News_Releases/1998/nrmm8005.html.

FRAME GRAB

A look at the issues driving today's technology.

Mac beats Windows in TV station graphic applications.

Despite Windows dominant overall marketshare, TV stations prefer the Mac for video and multimedia applications.



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First live digital HDTV soccer broadcast

The significance of broadcasting the first soccer game in digital high-definition using the ATSC standard is major. The world's first live DTV broadcast of a soccer game was conducted in Mexico on Jan. 25. Live HDTV coverage of this soccer game in Mexico was provided by the ATSC and Televisa. Prior to this coverage, ATSC and Televisa had been conducting other live over-the-air broadcasts in HDTV. Televisa is the sister company to Univision, the Spanish language TV network in the United States.

Robert Graves, ATSC chairman

Kicking off the HDTV weekend in Mexico City, digital signals with crystal-clear HDTV pictures and CD-quality six-channel surround sound originated from Televisa's Chapultepec studios in Mexico City. From there, they were carried by fiber-optic link to Televisa's Tres Padres transmitting facility outside the city. The signals were broadcast over the air to receiving equipment at the Chapultepec studios.

Five HDTV cameras were used to send signals from Azteca stadium in Mexico City, via fiber-optic link to Tres Padres where they were broadcast to audiences at two TV studios in Mexico City.

Emilio Azcarraga, president of Grupo Televisa, said, "This historic digital HDTV broadcasts mark an important milestone in Televisa's ongoing efforts to bring the benefits of this new technology to the Mexican people. By conducting these broadcasts, we hope to demonstrate the benefits of digital television using the ATSC digital television standard to Mexican government representatives, to the TV broadcast industry and to the press." Televisa's efforts to explain the benefits of high-definition television date back to 1990 when it conducted demonstrations of analog HDTV broadcasts in Mexico City in conjunction with NHK of Japan.

"We are enthusiastic and excited about the advent of digital television," said Robert Graves, ATSC chairman. "The ATSC DTV standard offers broadcasters around the world the flexibility to provide many different combinations of high-definition television, multiple programs of standard-definition digital television (SDTV) and a virtually limitless set of potential information services. Implementing the ATSC standard will mean a quantum improvement in the technical quality of television service and will provide data delivery capability that represents a fundamental improvement in the information infrastructures of the nations that adopt it.

"What's more," Graves added, "implementing common or similar digital television standards in many countries will benefit those countries by providing wider availability of broadcast and consumer equipment at lower prices."

In addition to being the standard in the United States (beginning this fall), the ATSC standard has been adopted in Canada and South Korea, and is being considered for adoption in Mexico. Brazil and Argentina are considering the ATSC standard. Broadcasters in those countries have expressed a preference for the ATSC standard. Taiwan also has made a preliminary decision to go ATSC.

The favorable aspects of the ATSC standard are its emphasis on HDTV and the economic advantages of aligning with the North American equipment

Add Brazil to the ATSC list

In addition to the story about Mexico and Televisa, the ATSC digital TV standard is gaining acceptance in South America. Comark Digital Services (CDS) of Alexandria, VA, has been awarded a contract by TV Globo, a national network that covers Brazil through 104 TV stations, to send the "World Cup Soccer" games live from France to Brazil in digital HDTV. The first match is on June 10. What is significant about this event is that it is the first World Cup Soccer coverage to be delivered in the ATSC digital TV standard and it is the first transatlantic broadcast of HDTV of a world class sporting event. "Comark is proud to work with TV Globo on this historic intercontinental event," said Mark S. Richer, vice president and general manager of CDS.

Mark Richer

"There is no better programming than sports, particularly soccer, to demonstrate what HDTV means to the viewers. There is no better moment than the World Cup to demonstrate this technology, when the Brazilian people will focus their attention to television, anxiously rooting for their national team to win its fifth World Cup.

"For this reason, with the support of CDS, we have decided to undertake this challenging project of being the first to broadcast HDTV live from another continent. We are confident about the project and count upon CDS to make it successful," said Fernando Bittencourt, director of Engineering of Globo TV Network.

CDS will provide end-to-end facilities, from digital satellite transmission in France to the terrestrial broadcasting in Sao Paulo, Brazil. CDS is providing project management, engineering design, equipment procurement and integration services to TV Globo. The World Cup Soccer games will be transmitted using solid-state UHF transmitters fed by eight-level vestigial sideband (8-VSB) all-digital modulators for over-the-air broadcast. An in-house production capability that is responsible for more than 60% of airtime programming and for exportation to more than 130 countries, will work in conjunction with the World Cup Soccer feed. ■

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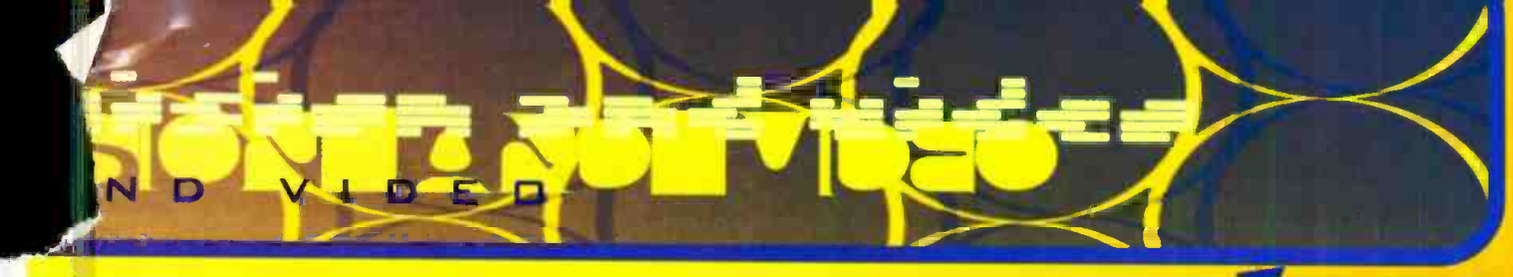

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market that is unfolding. In promoting its standard, the ATSC has conducted HDTV demonstrations in Switzerland, China, Australia, Brazil and Mexico.

In addition to Televisa, the Mexico City demonstrations were supported by a host of other ATSC members. The Advanced Television Technology Center provided integration and technical support. HD Vision supplied equipment and production expertise. Harris Corporation, Comark Communications and ITS Inc. provided digital transmitters. M&K Sound Systems also provided equipment to support the demonstrations. Mitsubishi Electronics America provided video encoding and decoding equipment. Panasonic and Sony Electronics provided equipment, as well as technical support. Not to be forgotten are Zenith Electronics Corporation, which developed the digital transmission system incorporated in the ATSC DTV standard and Dolby Laboratories, which developed the multichannel surround-sound audio system. ■

In the world of EAS, all broadcasters are not equal

Alerting the public in times of emergency is one of the highest charges of the broadcast licensee. Emergencies are the only times when the FCC rules can be bent to the breaking point to save lives and property. The first attempts to bring into being any kind of organized, nationwide alert system was done when President Truman signed into law the CONLRAD system. Remember when we were required to transmit the messages on 640kHz, 1,240kHz or go off the air? Although a step in the right direction, it didn't take into account the people who were listening to FM radio or watching television. In 1976, the emergency broadcast system (EBS) replaced CONLRAD and for many years the vehicle through which emergency messages were disseminated to the public was the EBS. The system was intended for the President to convey messages and information in times of pending disaster. The EBS allowed for the governor of a state to convey the same. In recent years, local operational areas have adapted the two-tone attention signal system to alert smaller groups of the population in times of pending disaster. It is the latter use of the EBS that saw the most actual emergency duty, with the national and state EBS limited to occasional testing.

Congressman Billy Tauzin

As technology advanced, the EBS did not. The two-tone attention signal became a tune-out factor as stations were required to transmit it during main broadcast hours once per week. Also, because all EBS broadcasts had to take place on main broadcast channels, it forced broadcasters to become selective in their retransmission of an emergency message, especially if that transmission pertained to a narrow section of the population outside the broadcaster's coverage. Finally, because the EBS was a serial relay system of main-channel broadcasters, the system became vulnerable to those broadcasters choosing not to retransmit all messages when the relay chain became broken.

Out of a request for input on changing the length of the two-tone EBS attention signal grew a revamp of the method of emergency broadcasting to what is now the emergency alert system (EAS). In the FCC rules adopted a few years ago, a digital protocol was adopted to allow for specific area alerting. In addition, the FCC opened up the path of emergency message transmission to include broadcasters and any other means available then or in the future. As this system develops, this flexibility of transmitting emergency messages should eliminate the vulnerability of the old EBS serial relay system, but there are some glitches.

Keep in mind that the only EAS transmissions a broadcaster must transmit are national messages, the locally generated required weekly test (RWT) and the local stations' participation in the required monthly test (RMT). All other messages, be they local, regional or statewide, are at the discretion of the individual station or broadcaster.

The FCC addressed mostly national and state issues in their rules, scarcely mentioning how implementation would be accomplished on a local, regional or other area level, leaving the local broadcasters on their own to develop system(s) to meet local needs. Broadcasters and local agencies have been struggling for the past year just to get their required monthly tests aired. The Sacramento area stations first used the EAS during floods last year. Reports have it that it was a success. Yet, others have suffered considerable embarrassment with gross failures.

EAS has been around for just more than a year. Cable companies will be coming on-line by the end of this year. The reasoning was to fill the gaps where viewers not watching over-the-air television could be alerted to impending disasters.

Ken Johnson, spokesperson for Congressman Billy Tauzin, R-LA and chairman of the House Telecommunications subcommittee said that Congressman Tauzin's office asked the FCC to review its policy concerning emergency alert systems. Johnson said, "We became personally aware of a problem associated with the system in March 1997, when we were conducting a public hearing in Peoria, IL, on the voluntary TV rating system. At that time, Congressman Tauzin and I were in a hotel room watching a local weather forecaster pinpoint, with great accuracy, using Doppler radar, where a tornado had been spotted. He was projecting its path, which by the way, was moving in our direction, when suddenly the local broadcaster, as well as all local stations, were interrupted by a booth announcer who broadcast emergency precautions."

"It was nothing more than a civil defense announcement, saying that the

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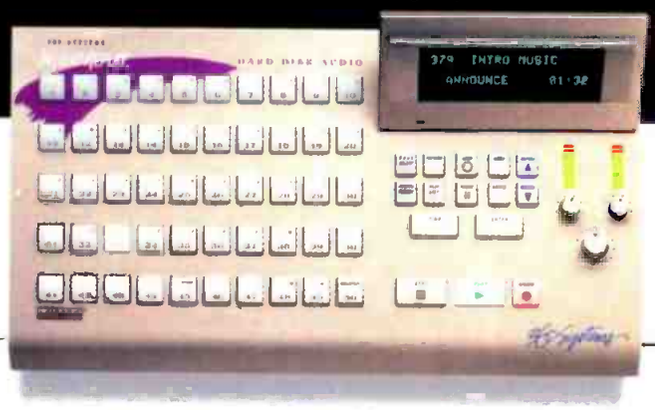

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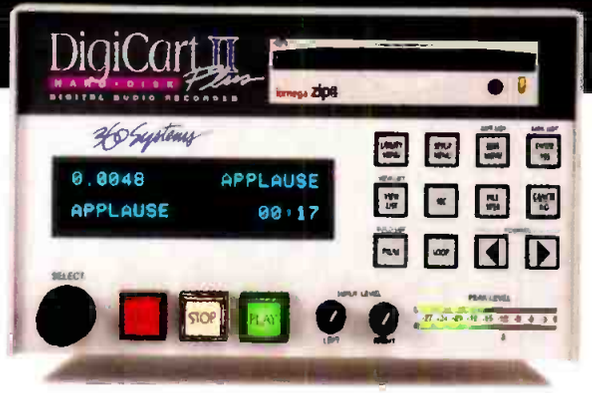

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following counties in the Peoria area, and they were listed, are now under a tornado watch." Well, as you know there is a great difference between a watch and a warning.

"So what I'm saying," Johnson continued, "is, we were watching, as part of the warning, where the tornado was headed. Then all of a sudden, we were interrupted by information that was probably 30 to 40 minutes old — information, by the way, that could have cost us our lives. So Congressman Tauzin asked the FCC to review its position when it comes to emergency override.

Johnson also said, "We were unaware that there is an associated problem with the direct satellite broadcasting industry. And as a result, we will now ask the FCC to explore those issues as well. In addition, Congressman Tauzin intends to, in our next meeting with leaders of the DBS industry, to ask them how they plan to respond to these concerns."

Johnson felt that there should be little or no problem implementing a system with the DBS industry, "It is our understanding that this technology is currently available. It is in place in other parts of the world and there's no reason why it shouldn't be made available to American subscribers as well."

When we called Senator John McCain's office, Pia Pialorsi, Senator McCall's spokesperson said none of this "is currently in the Senator's radar."

One of the players in the EAS game is the National Weather Service. Rod Becker from the Silver Springs, MD, office said that it transmits complete weather alerts over a nationwide radio system. It's up to the individual broadcasters to respond as they see fit. He said, "Except for presidential messages, all other EAS messages are strictly voluntary and no one has to transmit them. It's certainly not federally mandated that they do so."

But there is a growing gap that isn't being filled. There are four players in the direct satellite delivery business: PrimeStar, USSB, DSS and EchoStar. The only one of these four that has mentioned anything about local-to-local delivery is EchoStar. The rest say they are a national service." Much of middle America has gotten its signal via one or more translators. Unless the

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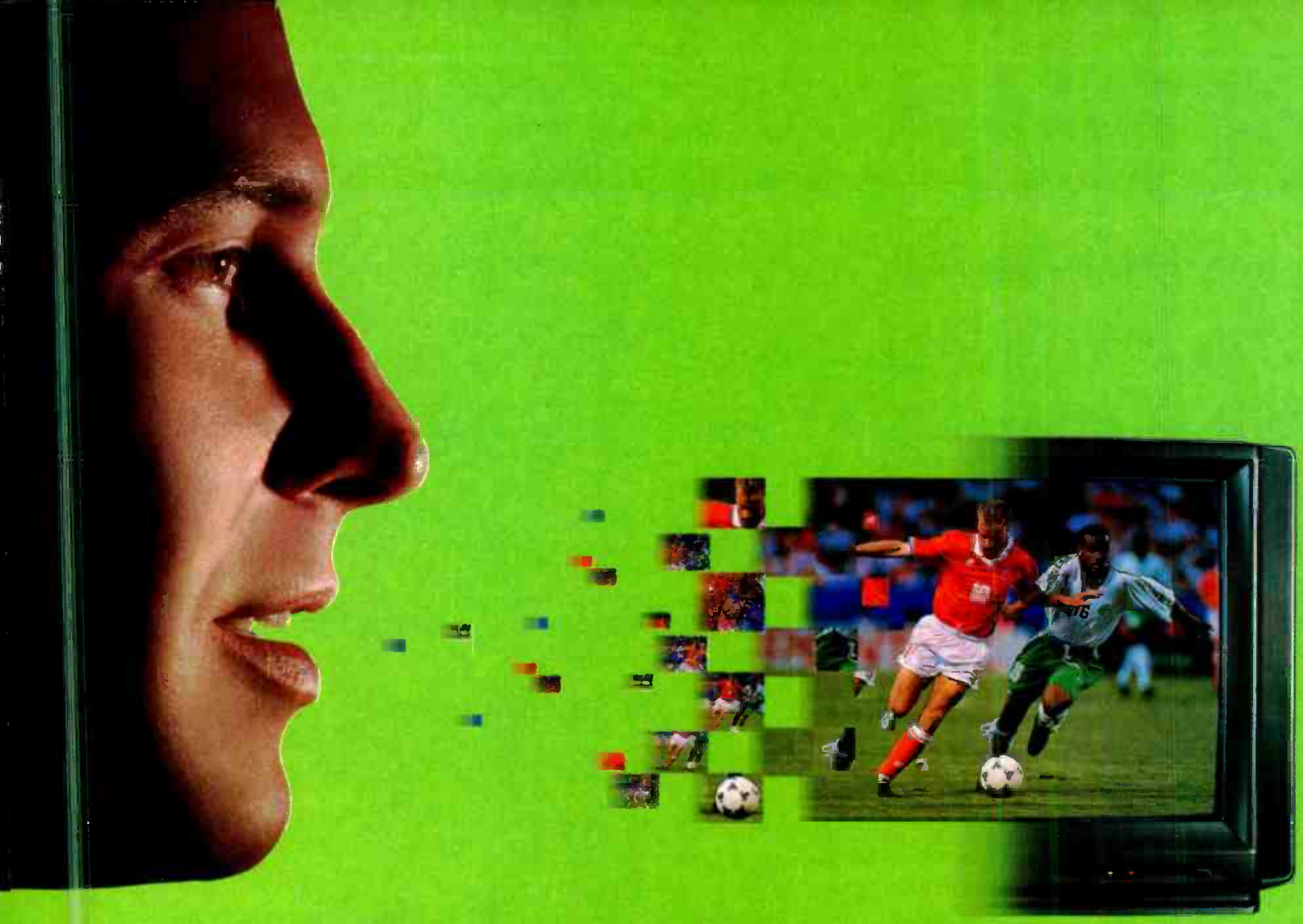

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translator is owned or maintained by the serving station, many of the associations and local government have been pulling the plug on their translators for any number of reasons. By reason of this attrition, many have become DBS subscribers if they want to watch any television.

If the DBS people can address each and every receiver, turn it on or off and deliver detailed programming information about each channel, they can warn viewers of disasters. The technology is there. If that farmer's or other rural viewer's sole source of information is a DBS dish, then that provider has a responsibility to keep them informed of any impending disaster and the details will just have to be worked out. ■

Secondary services may have problems

Operators of equipment that are considered a "secondary service" on any frequency in the TV broadcast band, Channels 2 through 69, may find that the frequency they are working on may have some powerful company. With the introduction of the digital TV channels, these secondary basis authorizations will have a rude awakening if they are co-located with a DTV channel assignment in their area when it signs on the air. Such was the case in Dallas.

David Johnson, Capital Projects coordinator and a member of the WFAA-TV's engineering staff said, "On Feb. 27 we signed on our new DTV transmitter for the first time. It operates on Channel 9. We proceeded to do testing and everything looked good. Our initial concern was co-channel interference with our NTSC station on Channel 8 and with the cable companies in and around Dallas. There were no problems. About 3 a.m. on March 1, our news assignments desk got a call from Baylor University Medical Center (BUMC) saying that it had determined that our Channel 9 transmitter was interfering with 12 of their heart monitors. We had already signed off the air at 10 p.m. the night before." Beaven Els, WFAA-TV's chief engineer met with the A. Webb Roberts Hospital's officials at BUMC later on that same morning. Johnson continued, "We came to an agreement to stay off the air with our DTV Channel 9 until they could resolve the problem." In the meantime, the WFAA-TV's engineering staff have worked with the BUMC administrators to resolve the problem and have tried to coordinate the same efforts with other hospitals in the area.

Wayne Kube, engineering technical manager and Beaven Els, chief engineer at WFAA-TV, standing in front of the Harris digital transmitter.

Station operators who accept licenses that are designated to operate on a secondary basis must live with any signal levels they encounter from the primary service. As the FCC R&R's say, they "must not interfere with and must accept interference from current and future full-power stations" on these frequencies. But the WFAA-TV's engineers couldn't ignore the life-threatening situation at the local hospital.

Jamie Ramo, director of public relations at Baylor University Medical Center, said, "We are buying and installing 30 new multifrequency wireless heart monitors to avoid future interference. It is my understanding that this will cost the hospital nearly $200,000." Ramo said, "We have a technology team that maintains all of the medical equipment here at our facility. It was that team that discovered this particular issue. As a solution, our technology team will be working with the FCC and the Dallas/Fort Worth Hospital Council to educate other medical facilities about such situations." ■

Larry Bloomfield is a former chief engineer, industry consultant and author, located in Bend, OR.

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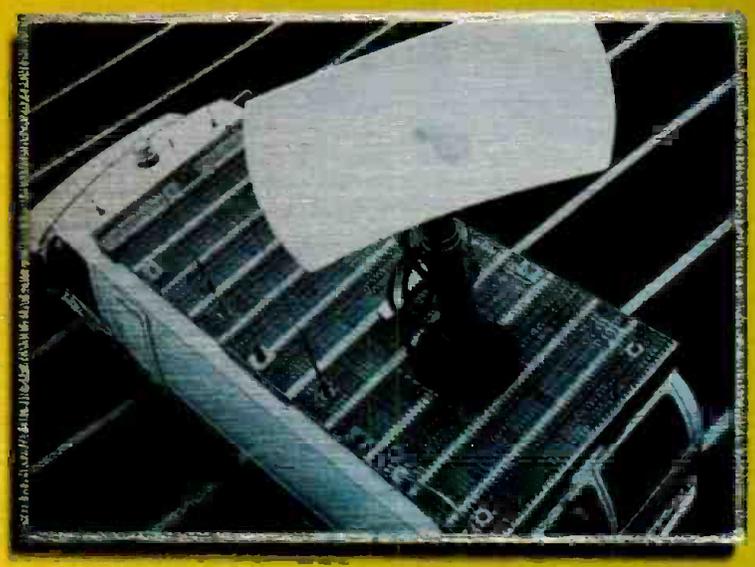

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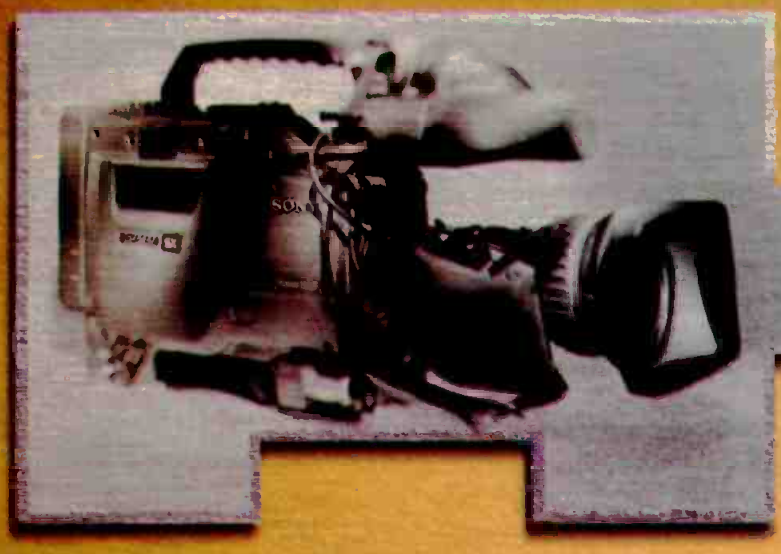

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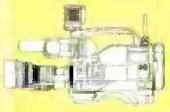
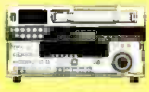


Camcorders

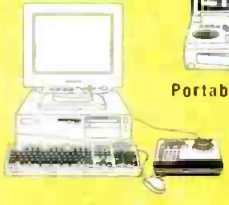
Dockable Recorder

Production



Linear Editors

Hybrid Recorders



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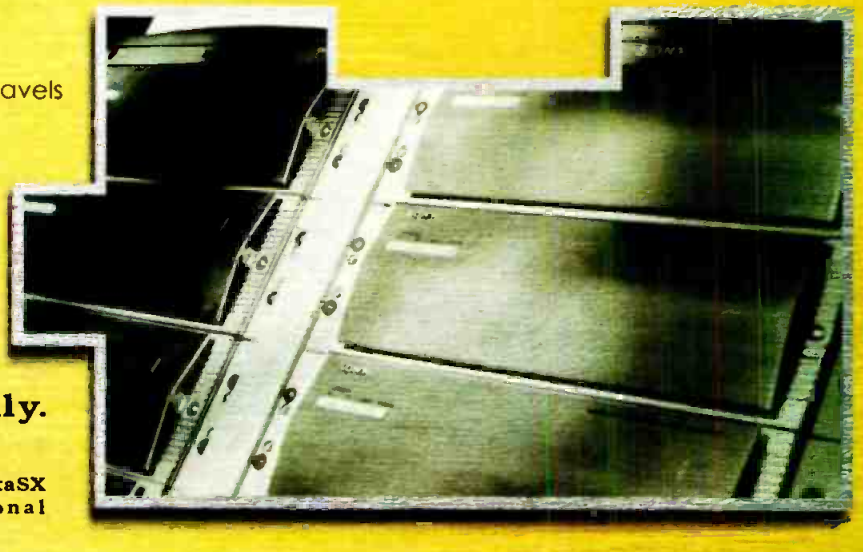

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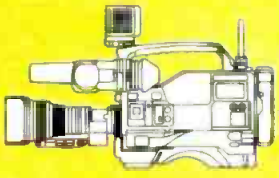
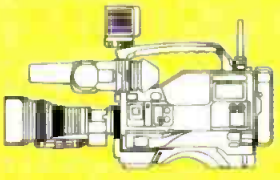
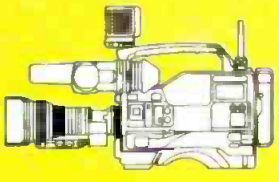


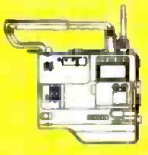
DNW-7



DNW-9WS



DNW-90WS



DNV-5
Dockable Recorder

Editing

DNW-A220

DNE-50

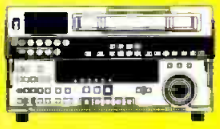
DNW-A225

DNE-700

DNW-A25

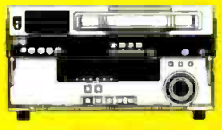
DLE-110

Recorders/Players



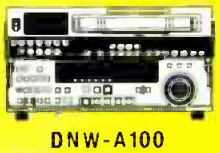
DNW-A75

DNW-A22



DNW-A30

Hybrid Recorders



DNW-A100

DNW-A45

DNW-A50

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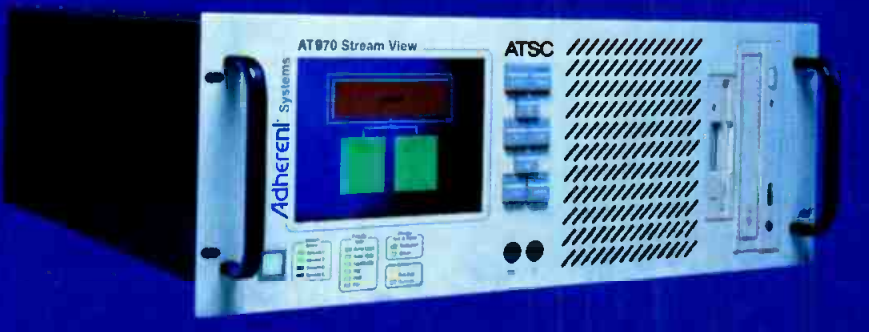

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FCC Update

DTV rules and allotment table affirmed

BY HARRY C. MARTIN

In February, the final digital TV rules and DTV table of allotments were affirmed. Following are the highlights.

• DTV table of allotments. The commission made 71 revisions to its DTV table of allotments, which was published last April. Of those revisions, 42 were primarily to reduce interference due to DTV-to-DTV adjacent-channel situations. The remaining revisions were in response to requests for modifications. Changes will be allowed on an individual basis where such changes are agreed upon by all affected broadcasters or do not result in additional substantial interference to other stations or allotments and/or do not conflict with the commission's other goals for the spectrum. However, almost all of the petitions to change DTV allotments, where the proposed change was challenged by other affected parties, were denied at this stage.

• Increase of UHF power. In response to the Joint UHF Broadcasters' petition, the commission acknowledged UHF broadcasters' concerns about power and responded by adopting a de minimis standard. UHF stations will be allowed to increase power from 50kW up to 200kW ERP (or 1,000kW using beam tilt) or make other changes if they would not result in more than a 2% increase in interference to the population served by another station. The de minimis standard does not apply to stations that already receive interference to 10% or more of its population or the change would result in the affected station receiving interference in excess of 10% of its population. Under the predicted DTV standards, such changes should not cause any new interference.

• Core spectrum expanded. Channels 2 through 6 are suitable for DTV and the core DTV spectrum has been defined as Channels 2 through 51. The extra channels will allow for the minimization of DTV-to-DTV adjacent-channel interference and, by increasing the number of channels, open up new channels for dissatisfied broadcasters.

Many of the petitions for reconsideration that the FCC denied sought a different DTV channel inside the core because the petitioner did not want to move twice. The commission refused to accommodate these licensees, but is open to reallotments on an individual basis. Twelve stations have NTSC and DTV allotments outside the core and they will receive priority treatment as channels become available.

• LPTV/TV translators. The FCC's order attempts to provide some help

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for LPTV and TV translators that will be displaced by the DTV allotments.

The FCC recognizes that low-power stations will be displaced during the transition phase. Applications for displacement relief may be submitted at any time during the transition, commencing on the effective date of the order. The order also provides priority for displacement relief applications over requests to extend or alter existing service not affected by the DTV implementation. After the transition period, displaced LPTV and TV translator stations will be able to apply for channels without being subject to competing applications.

LPTV and TV translators may also apply for digital authorizations pending the release of a rulemaking.

• **Pre-emption of local zoning challenged by Audubon Society.** The National Audubon Society has asked the FCC to prepare an environmental impact statement (EIS) in connection with the consideration of proposed rules that would allow the FCC to pre-empt local zoning regulations when they obstruct or impede the construction of towers needed to implement DTV.

The Audubon Society alleges that the proposed pre-emption regulations must be analyzed under the National Environmental Policy Act (NEPA) due to the potential environmental impact tower construction might have in situations where local zoning authorities have rejected the proposal.

In early March, the Mass Media Bureau asked for comments on the applicability of NEPA to the proposed pre-emption rules. The bureau pointed out that broadcasters must demonstrate in their CP applications that a proposed tower project will meet NEPA requirements as embodied in Section 1.1307.

The FCC's pre-emption proceeding has caused controversy, prompting FCC chairman Bill Kennard to comment that the commission has no plan to become a "national zoning board." New regulations will be tailored so they will apply only in cases where local zoning authorities impose undue delays or unreasonable standards. ■

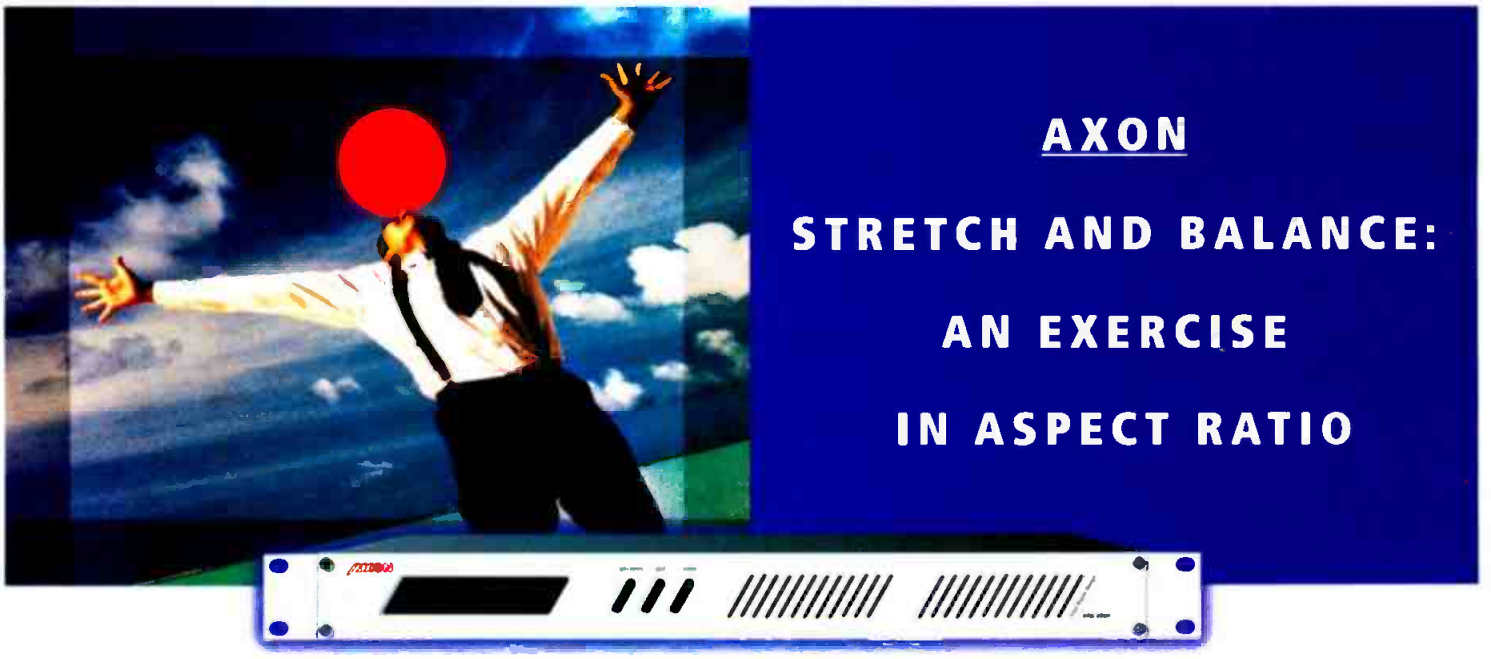
Harry C. Martin is an attorney with Fletcher, Heald & Hildreth, PLC., Rosslyn, VA.

Dateline

TV stations, LPTVs and TV translators in Arizona, Idaho, New Mexico, Nevada, Utah and Wyoming should file license renewal applications by June 1. (Date is optional for Wyoming LPTV and TV translator renewals.) LPTVs and TV translators in Oklahoma and Texas are required to file their renewals by June 1.

Commercial TV stations in the following states must file their annual ownership reports by June 1: District of Columbia, Maryland, Virginia, West Virginia, Michigan, Ohio, Arizona, Idaho, Nevada, New Mexico, Utah and Wyoming.

All licensees must file their Annual Employment Reports (Form 395-B), previously due May 31, now are due on or before Sept. 30.



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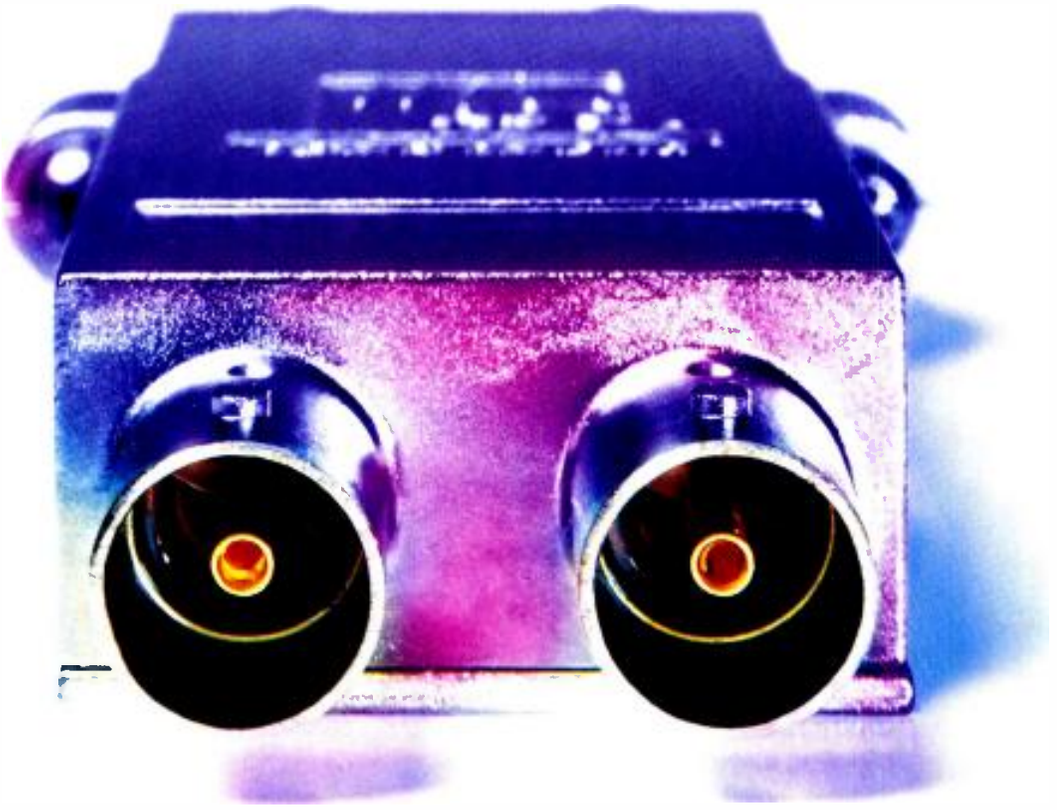

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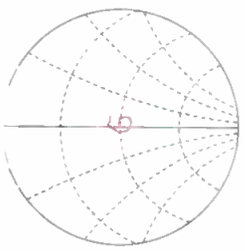

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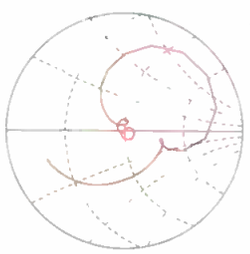

The impedance performance of the nearest competitive jack spirals out of control

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DTV Update

Ready or not, here it comes

BY LOUIS LIBIN

Consumers enjoy television today using the same NTSC standard that was developed and implemented in the late 1940s. Now, broadcasters and equipment manufacturers are prepared to move to digital, and it is a significant and traumatic, but necessary, move.

Recently, there were two unrelated events that are of some significance to DTV implementation. The first event was a frequency coordination issue. On Feb. 27, 1998, WFAA in Dallas, went on the air with the first non-experimental TV broadcast in the United States. By now, most broadcasters are probably aware that there was some interference to unlicensed medical devices on the same channel, VHF Channel 9, at a nearby hospital. As soon as the station was notified, it shut down the transmitter. The devices that were interfered with were cardiac monitors and are now in the process of being replaced. (See "Beyond the Headlines," p. 26.)

This is a significant occurrence because it will happen in every city. We do know that there are many unlicensed low-power devices on many VHF and UHF channels. The users will soon be aware of the new primary users and there will be some hindrance to these existing users, but on a limited basis. This is surely no cause for alarm.

The second event significant to DTV implementation was a speech by Peter Dare, Sony's chief technology officer, and a close intimate of digital television and the entire process. During Sony's annual pre-NAB product presentation about the uncertainties regarding the implementation of digital television, Dare did not say that the 26 stations that are to be implemented by this year's end are at risk, but he did say that the unknown issues will not be cleared up before those stations are implemented. Some of the unknowns include the MPEG stream manipulation, potential indoor reception including multipath interference and the lack of common equipment interfaces.

Consumers are just now beginning to hear the news that digital television (DTV) is now officially on its way to market. As DTV begins to receive more publicity, consumers will begin looking for receivers in the stores. This consumer expectation for service excellence does not translate into huge sales volumes quickly. The projected sales numbers are an entirely different issue. The mass confusion that reigned

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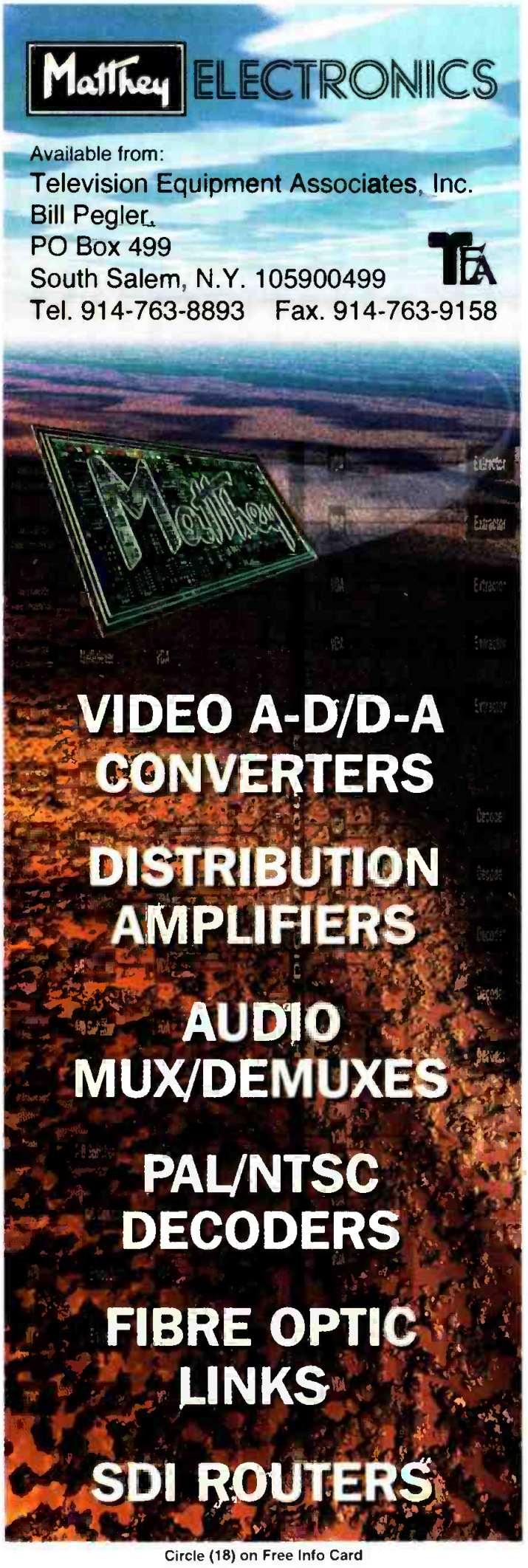

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in the world of DTV just a couple of years ago has progressed to only a few substantial issues needing to be resolved:

- Has enough headroom been built into the new channel assignment table?
- What kind of digital service will broadcasters offer to consumers?
- Will all stations in the same market offer the same services?
- How will the consumer receive these services? Indoors?
- What kind of receivers will be available and when?
- Will the first generation of DTV receivers be devoid of features?
- What will the cable position be regarding DTV?
- How will local program insertion be accomplished?
- Will audio synchronization be standardized?
- When will the equipment interfaces be finalized?

The new digital receivers

On the positive side, at the CES show this past January, approximately 15 consumer electronic manufacturers displayed prototype receivers similar to those they will begin to distribute later this fall. The number of manufacturers in itself was heartening to broadcasters who are wondering about the chicken and the egg with regard to the DTV audience and receiver purchases by the consumers. The cost of the new receivers is still predicted to begin at about $5,000 and continue up from there. There will be set-top converters (downconverters) priced at about $800. These price levels are for the first-tier buyers only, and volume should drive down costs.

Fast implementation

The digital TV system needs to be fully implemented before all of its characteristics can be fully documented and the set of rules finalized. The allotment/assignment table may not be absolutely finalized for years to come. Until the industry has developed real experience in dealing with the parameters of the system under the different environmental conditions in the real world, the system will never be fully characterized and the bugs will never be eliminated. Any delays in implementing and fully embracing DTV will only confuse the marketplace and bring down the wrath of the FCC upon the broadcasters. Implementation delays could prove to be severely damaging to the many broadcast interests who have already made major investments leading to DTV.

Broadcast stations will be making huge investments in new equipment and station personnel. The faster that stations can begin to see a payback on this investment, the better off they will be financially. It is important to note that Sony's Peter Dare did not say that DTV would fall on its face because of these open issues. He did say that the back end of the DTV schedule, where the FCC has said that all existing NTSC stations must cease operations by 2006, is probably unrealistic. Both manufacturers and broadcasters have some work ahead of them. ■

Louis Libin is a broadcast consultant in New York and Washington.

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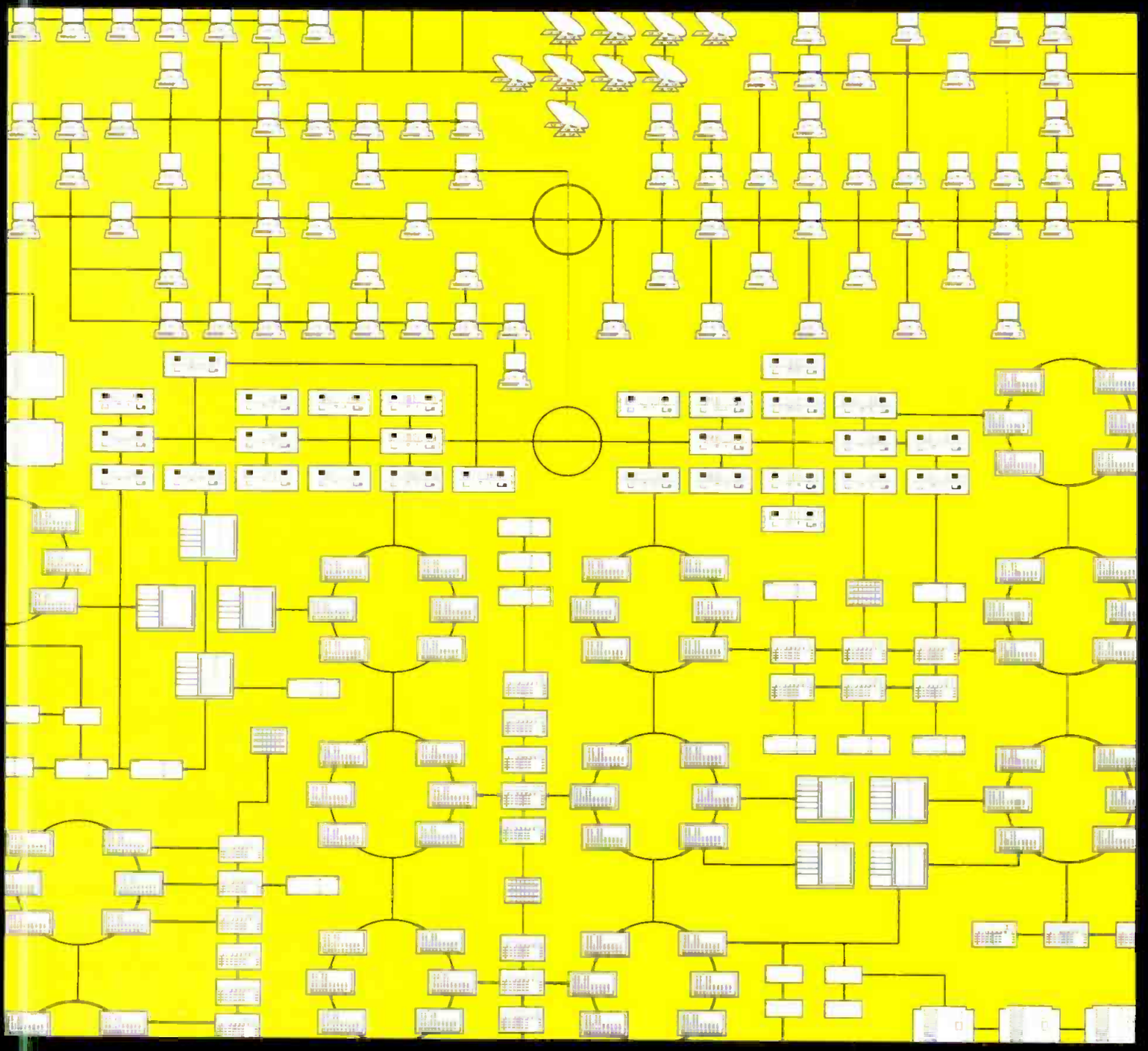

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Expert's Corner/Vendor Views

Defining HDTV, Part 2

Initially, HDTV was assumed to mean a 1,080-line, interlaced signal. Today, other (and much less-expensive) display formats are being discussed and proposed. Can a facility simply adopt one of these lower-quality image formats and get away with calling it "HDTV" without penalizing themselves in terms of their marketplace perception? After all, will the viewers even know?

(Last month's column explored the topic from the expert's side. This month, we will look at it from the vendors' side.)

VENDOR

Christian Tremblay, president, Miranda Technologies Inc., St. Laurent, Quebec, Canada.

The two most important aspects of DTV are its digital nature and its use of the 16:9 aspect ratio. The digital nature of DTV provides the broadcaster with a powerful communications channel, perfectly adapted for the information society of tomorrow. The 16:9 screen format is a key marketing issue for TV set manufacturers, whose job is to convince customers to acquire the new technology as was done for microwave ovens, VCRs and compact disk players. On their success depends ours.

Image definition has little to do with the above. What consumers will buy are large flat-screen displays with surround sound. These sets will seduce mainly because of their slim shape and extended viewing angle. As set manufacturers are getting ready, our symbiotic relationship with them implies that we broadcast an appropriate signal capable of convincing the consumer. The matched signal theory stipulates that the best return on investment will be obtained when the quality of the signal will equal the quality displayed at the consumer set. One thing is sure, the first-generation sets will definitely not have the technology to display HDTV and will be closer to VGA quality. Later, the sets will evolve and so will the ability of viewers to appreciate better quality pictures.

As a result, our evolution in sending better TV signals can be spread over a certain time span. The advantage is that the cost of conversion will decrease with time. The strategy would be to invest in 16:9 cameras and use at maximum the conventional definition equipment already installed. Upscaled pictures are not just glorified NTSC pictures, they will produce a quality never seen at home and given the quality of receivers will produce the optimum result.

As ancient Romans used to say, "Festina lente" "Make haste slowly." ■

VENDOR

Gary Shapiro, president of the Consumer Electronics Manufacturers Association (CEMA).

The target goal of HDTV is to provide consumers with the most crisp and clear audio and video technology. For today's movie standards, home theater requires high resolution to avoid artifacts of the picture's structure and a large screen to immerse the viewer in the program. Only true HDTV replicates 35mm film quality.

The industries involved in bringing DTV to the consumer (i.e., broadcasters and consumer electronics manufacturers) have defined HDTV as having a vertical display resolution of 720p, 1,080i or higher; capable of displaying a 16:9 image at the minimum resolution-level; receiving all ATSC Table 3 formats; and receiving and reproducing/outputting Dolby digital audio. Therefore, there is a difference when the consumer views anything less than HDTV as defined.

In recent focus group studies conducted by CEMA, participants were shown a video and audio demonstration of the improvements offered by digital and HDTV. When participants were shown an HDTV picture, the reaction was unanimously positive among all consumers, and virtually all "strongly preferred" HDTV to any lower-resolution digital sets. Early-adopter-type participants especially preferred the widescreen presentation format of HDTV on today's sets.

When asked about "multicasting," the ability to simulcast several channels of digital programming, mainstream adopters expressed dissatisfaction with current programming, saying quality improvements in programming were much more important than access to additional channels.

The HDTV demonstrations at the 1998 International CES produced reactions of "When will it come?" not "How much will it cost?" And, this showing was just the first commercially viable HDTV. The lowest tier of what will be continuing improvements already is so different from NTSC-quality broadcasts that it knocked 'em dead when shown on a wide screen. Anything lower than HDTV will not pass muster once the average consumer has seen this demonstration. And, to spur sales of the attractive new medium, TV retailers *will* take the "comparison" road.

Once consumers have tasted the true thing, nothing less will suffice. ■

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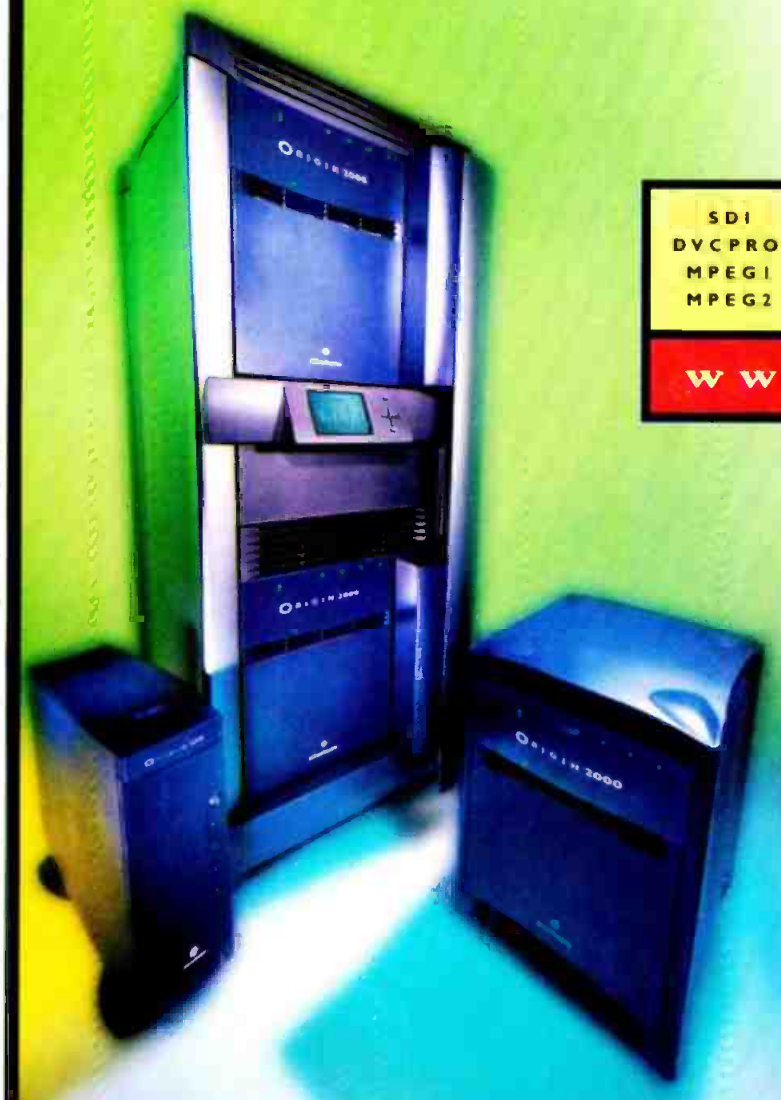

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• *The common data rate (CDR):* This concept is derived from CCIR-601 and is based on a common luminance sampling frequency of 13.5MHz and an identical number of samples per active line of 720 for the luminance information and 360 each for the blue and red color-difference information. This approach was extended to cover HDTV signals by doubling the spatial resolution of CCIR-601 and adapting to a 16:9 aspect ratio. This results in 720x2x16/9x3/4 = 1,920 samples per active line for the luminance information and 960 each for the blue and red color-difference signals.

• *The common image format (CIF):* CIF specifies the spatial characteristics for the active picture area systems. Common elements include the image aspect ratio, the number of samples per active line and the number of active lines. However, the total number of lines, sampling rate and picture rate may vary. TV frame formats from different image scanning dimensions are made of a common CIF and different inactive horizontal and vertical blanking intervals. As an example, this CIF can be repeated at a rate of 30fps (frames per second) in the 525-line scanning standard and 25fps in the 625-line scanning standard. This approach is commonly used in image compression and computer processing. The CIF advantage is the simple temporal conversion between two progressive format systems.

• *The image aspect ratio (IAR):* IAR is defined as the ratio of horizontal image dimension (expressed in centimeters or inches) to the vertical image dimension (expressed in centimeters or inches). It takes the value of 4:3 or 16:9 for television and 2.4:2 for film applications. The 16:9 aspect ratio was established by the SMPTE Working Group on High-Definition Electronic Production in 1985. Any program material or motion picture film can be accommodated within the 16:9 format either for production and post-production, distribution or display.

• *The pixel aspect ratio (PAR):* PAR is defined as the ratio of the horizontal pixel spacing to the vertical pixel spacing. It does not refer to the actual shape of the pixel. This pixel aspect or dot spacing is determined by the IAR and the number of horizontal pixels (Hp) and vertical lines (Vl) in the reproduced picture. The relationship between PAR and IAR is given by PAR = IAR x Vl/Hp. If IAR and Hp/Vl are identical or if the PAR = 1, the image has square pixels or samples. As an example, the SVGA standard image format has 640x480 pixels for a 4:3 picture dimension format. Consequently, PAR = 4/3x480/640 = 1 confirming that computers generate and display square pixels. In video applications, the number of horizontal pixels is determined by the video sampling frequency that is derived from a multiple of the horizontal scanning frequency or the color subcarrier frequency. This results in non-square pixel displays of digitized NTSC or CCIR-601 signals. Figure 1 summarizes the situation for several standard-definition (SDTV) and high-definition (HDTV) formats. ■

Michael Robin, former engineer with the CBC engineering headquarters, is an independent broadcast consultant in Montreal, Canada. He is a co-author of "Digital Television Fundamentals," published by McGraw-Hill.

Computers & Networks

Software maintenance

BY BRAD GILMER

Today, it is no secret that computers are as much a part of our lives as VTRs. It is important to properly maintain these systems. Software maintenance can be broken down into several categories — operating system (OS) maintenance, application maintenance and maintenance of code that you have written yourself. Here are a few tips on performing software maintenance.

OS maintenance

Generally speaking, there are three dominant operating systems in TV stations today: Windows95, WindowsNT and UNIX. Each of these requires care and feeding, and various utilities exist to help alleviate problems.

• *Fragmented data on hard disks.* After a while, the data on a hard disk becomes fragmented. How does this happen? An empty hard disk contains only contiguous (uninterrupted) data space.

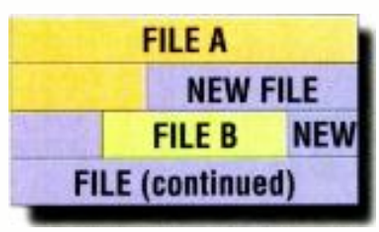

Figure 1. Files on the hard drives become fragmented when new files are written into several spaces previously used to hold smaller files.

When files are written, they are (usually) written continuously on the disk from beginning to end. When files are erased, a hole is left where the file was. If a file is written back to the disk that is larger than an existing hole, the operating system packs all of the file that will fit into the existing hole and then finds the next available space and places the rest of the file there. It then makes an entry in a table (called the file allocation table or FAT in DOS and Windows systems), noting where the pieces of the file are located. After a while, data can end up fragmented all over the disk.

The problem with data fragmentation is that it slows system response. The slowest part of disk access is seek time, the time that the system waits while the heads move to the appropriate track to retrieve the data. With

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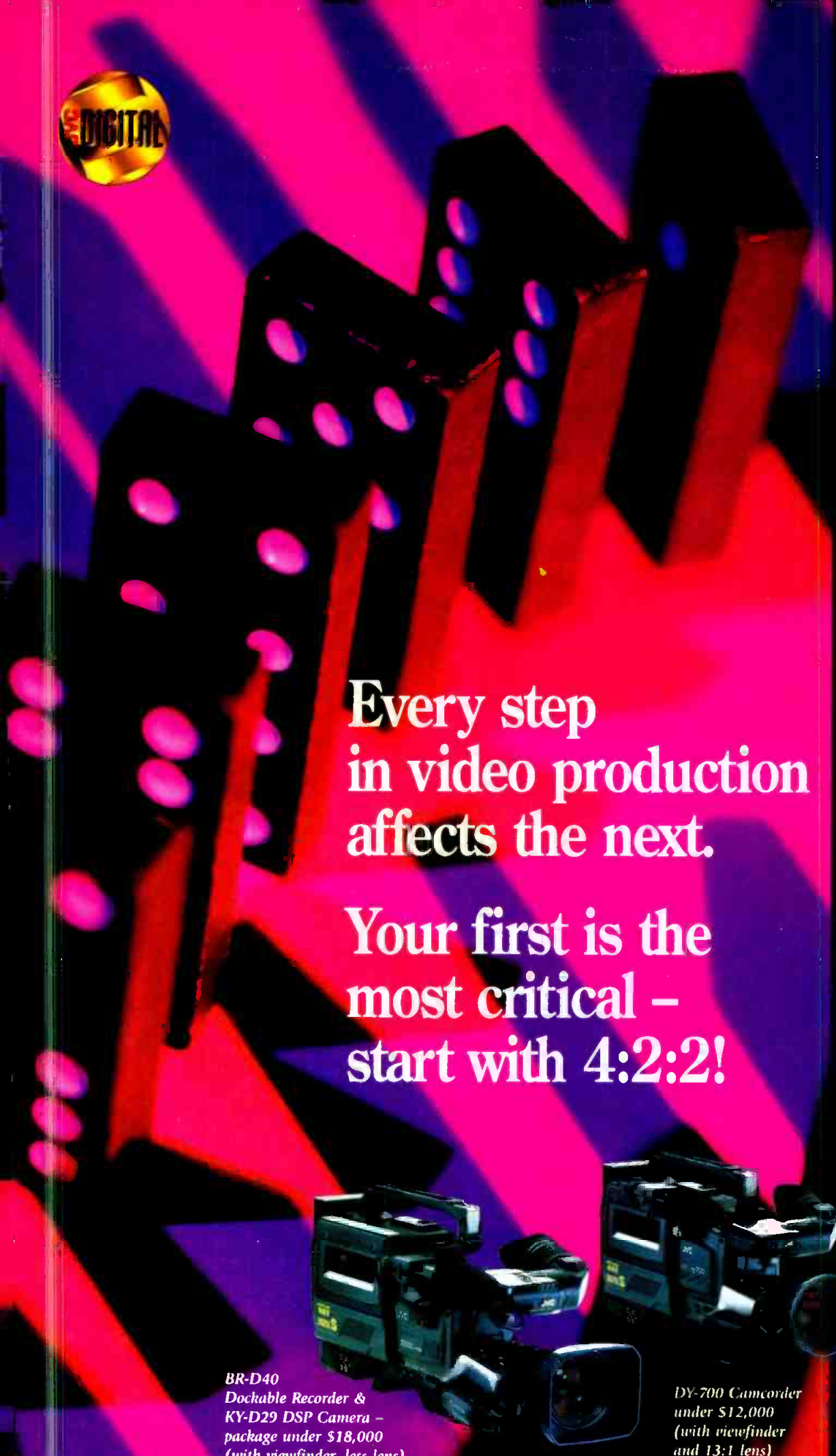

DIGITAL-S Acquisition

To get the most out of today's digital editing systems, you need to begin with the best raw footage possible. And that means shooting in 4:2:2. With DIGITAL-S, you get 4:2:2 color sampling with perceptually lossless compression. This produces an image that remains free of annoying artifacts that could build up through various steps in post production and digital distribution.

DIGITAL-S also offers superior chroma resolution, producing more well-defined colors, chroma keys and effects. In fact, all high-end systems, including the best non-linear editors, require 4:2:2 to achieve these benefits. The result is performance and quality that can stand up through each phase of digital video production. Shooting in a 4:1:1 DV format compromises your image, and you can't bring back the quality once it's lost.

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fragmented data, the head on the hard disk is continually moving back and forth to retrieve files. Disk defragment routines reorganize the data on the hard disk so that no jumps are needed when reading or writing files.

• *File system integrity checks.* In a perfect world, file system integrity checks would never be necessary. Unfortunately, power outages, software lock-ups and other problems can leave trash on your hard disk that can be the source of problems.

All modern operating systems come with utilities that check the integrity of the file system and repair problems if they are found. Common file utilities include SCANDISK for DOS and Windows, FSCK for UNIX and VREPAIR for Novell servers. Fortunately, SCANDISK is fairly automatic and takes care of most problems without any intervention from you. FSCK is another matter. It is a powerful and potentially disastrous tool you should run with caution the first few times.

File integrity utilities check for a number of problems including:

1. The FAT should point to files that have a beginning and an end.
2. FAT entries should point to files that are the same length as the lengths listed in the directories.
3. Directory entries should point to one and only one file (except in the case of links). The SCANDISK error "cross-linked files" refers to this condition.

Errors reported by these utilities should be addressed. They can represent wasted space on the hard disk or worse. Sometimes, running a file system utility more than once will fix particularly stubborn problems. So, if you run it once and it cannot repair all errors, don't give up hope. Try it again and see if the errors are fixed the second time around.

Virus scanning

A regular virus scan should be part of any software maintenance routine. Be sure to download the latest virus definitions from your software vendor before running the scan.

Application maintenance

There are two major categories of software applications in the broadcast facility: broadcast-related apps, such as station automation and desktop applications, such as word processors and CAD programs.

1. Broadcast-related application maintenance. Upgrading a system as important as an on-air automation system is something that should be approached carefully. What if the upgrade does not go as planned? Have you ensured that the previous software version can be reinstalled if things do not work as expected? My experience has shown that it is a good idea to allow about twice, perhaps even three, times as much time as you think it will take for an upgrade to these systems. That way, if things do not go well, you are not faced with the double problem of figuring out what went wrong while simultaneously dealing with any on-air problems the de-

Care and feeding

Keep things clean. If you have systems that have been sitting in racks for years, check the fans to see if they are running; clean the floppy drives once a year or so just in case you need them.

Buy good tools and keep them sharp. Use a good disk utility to keep your disk in proper operating condition. Be sure you have the latest version of the software.

Use the right tool for the job. Match your knowledge and skills with the maintenance software you use.

Keep good records. Just as you keep comprehensive records of head hours on tape machines, you should keep complete records of software running on your systems.

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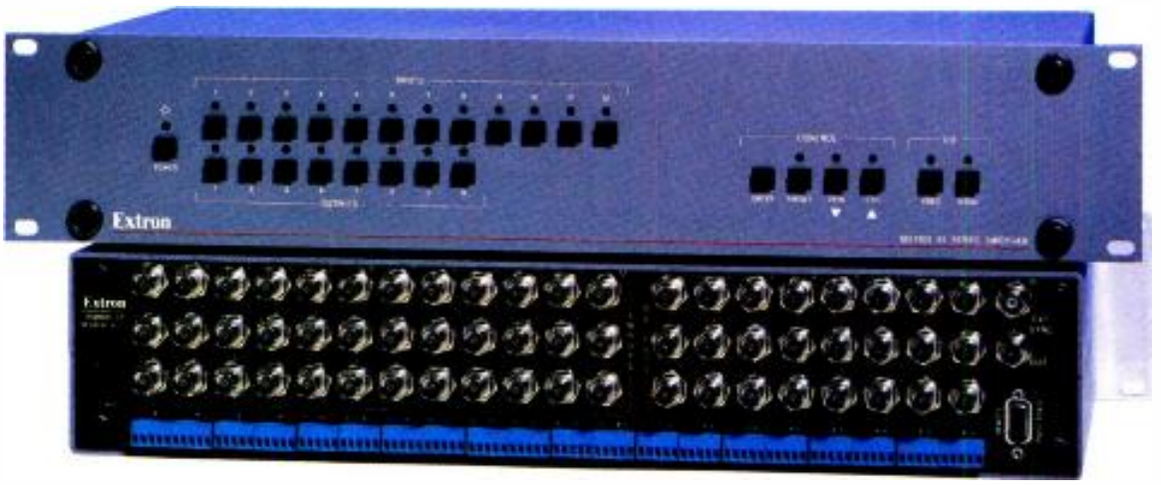

The Matrix 50 Series Switcher

Flexibility in matrix switching means being able to apply composite video, S-Video, component video and stereo audio in 8x4, 8x8, 12x4 and 12x8 I/O configurations. Extron's **Matrix 50 series** includes one audio channel (mono or stereo) and three video channels that are capable of being populated, or customized, to suit the requirements of any system.

The Matrix 50 series delivers broadcast quality performance with 80 MHz (-3 dB) video bandwidth and vertical interval video switching. When genlocked to an external sync source the Matrix 50 provides smooth, seamless transitions from various inputs to the display output.

With 28 models available, the Matrix 50 comes in a 2U high, rack mountable enclosure and list prices start at $1,240.

Standard features:

- Four I/O sizes: 8x4, 8x8, 12x4 and 12x8; 28 different models
- Capable of routing video, S-Video, component video and stereo audio signals
- QuickSwitch Front Panel Controller – QS-FPC™
- Capable of switching RGsB analog signals up to 50 kHz
- Vertical interval switching (seamless switching from input to input)
- RS-232/RS-422 control
- Extron's Simple Instruction Set™ for easy programming
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- Internal 100-240 volt switch mode power supply

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lay may have caused.

I always back up critical on-air systems before an upgrade and write down any critical setup parameters that are different from the normal installation. This way, if it is necessary to go back to the original distribution disks, time isn't wasted during the setup process. Once the upgrade is complete, be sure to check everything before you put the system back on the air. I have seen instances where an upgrade fixed one bug only to create another.

2. *Desktop application maintenance.* There are two major categories of desktop maintenance. The first is installing software upgrades and the second is reinstalling software after a crash.

Most software vendors have shifted to a new distribution model — they encourage you to purchase the software and then go to their web site for the latest upgrade. There are several versions of Windows95. Patches are available at www.microsoft.com that will upgrade systems to the current release. There is also a major service release called SR1 for Microsoft Office97 that takes care of several problems, including the broken converter used by Word97 to generate Word95 files. Anytime you purchase a new application, check with the vendor to see if there are any upgrades available.

When recovering from a software crash, it is easy to determine that you need to reload an application if it will not start. What about an application that has difficulty only occasionally? It may be that, over time, critical parts of the application file have been corrupted. When you run a file system integrity check and it gives you a warning about trash on your hard disk, it could be a code fragment from a desktop application that has lost its home. If a small fragment of code is involved, it may be that the application works fine until a seldom-used function is executed then boom, the application stops. Reloading the application from scratch will fix this problem. Two words of caution: first, if possible, uninstall the application with an uninstall program. This will remove such items as registry entries that will not be cleared if you erase the files from the directory. Second, be sure to note any important setup parameters or passwords before you uninstall the program; then reload the application. With luck, this will cure the errors.

Maintaining software you have created

Maintaining your own software is a topic all to itself. Writing an application and using it in your broadcast facility is similar to having a child. It may give a lot of pleasure to see something doing well, but be prepared to take care of it for many years to come.

Whatever you do, be sure to document your code relentlessly. You will be surprised how quickly you can forget what that particularly clever piece of code does. Also, resist the urge to trash documentation and notes on any application that may still be in use, regardless of how old it is. This goes for any assemblers or compilers you used to create the software. It seems that applications (or users) know when you throw out a critical piece. As soon as you do, you will need it. ■

Brad Gilmer is president of Gilmer & Associates Inc., a technology and management firm.

Ask Dr. Digital

Old scopes never die!

BY STEVE EPSTEIN, TECHNICAL EDITOR

In the February issue, I highlighted a reader request concerning a modification for the Tektronix 529 waveform monitor. The modification originally appeared in *Broadcast Engineering's* December 1978 issue, and concerned replacing the (then) hard to find and expensive 7788 tubes with transistors. Well, no sooner than the February issue hit the streets, I received several more requests for that modification.

Dan Zemorah at WXYZ-TV in Southfield, MI, wrote:

I've been looking for the mod for the Tek 529 WFM for awhile. Can you send me the info too? (I'm sorry I can't supply you with fast food coupons; I hope it's not a requirement!)

No, food coupons are not needed. I'm more than happy to help. The instructions are in the mail.

Tim Stoffel at WXXI-TV, Rochester, wrote:

I too have a bunch of 529's to fix in my broadcast equipment collection. Is it possible to get a reprint of the December, 1978 article describing how to replace the troublesome 7788 tubes with transistors? Thanks!

I called Tim to get his fax number and it turns out he's rebuilding quite a few old Quads. For those into old Quad parts (are there any new ones?), check out his web page at: www.servtech.com/~lionlamb/quadpark

As I was writing this, I received a call from Doug Moon, the transmitter supervisor at KTBN, Los Angeles. It seems he had a 529 about ready for the dumpster — needing 7788s — when he ran across the article.

Those instructions will go out today, Doug!

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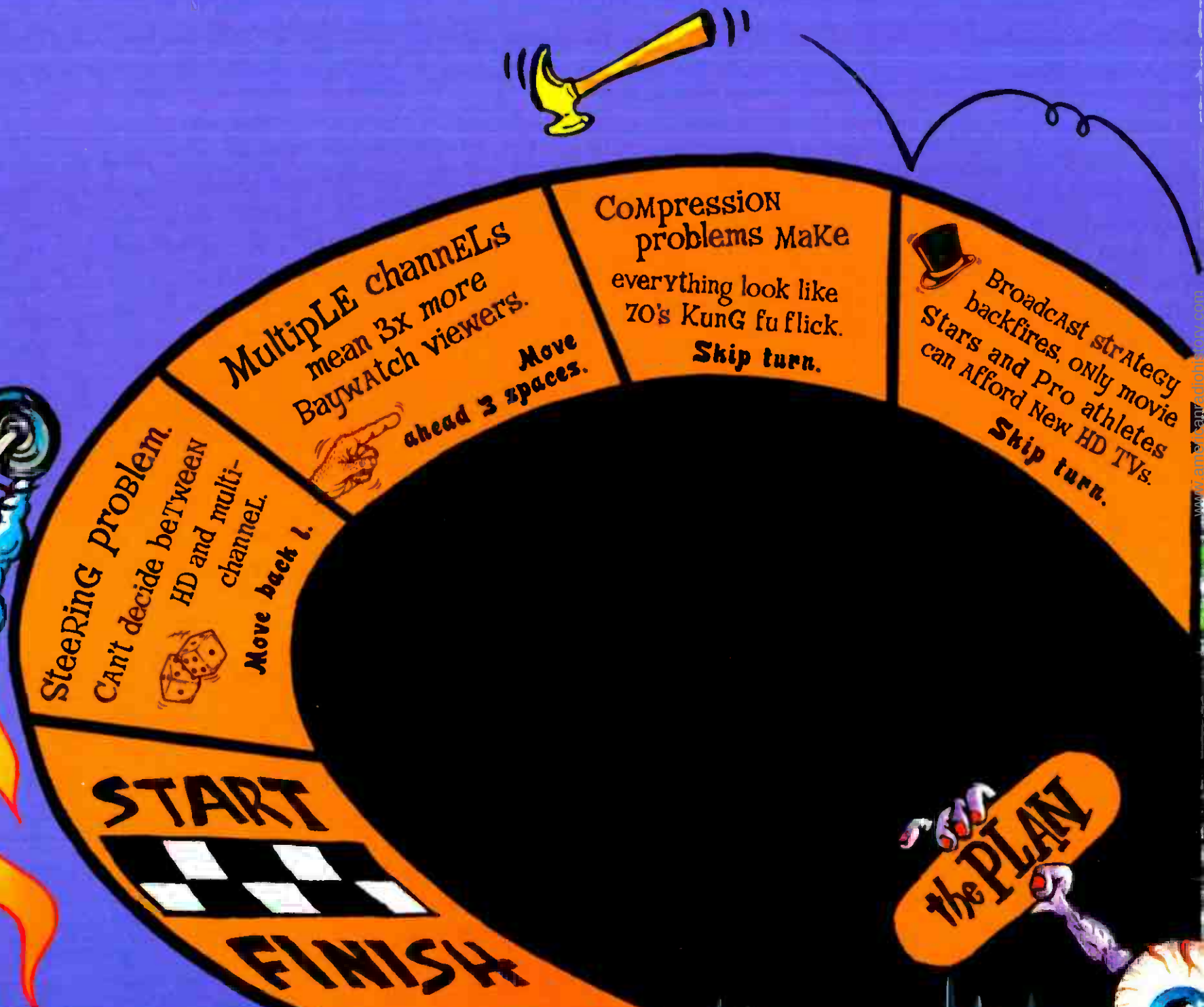
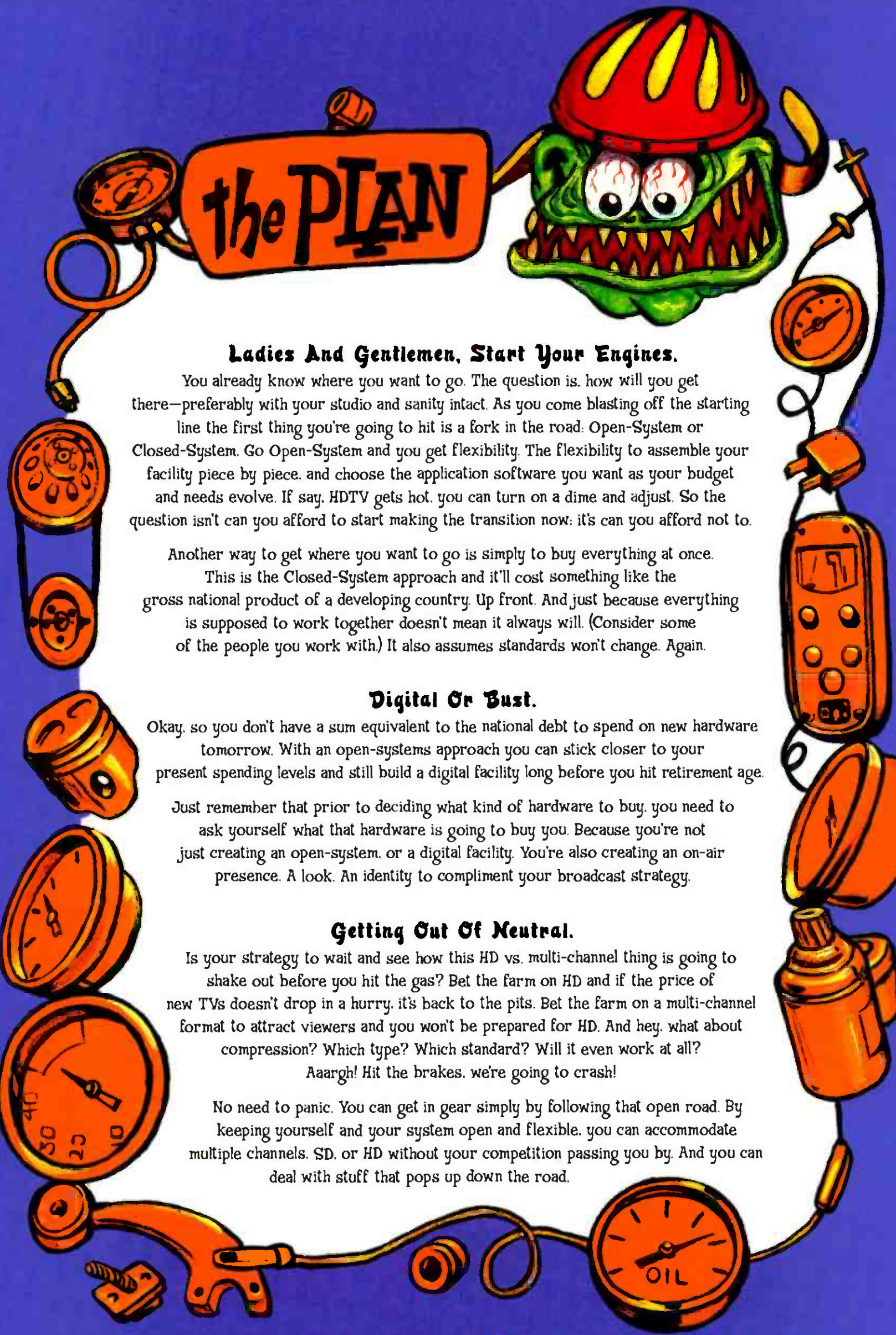
The Future of Broadcast is right Around the corner...





Ladies And Gentlemen, Start Your Engines.

You already know where you want to go. The question is, how will you get there—preferably with your studio and sanity intact. As you come blasting off the starting line the first thing you're going to hit is a fork in the road: Open-System or Closed-System. Go Open-System and you get flexibility. The flexibility to assemble your facility piece by piece, and choose the application software you want as your budget and needs evolve. If say, HDTV gets hot, you can turn on a dime and adjust. So the question isn't can you afford to start making the transition now; it's can you afford not to.

Another way to get where you want to go is simply to buy everything at once. This is the Closed-System approach and it'll cost something like the gross national product of a developing country. Up front. And just because everything is supposed to work together doesn't mean it always will. (Consider some of the people you work with.) It also assumes standards won't change. Again.

Digital Or Bust.

Okay, so you don't have a sum equivalent to the national debt to spend on new hardware tomorrow. With an open-systems approach you can stick closer to your present spending levels and still build a digital facility long before you hit retirement age.

Just remember that prior to deciding what kind of hardware to buy, you need to ask yourself what that hardware is going to buy you. Because you're not just creating an open-system, or a digital facility. You're also creating an on-air presence. A look. An identity to compliment your broadcast strategy.

Getting Out Of Neutral.

Is your strategy to wait and see how this HD vs. multi-channel thing is going to shake out before you hit the gas? Bet the farm on HD and if the price of new TVs doesn't drop in a hurry, it's back to the pits. Bet the farm on a multi-channel format to attract viewers and you won't be prepared for HD. And hey, what about compression? Which type? Which standard? Will it even work at all? Aaargh! Hit the brakes, we're going to crash!

No need to panic. You can get in gear simply by following that open road. By keeping yourself and your system open and flexible, you can accommodate multiple channels, SD, or HD without your competition passing you by. And you can deal with stuff that pops up down the road.

Avoiding the potholes o

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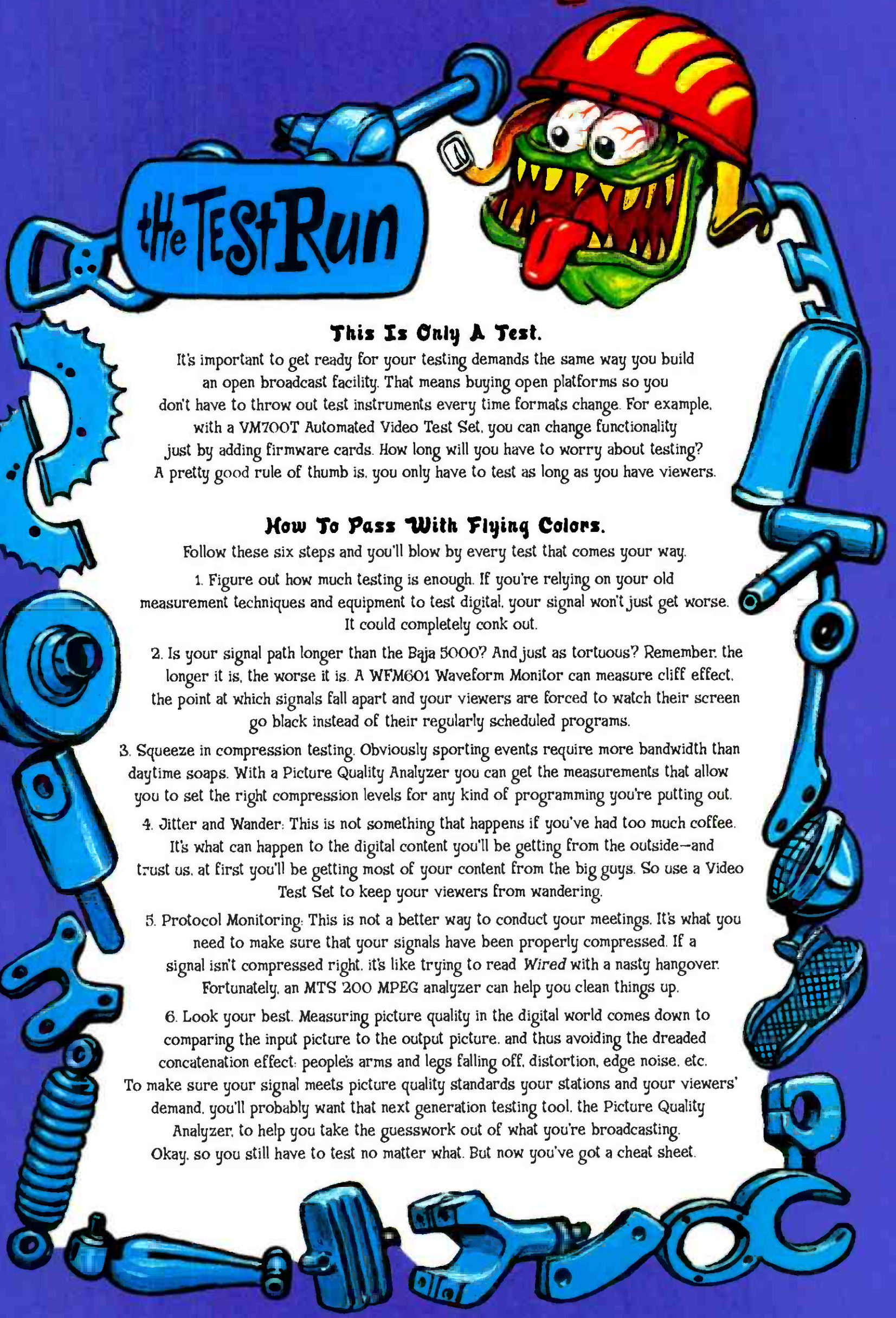

This Is Only A Test.

It's important to get ready for your testing demands the same way you build an open broadcast facility. That means buying open platforms so you don't have to throw out test instruments every time formats change. For example, with a VM700T Automated Video Test Set, you can change functionality just by adding firmware cards. How long will you have to worry about testing? A pretty good rule of thumb is, you only have to test as long as you have viewers.

How To Pass With Flying Colors.

Follow these six steps and you'll blow by every test that comes your way.

1. Figure out how much testing is enough. If you're relying on your old measurement techniques and equipment to test digital, your signal won't just get worse. It could completely conk out.

2. Is your signal path longer than the Baja 5000? And just as tortuous? Remember: the longer it is, the worse it is. A WFM601 Waveform Monitor can measure cliff effect, the point at which signals fall apart and your viewers are forced to watch their screen go black instead of their regularly scheduled programs.

3. Squeeze in compression testing. Obviously sporting events require more bandwidth than daytime soaps. With a Picture Quality Analyzer you can get the measurements that allow you to set the right compression levels for any kind of programming you're putting out.

4. Jitter and Wander: This is not something that happens if you've had too much coffee. It's what can happen to the digital content you'll be getting from the outside—and trust us, at first you'll be getting most of your content from the big guys. So use a Video Test Set to keep your viewers from wandering.

5. Protocol Monitoring: This is not a better way to conduct your meetings. It's what you need to make sure that your signals have been properly compressed. If a signal isn't compressed right, it's like trying to read *Wired* with a nasty hangover. Fortunately, an MTS 200 MPEG analyzer can help you clean things up.

6. Look your best. Measuring picture quality in the digital world comes down to comparing the input picture to the output picture, and thus avoiding the dreaded concatenation effect: people's arms and legs falling off, distortion, edge noise, etc. To make sure your signal meets picture quality standards your stations and your viewers' demand, you'll probably want that next generation testing tool, the Picture Quality Analyzer, to help you take the guesswork out of what you're broadcasting. Okay, so you still have to test no matter what. But now you've got a cheat sheet.

THE QUESTION IS...

new MasteR ControL works wiTH SDTV cONtrol. Move forward 1 space.

Central serveR CrAshEs InTo waLL. Move back 3 spaces.

Old routeRS lack BAndwidth to MOve to DTV. Move back 1 space.

Bitstream splicing forcEs ugly network proMo to run over your mega-spot. Move back 2.

Yes. You can run that voicEOVer teaser Your STaTion ManaGer's wife Recorded. Move forward 2.

the ASSEMBLY

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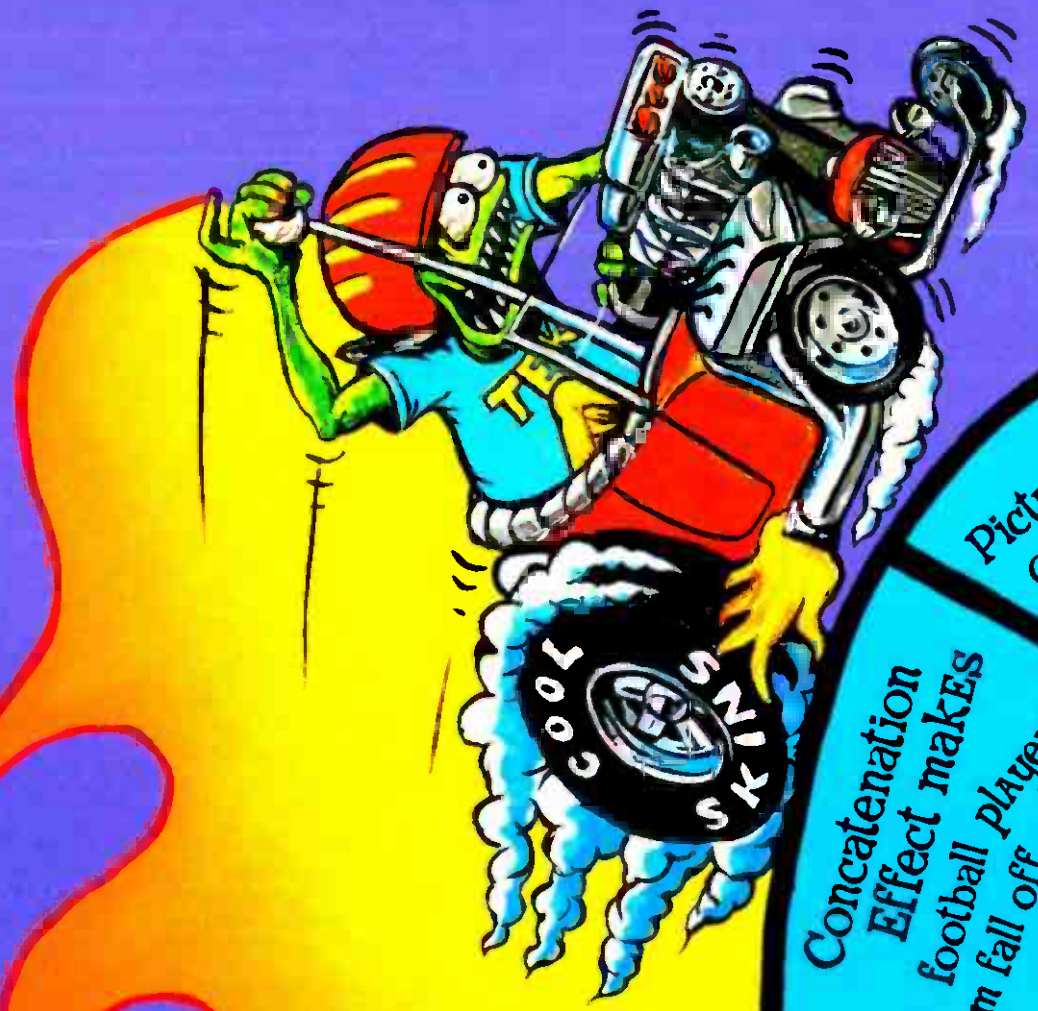
Which corNER ?!?



Picture QuaLity Analyzer helps determine appRopriate compression levEL. Move forward 2.

ForGot to test for jitter and wAnder Ratings StArT sinking Fast. Skip turn.

Use of MPEG analyzer MeAns you Know protocol is intact. Move forward 1.

Concatenation Effect makES football player's arm fall off. Move backward 1.

Cable length problem causes cliff Effect. Fall off track for 2 turns.

the TEst Run

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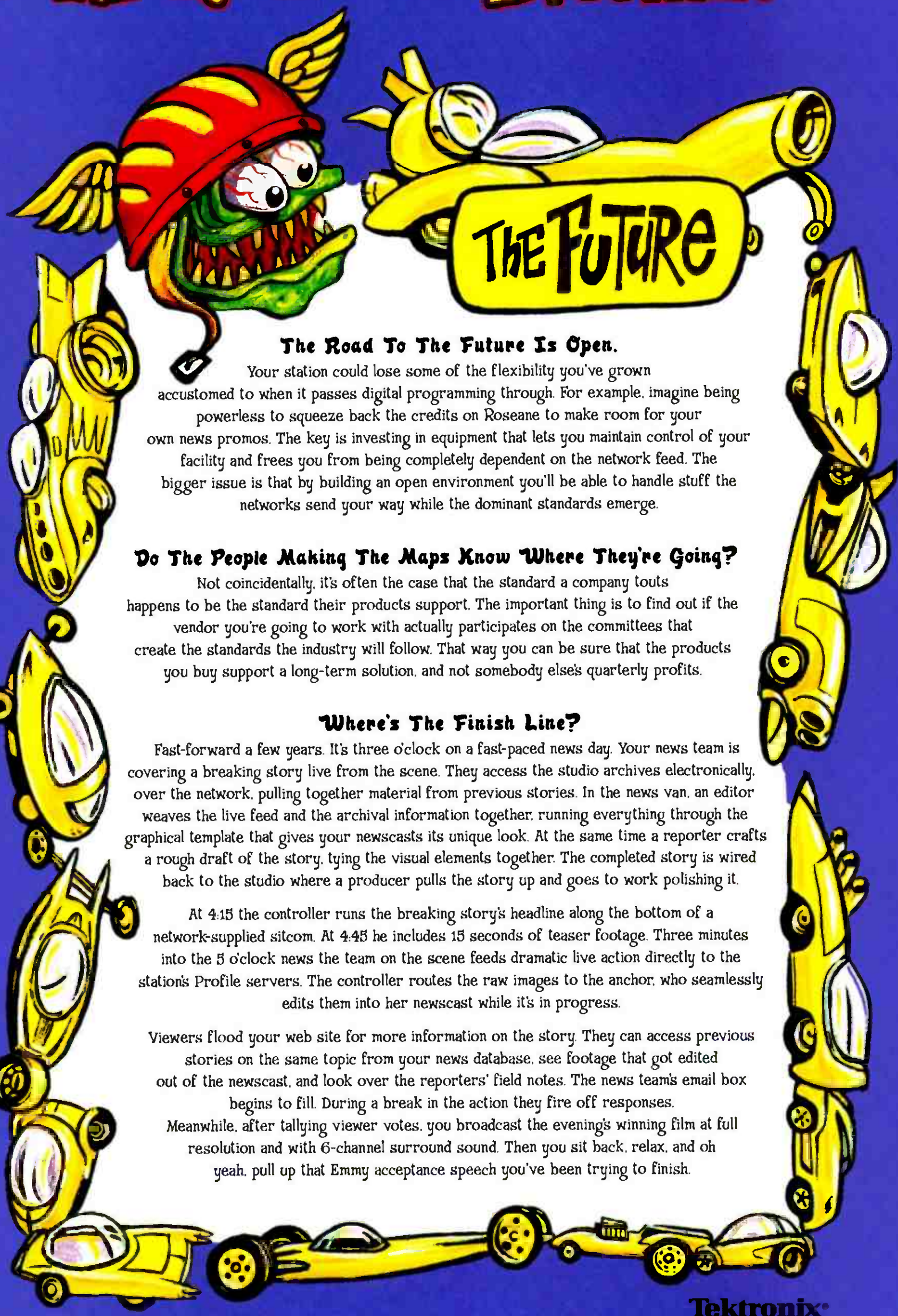

The Road To The Future Is Open.

Your station could lose some of the flexibility you've grown accustomed to when it passes digital programming through. For example, imagine being powerless to squeeze back the credits on Roseane to make room for your own news promos. The key is investing in equipment that lets you maintain control of your facility and frees you from being completely dependent on the network feed. The bigger issue is that by building an open environment you'll be able to handle stuff the networks send your way while the dominant standards emerge.

Do The People Making The Maps Know Where They're Going?

Not coincidentally, it's often the case that the standard a company touts happens to be the standard their products support. The important thing is to find out if the vendor you're going to work with actually participates on the committees that create the standards the industry will follow. That way you can be sure that the products you buy support a long-term solution, and not somebody else's quarterly profits.

Where's The Finish Line?

Fast-forward a few years. It's three o'clock on a fast-paced news day. Your news team is covering a breaking story live from the scene. They access the studio archives electronically, over the network, pulling together material from previous stories. In the news van, an editor weaves the live feed and the archival information together, running everything through the graphical template that gives your newscasts its unique look. At the same time a reporter crafts a rough draft of the story, tying the visual elements together. The completed story is wired back to the studio where a producer pulls the story up and goes to work polishing it.

At 4:15 the controller runs the breaking story's headline along the bottom of a network-supplied sitcom. At 4:45 he includes 15 seconds of teaser footage. Three minutes into the 5 o'clock news the team on the scene feeds dramatic live action directly to the station's Profile servers. The controller routes the raw images to the anchor, who seamlessly edits them into her newscast while it's in progress.

Viewers flood your web site for more information on the story. They can access previous stories on the same topic from your news database, see footage that got edited out of the newscast, and look over the reporters' field notes. The news team's email box begins to fill. During a break in the action they fire off responses. Meanwhile, after tallying viewer votes, you broadcast the evening's winning film at full resolution and with 6-channel surround sound. Then you sit back, relax, and oh yeah, pull up that Emmy acceptance speech you've been trying to finish.

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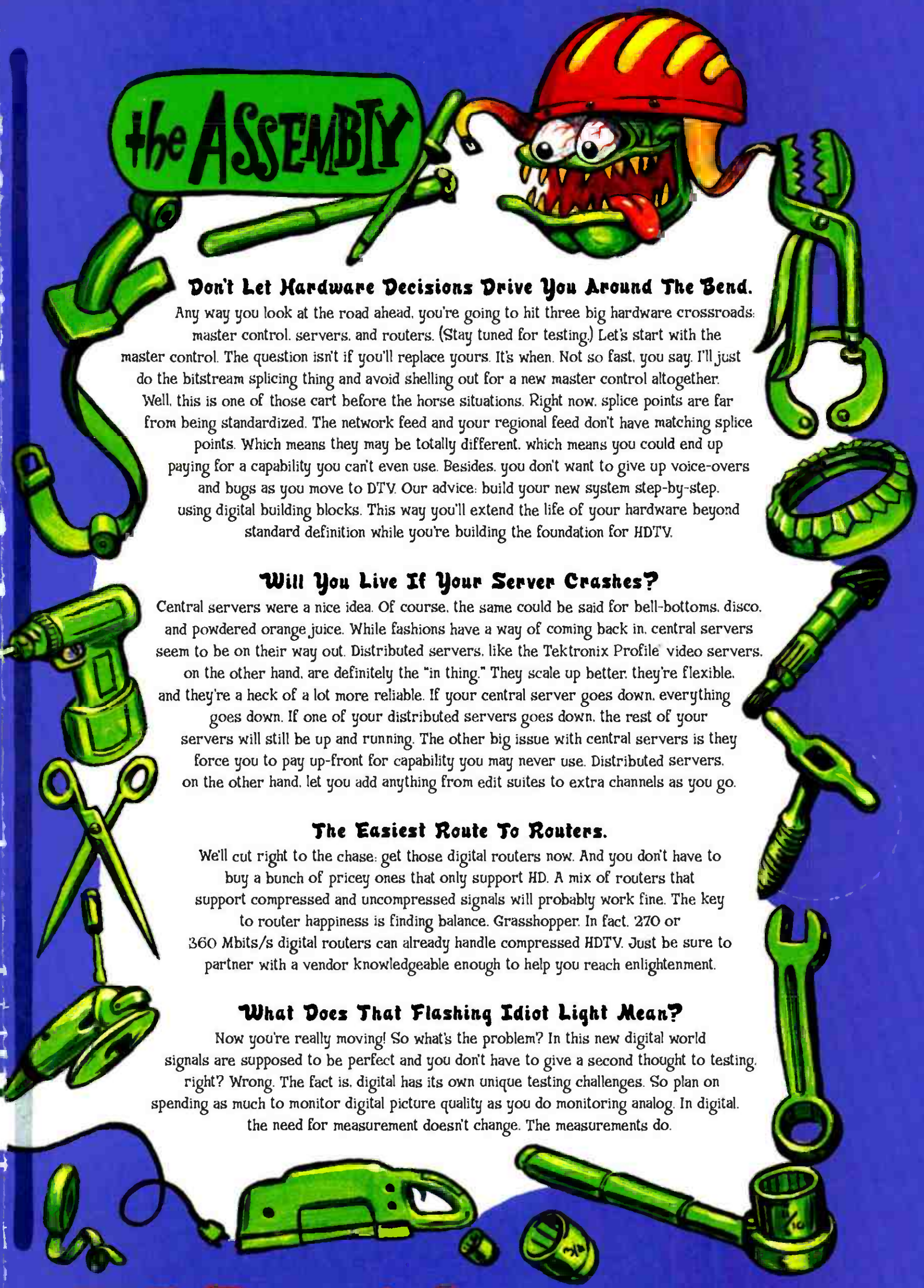

Don't Let Hardware Decisions Drive You Around The Bend.

Any way you look at the road ahead, you're going to hit three big hardware crossroads: master control, servers, and routers. (Stay tuned for testing.) Let's start with the master control. The question isn't if you'll replace yours. It's when. Not so fast, you say. I'll just do the bitstream splicing thing and avoid shelling out for a new master control altogether. Well, this is one of those cart before the horse situations. Right now, splice points are far from being standardized. The network feed and your regional feed don't have matching splice points. Which means they may be totally different, which means you could end up paying for a capability you can't even use. Besides, you don't want to give up voice-overs and bugs as you move to DTV. Our advice: build your new system step-by-step, using digital building blocks. This way you'll extend the life of your hardware beyond standard definition while you're building the foundation for HDTV.

Will You Live If Your Server Crashes?

Central servers were a nice idea. Of course, the same could be said for bell-bottoms, disco, and powdered orange juice. While fashions have a way of coming back in, central servers seem to be on their way out. Distributed servers, like the Tektronix Profile video servers, on the other hand, are definitely the "in thing." They scale up better, they're flexible, and they're a heck of a lot more reliable. If your central server goes down, everything goes down. If one of your distributed servers goes down, the rest of your servers will still be up and running. The other big issue with central servers is they force you to pay up-front for capability you may never use. Distributed servers, on the other hand, let you add anything from edit suites to extra channels as you go.

The Easiest Route To Routers.

We'll cut right to the chase: get those digital routers now. And you don't have to buy a bunch of pricey ones that only support HD. A mix of routers that support compressed and uncompressed signals will probably work fine. The key to router happiness is finding balance. Grasshopper. In fact, 270 or 360 Mbits/s digital routers can already handle compressed HDTV. Just be sure to partner with a vendor knowledgeable enough to help you reach enlightenment.

What Does That Flashing Idiot Light Mean?

Now you're really moving! So what's the problem? In this new digital world signals are supposed to be perfect and you don't have to give a second thought to testing, right? Wrong. The fact is, digital has its own unique testing challenges. So plan on spending as much to monitor digital picture quality as you do monitoring analog. In digital, the need for measurement doesn't change. The measurements do.

N THE Road to DIGITAL!

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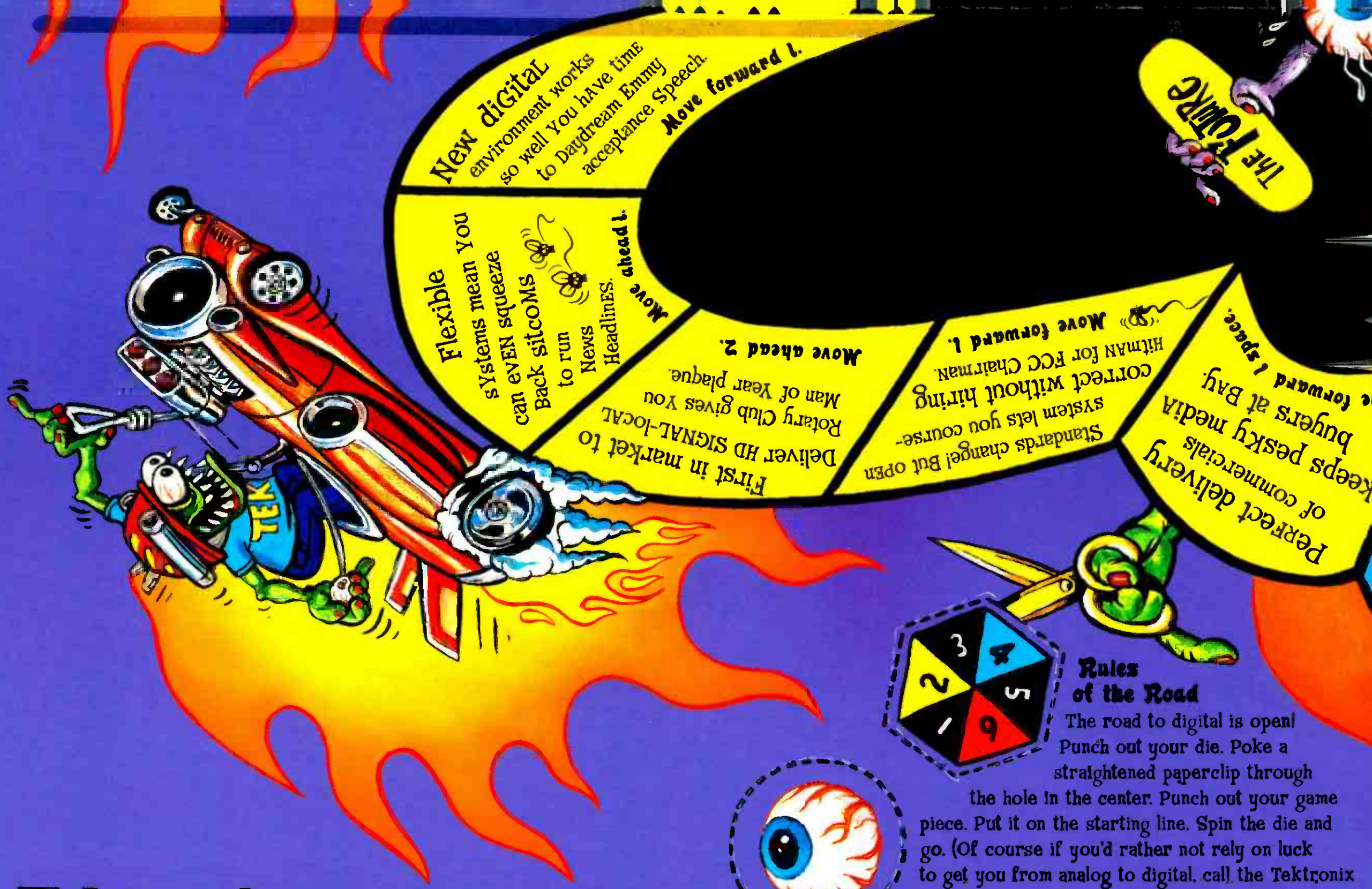

Rules of the Road

The road to digital is open! Punch out your die. Poke a straightened paperclip through the hole in the center. Punch out your game piece. Put it on the starting line. Spin the die and go. (Of course if you'd rather not rely on luck to get you from analog to digital, call the Tektronix Transition Team at 1-800-TEKVIDEO, Dept. 1000, or visit our web site at www.analog2digital.com)

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Looking over some of the other items in the E-mail inbox, we also received a nice pat on the back from Bob Hammel at NAIT in Canada:

I think "Dr. Digital" is a great piece of work. This is the type of information engineers like to see. I am sure that every engineer has a situation that they have solved that other engineers are sweating blood over. I've come across a few quick fixes myself that I know, by meeting guys at conventions, would save a lot of anguish. I've also learned a lot from other guys that way. Would it not be possible to set up some kind of a database that engineers could log their major repair techniques, like the capstan thing, so that all could benefit? Thanks and keep up the good articles.

Bob Hammel, Chief Engineer
Radio & Television Department
Northern Alberta Institute of Technology (NAIT), Edmonton, Alberta Canada.

The database idea is worth considering. If anyone out there is interested, let me know, and I'll see what we can do.

If you need help finding information or are having trouble with a piece of equipment or a manufacturer, let me help. Send me the pertinent details at dr_digital@intertec.com, and I'll see what I can do.

Steve Epstein

In a bit of a departure this month, I received a reader request wanting an explanation as to whether a digital video router can be used to route analog video signals. So, let's look at that.

It is true, that a digital router cannot be used to route analog video, but there are exceptions. From the perspective of a completely digital system, such as would be used for a reclocking router, the input/output circuitry is not designed to pass analog signals. Virtually all digital routers use a receiver input circuit that is looking for an incoming clock at 135/270MHz. Because there is no energy at 135/270MHz in an analog video signal, an analog video signal at the input will go nowhere — fast, effectively eliminating the use of a digital router for analog video.

In some cases, well-designed (wide bandwidth) analog switchers can be used to pass digital signals. However, any signal degradation through the router will impact the maximum cable lengths allowed. Additionally, without signal conditioning done on the input signal, the input and output cable lengths, as well as the effective cable length of the router signal path, become the total cable length. The frequency rolloff characteristics of the various pieces must also be considered. If, for instance, the input cable consists of 50 feet of Belden 8281, and the output cable is also 50 feet, but is a Belden equivalent with slightly different rolloff specs, the frequency spectrum seen by the SDI receiver will not match a 100 foot run of either cable type. Add in any distortions from the router, and it may become difficult to recover the SDI signal at the receiver.

A better approach is to use a chassis designed to handle either analog or digital signals and populate the chassis with an appropriate number of crosspoints for each signal type. For instance, a 20x20 frame could easily be "partitioned" for 15x15 analog and 5x5 digital today. Over time, analog crosspoint cards could be replaced by digital crosspoint cards. As needed the switcher could evolve to 5x5 analog and 15x15 digital. The analog crosspoint cards might even have some trade-in value. Another approach would be to buy a chassis large enough to accommodate additional growth. In this example, that might mean a 30x30 or larger chassis. ■

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Hero Productions EXPAN

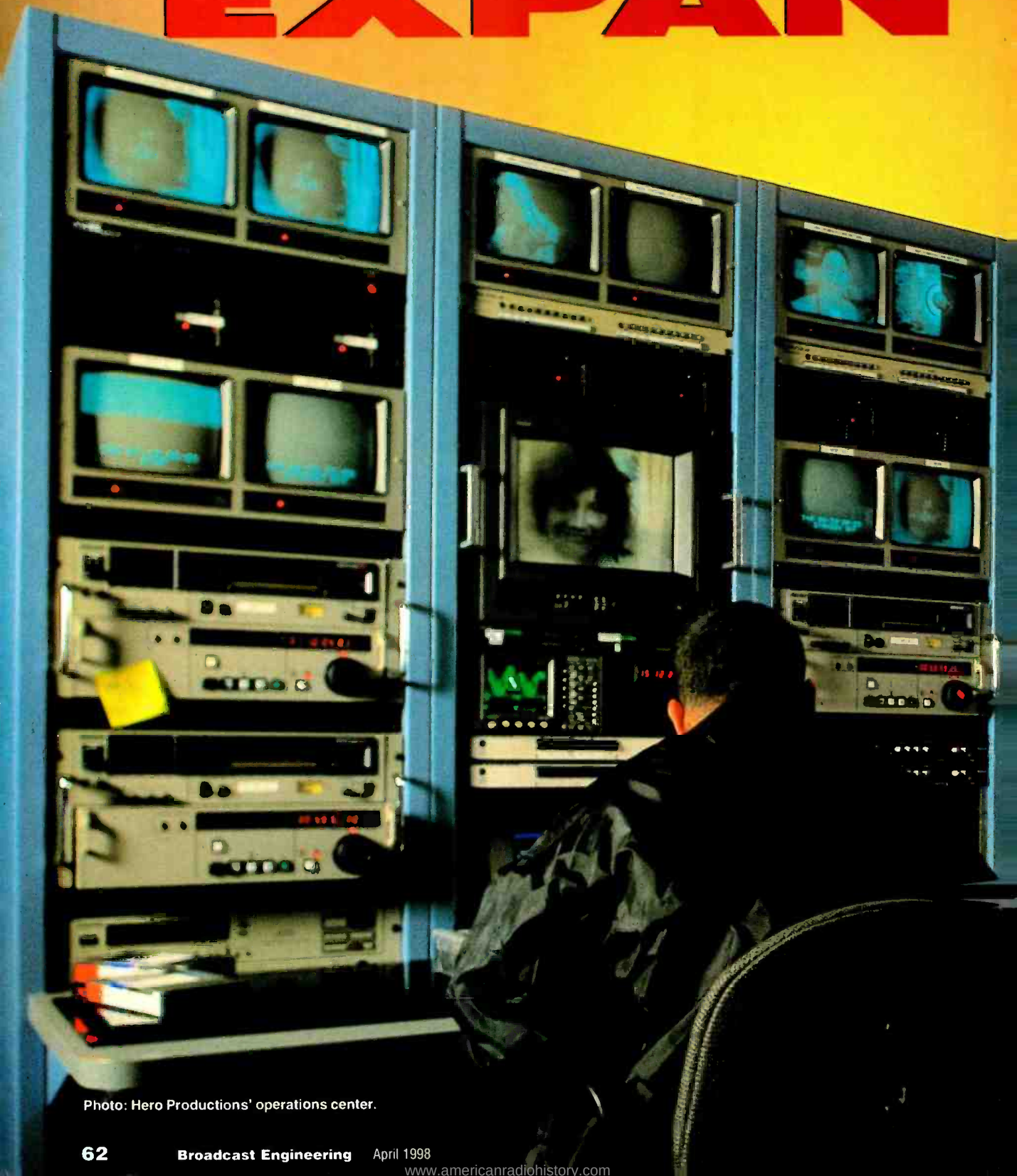

Photo: Hero Productions' operations center.

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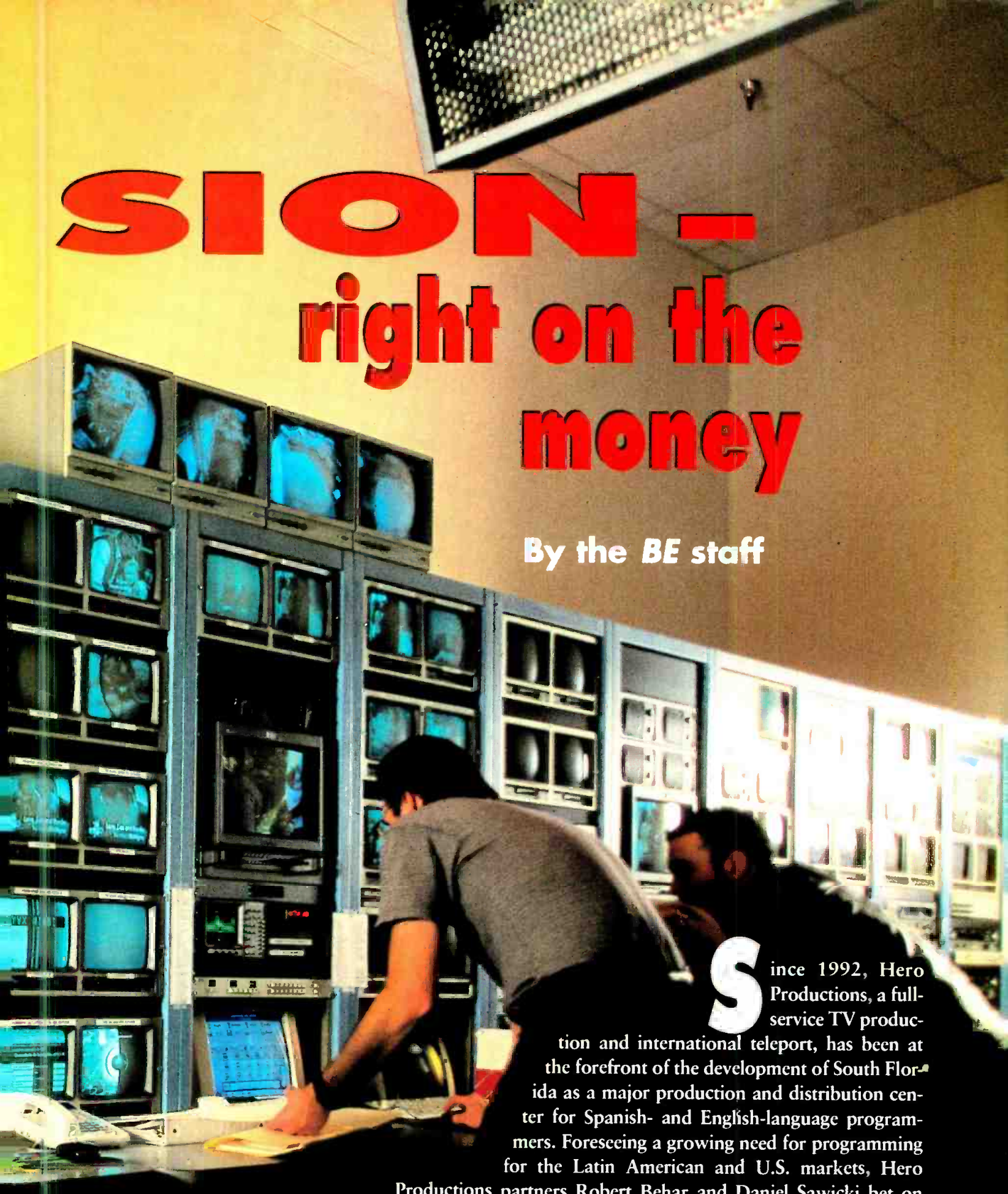
SION – right on the money

By the *BE* staff



Since 1992, Hero Productions, a full-service TV production and international teleport, has been at the forefront of the development of South Florida as a major production and distribution center for Spanish- and English-language programmers. Foreseeing a growing need for programming for the Latin American and U.S. markets, Hero Productions partners Robert Behar and Daniel Sawicki bet on Miami becoming the U.S. entertainment gateway to Latin America — and won.

Its concept — to offer programmers and producers every possible service from pre-production through distribution, including capacity on satellites beaming into Latin America, all in one place and with a fully bilingual staff — was right on the money.

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Hero Productions' control room.

Growing to fit clients' needs

The first U.S.-based Spanish-language cable networks to originate from South Florida did so from Hero Productions. Over the past five years, Hero Productions has developed into a 65,000-square-foot and growing TV broadcast center by following a philosophy of anticipating and reinvesting according to clients' needs. Today, the facility provides programmers from all over the world with a full array of production, post-production, mobile production, master control and transmission services.

Recently, Hero Productions launched a language conversion division. This area provides translation, audio recording, subtitling and layback services to a growing number of programmers looking to enter international markets with programming originally produced for single-language audiences.

With its large client base of international programmers who enjoy one-stop services, Hero Productions recognized a growing need for quality language conversion and felt that this was a natural complement to its comprehensive menu of production and transmission services. To support the new service, Hero Productions added three audio lay-in rooms, two audio layback rooms and four voice-over booths to its state-of-the-art facility.

• **Audio lay-in rooms:** equipped with Alesis ADAT XT eight-channel digital recorders, Alesis BRC remote controllers with SMPTE time-code sync, Mackie CR1604VLZ audio mixers with talkback, DBX 1066 compressor/limiters, Sony Beta SP PVW-2600 players with remote control and Electro-Voice RE27N/D mics with screen, shock-mount and retractable arm.

• **Audio layback room:** features an Alesis ADAT XT eight-channel digital recorder, Alesis BRC remote controller with SMPTE time-code sync, Sony Beta SP PVW-2800, Sony Beta SP BVW-70, Sony Beta BVW-D75 and Protools 4.01 system with eight tracks of record/playback, effect sends of I/O, VSD interface, SSD interface and Macintosh 9600 computer. Plug-ins include DVERB, machine control, pitch shifter, Vocalign and Timemod, Panasonic 4100 DAT machine, Mackie CR1604VLZ audio console with talkback and Tascam DA-60 MKII time-code recorder.

The audio layback room with time-code repair is equipped with Alesis ADAT XT eight-channel digital recorder, Alesis BRC remote controller with SMPTE time-code sync, Mackie CR1604VLZ audio console with talkback, F22 time-code recondition and repair, Electro-Voice RE27N/D mic, Pentium 150MHz system with 20-inch monitor and audio workstation tools Creamware software and T-DAT triple DAT software with Wave Walker, Fire Walker with analyzer, EQ and meters, CD mastering tools and multitrack recording. Plug-ins include Osiris real-time restoration, declicker, denoiser, dehiss, exciter and sub-bass enhancement and Tascam DA-60 MKII time-code recorder.

• **Voice-over booths:** feature Mackie 1202 audio consoles, Panasonic SV3800 DAT recorder/players, Crown D-45 amplifiers, JBL 4206 monitor speakers, DBX 1066 compressor/limiters, Electro-Voice RE27N/D mics and Rane MS-1 mic pre-amps.

Hero Productions' A/B-roll edit room.

Providing clients with it all

Hero Productions' mission has al-

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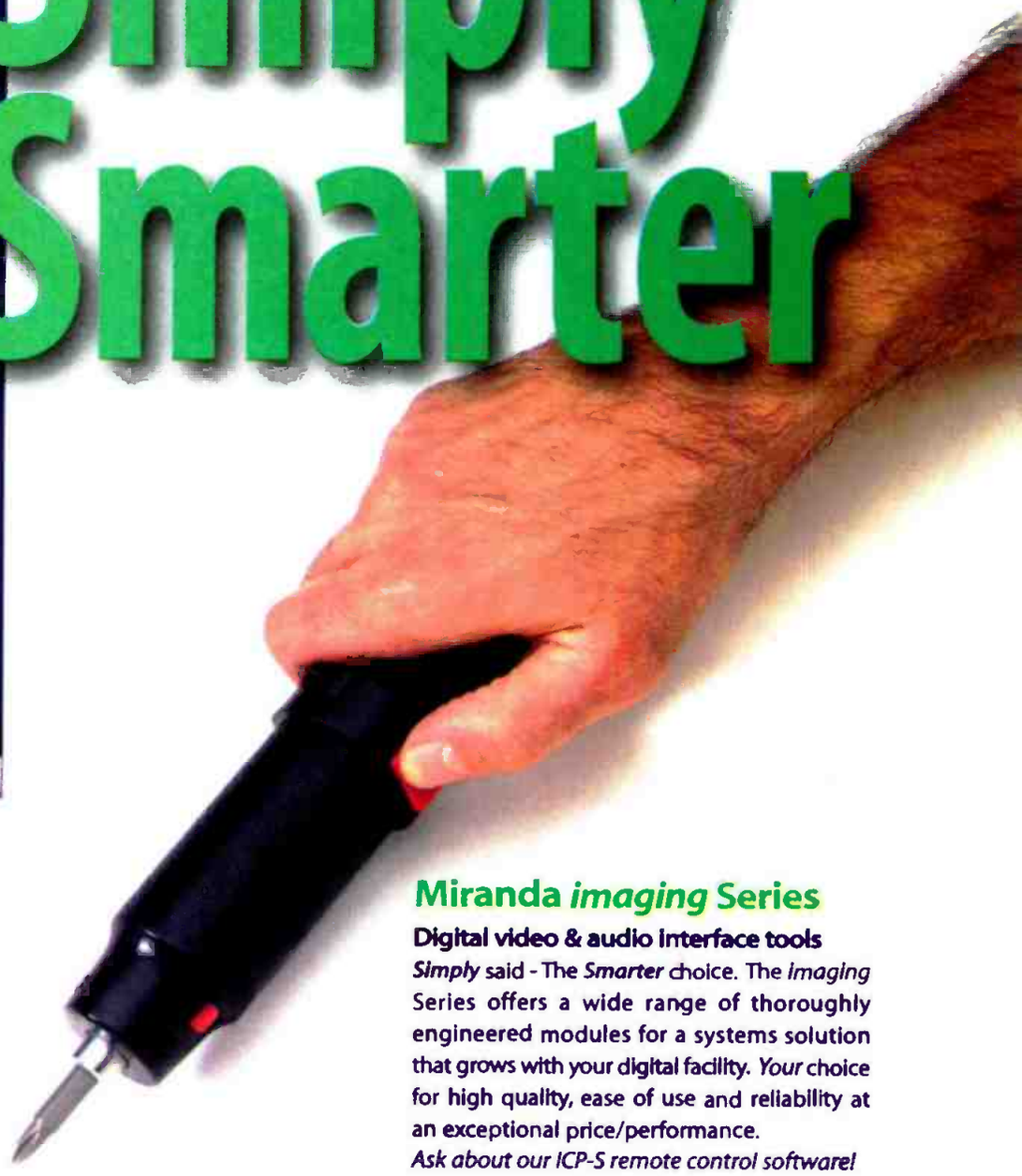

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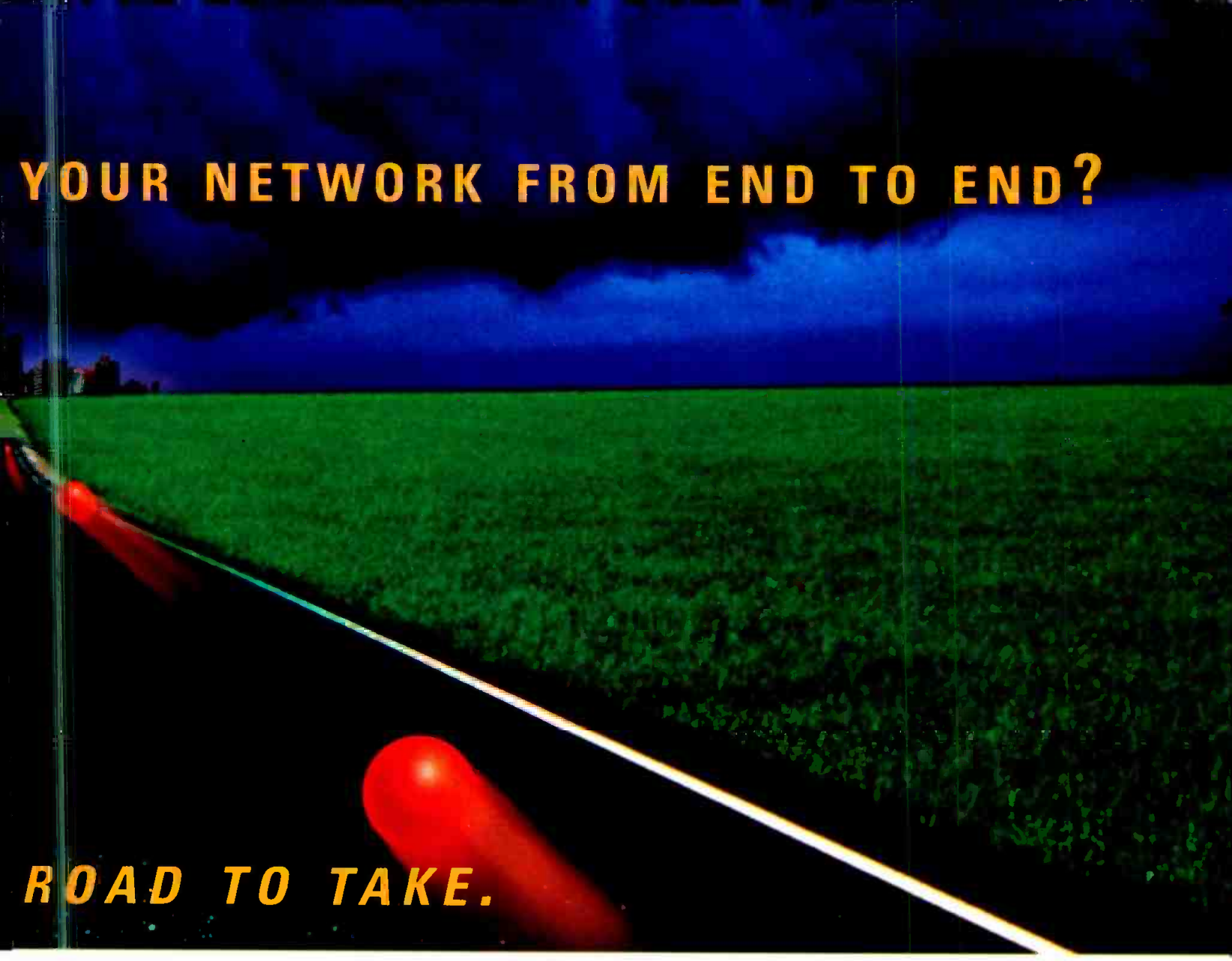

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ways been to provide programmers with every service they could require in one place and to do it all better and more efficiently than anyone else. With more of our clients seeking to serve other-language markets with original programming, we decided to apply our expertise as a full-service international production facility to convert their programming into other languages.

So far, Hero Productions' language conversion clients have included Hallmark Entertainment Networks, CBS TeleNoticias and Family Channel. Behar believes that language conversion will be the broadcast center's largest growth area in 1998.

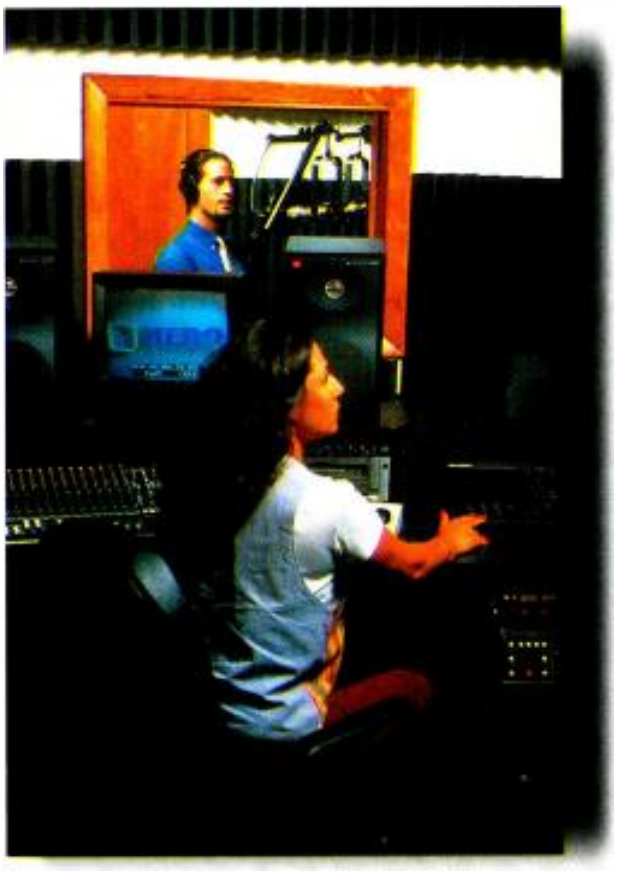
The language conversion division is only the latest addition to Hero Productions complete array of quality TV production and transmission services available in one full-service South Florida complex. Over the past year, the broadcast center has continued to expand in all directions, including facilities, services, clients, revenues and personnel.

Last May, Hero Productions completed a major renovation, extending the facility to 65,000 square feet, expanding and upgrading its production and post facilities to digital, completing a third studio with control room and adding two digital operation centers to the teleport.

The latest renovation and upgrade of the facility was engineered to provide production, post-production and master control clients with the latest technology in an efficient and comfortable working environment.

• Studios: 85'x40,' 75'x40' and 35'x30' studios are equipped with Hitachi Z-2000 digital studio cameras, QTV teleprompter system, IDEA 48-input lighting console, assorted lighting fixtures and six-channel RTS communication system with wireless microphones and IFBs.

• Broadcast center: state-of-the-art control rooms feature ECHOlab MVS-9 2-1/2 ME switcher with chroma-key and back-up power supply, Grass Valley 300 rotary wipe switcher with back-up power supply/EMEM, Mackie 32-input audio console, Chyron Max! character generator, Sony BVE-2000 editors, Abekas A-42 still-stores, Abekas A-51 and Microtime Impact DVEs, Sony Beta SX DNW-30, Sony Beta SP PVW-2800s, Tektronix waveform/vectorscopes, Sony color monitors PVM-1954Q, Panasonic black-and-white monitors TR-930B, DAT/CD/cassette players, Telos 1 and Telos link hybrids, auto-answer couplers and Yamaha digital reverb.



Hero Productions' language conversion booth.

The facility's production revenues more than doubled over 1997, with regular shows like CBS TeleNoticias' "En Directo con Jaime Bayly" and "Habla America," United Family Communications' "Casa Club Magazine" and others joining the ranks of HTV's exclusive music videos and TV Marti's "Perspectivas" and "Mesa Redonda," all produced in Hero Productions' facilities.

In addition, Hero Productions maintains strong niches in the electronic news gathering and insert studio businesses, with Reuters TV and APTV among its core clientele. The facility also maintains a strong niche in production and international transmission of live sporting events, such as the Olympic Games and World Cup soccer. Clients have included ABC, NBC, CBS, CNN, CNBC, World Television News and many other international broadcasters worldwide.

Hero Productions' upgraded post-production facilities provide digital and analog capabilities and include an expanded post-production suite, a new A/B-roll edit room, two cuts-only edit bays and an upgraded transfer room.

• Post-production suites: feature Sony DVS-2000C digital video production switcher with all options, Sony DME-3000 DVE, Sony BVE-2000 editor, Sony DigiBeta DVW-A500, Sony Beta SX DNW-A50, Chyron Maxine digital character generator, Sony MXP-3905 24-input audio console, Tektronix waveform/vectorscope, Panasonic monitors, DAT/CD player, Crown D-75 amplifiers, JBL 4208 and 4206 monitor speakers.

• A/B-roll edit room: includes Sony BVE-2000 editor, Sony Beta SX DNW-A50, Sony Beta SP BVW-70, ECHOlab MVS-3 component video switcher, Sony MXP-390S 24-input audio console and DAT/CD player.

• Upgraded digital transfer room: features Sony Beta SX DNW-A50, Sony Beta SP BVW-70, Sony Beta SP PVW-2800, Sony Beta SP PVW-2800P PAL, video/international standards converter, Tektronix WFM/VS, Panasonic black-and-white monitors, Sony color monitors, VHS recorder/players and audio and video patching.

In addition to its production facilities, Hero Productions operates a full-service state-of-the-art teleport — the only one in South Florida to offer switched fiber-optic capabilities. The teleport maintains long-term leases on domestic and international transponders.

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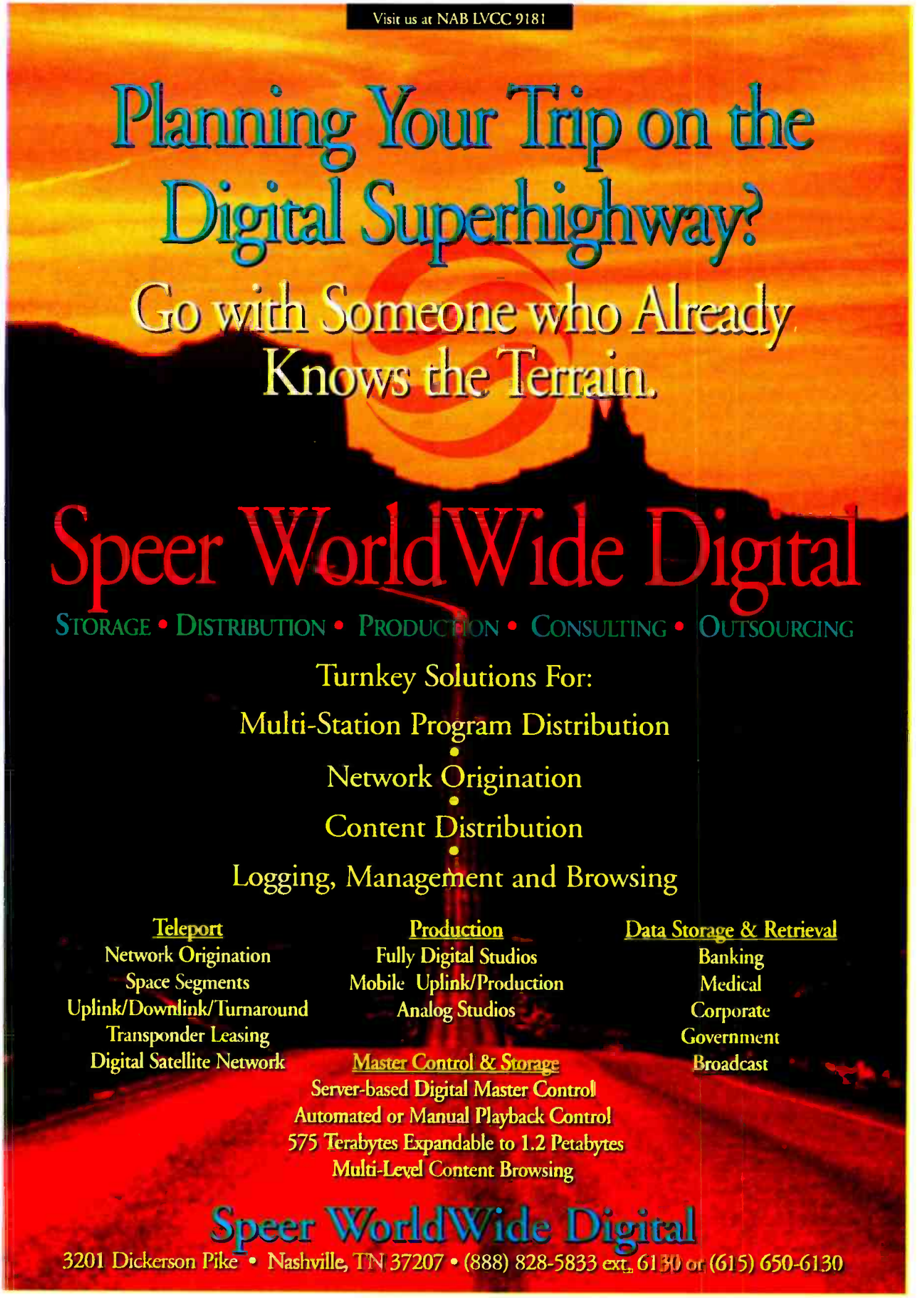

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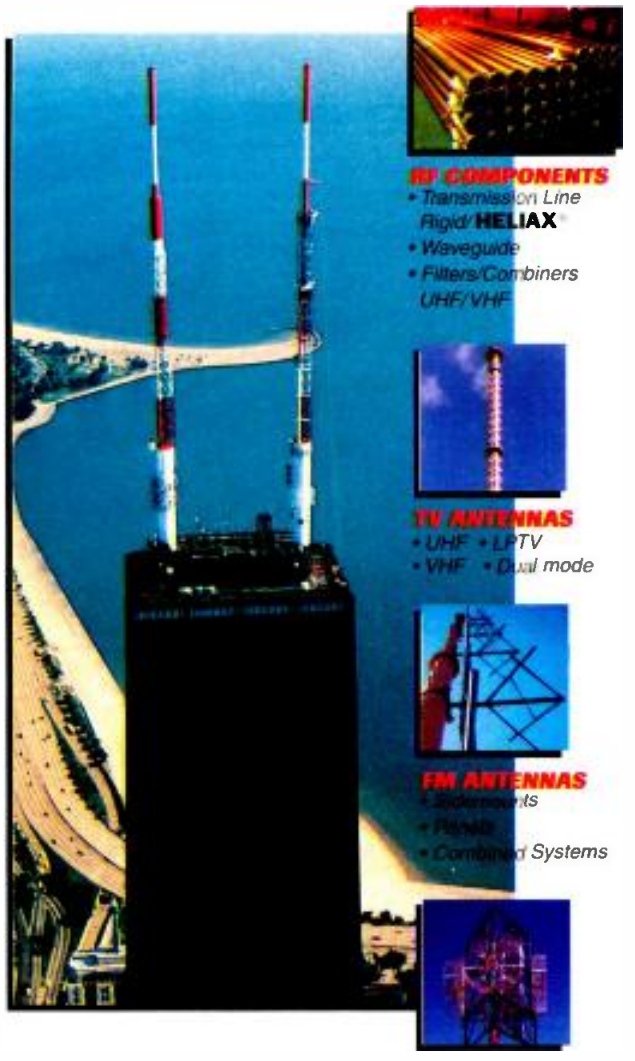

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Last year, Hero Productions added teleport and production clients Hallmark Entertainment Networks, CBS Tele-Noticias, Family Channel, Casa Club TV and others, increasing its list of full-time uplinks to 24 from 17 in 1996. Occasional-use clients include Reuters, APTV, NBC, EBU, Gol Network, Telemundo, Univision, Embratel, Telefe, and other domestic and international programmers.

Furthermore, Hero Productions is one of a handful of teleports in the United States to offer master control services. The facility uses its own comprehensive automation software to program the networks.

In another example of Hero Productions' philosophy of reinvesting according to clients' needs, when Travel Channel Latin America first approached the broadcast center three years ago to originate and uplink its signal, the network's needs extended beyond the facility's current offerings. The mission posed by Behar to his engineering team: add ad insertion to the mix within six months. Not only did Hero Productions meet the challenge, but it crafted its own automation software and customized it to meet individual clients' specifications.

For each master control client, the PC-based proprietary software controls a unique set-up of digital file servers, tape machines, switchers, logo inserters and audio equipment. Interstitial materials are stored on a series of 9GB SCSI drives using RAID 3 technology to provide redundancy to protect against disk failure. These drives are controlled by the servers, which are in turn controlled by the automation software.

• **13 master control operating centers:** feature DigiBeta SP playback VTR decks, ASC VR digital file servers and delays, Sony DigiBeta DVW-A500s, Sony Beta SX DNW-A30s, Sony Beta SP BVW-60s, Sony Beta SP BVW-70s, Sony Beta SP PVW-2800s, Sony Beta SP PVW-2600s, Chyron character generators, Soundcraft four-channel audio consoles, QSI 908 logo inserters, Tektronix waveform/vectorscopes, Link 800 series video and audio switchers, Sony PVM-1340 color monitors, Panasonic TR930B black-and-white monitors, Videotek RS-10A video/audio switchers, Mackie 1202 audio consoles, Leitch 3211E encoders, Leitch clean switch serial digital switcher, Tekniche series 6000 digital audio embedding, Leitch digital audio de-embedding, screen subtitling systems multilanguage subtitle transmission systems and audio, video and RF patching.

Ongoing master control clients include Discovery —Latin America and Iberia, Discovery Kids — Latin America, Travel Channel Latin America, TeleUno, GEMS Television and HTV.

• **Teleport:** equipped with 10 transmit antennas and 13 receive antennas, as well as Scientific Atlanta Power VU digital video compression system (1:5 analog, 1:1 digital), General Instrument SCPC encoder, General Instrument 1:6 DigiCipher II digital video compression system, Scientific Atlanta SCPC encoder, 3.35kW C-band transmitters, 2kW

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The transmit antennas include an 11.3m Intelsat B-certified step-track RSI, a 10m Scientific Atlanta, two 9.2m Intelsat B-certified RSI, a 9.1m Andrew, an 8.1m Intelsat-certified Ku-band Vertex F-3, a 7m Ku-band RSI, a 4.5m Andrew and two 3.7m Miralite. Receive antennas include a 10m Scientific Atlanta, a 6m Hero, eight 5m Hero, a 4m Hero, a 2m Prodelin and a 2m RYMSA.

To support the expansive broadcast center, Hero Productions employs two 150kVA Liebert uninterrupted power supplies and two 300kVA Onan diesel generators with 500-gallon sub-base fuel tank.

In addition, the broadcast center offers production personnel, microwave interconnectivity and a seven-day, 24-hour operations center to monitor transmissions and provide quality control.

Hero Productions' 1997 revenues exceeded $17 million, a more than 55% increase over 1996 results. The facility currently has more than 100 employees, more than double last year's 40, indicating Hero Productions' commitment to client service, as well as future growth.

The 65,000-square-foot full-service TV broadcast center is located at 7291 NW 74th St., Miami. For further information on Hero Productions, call Robert Behar at 305-887-1600. ■

Equipment List:

Alesis ADAT digital audio recorders; Sony MPX-3905 audio console, Beta SP decks with full editing capabilities, DVS-2000C digital video production switcher, DME-3000 digital video effects, BVE-2000 editor, Digi-Beta DVW-A500, DNW-A50, SX DNW-30 and PVW-2800 cameras, BE 2000 editors; Mackie consoles; Electro-Voice microphones; Tascam recorders; Hitachi Z-2000 digital studio cameras; QTV teleprompters; IDEA 48-input lighting console; RTS intercom and wireless communication system; Crown D75 power amplifiers; ECHOlab MVS-9 and MVS-3 digital production switchers; GVG switcher; Chyron Maxine and MAX! character generator; Abekas A-42 still-stores; Microtime Impact DVEs; ASC video servers; QSI logo inserters; Videotek RS-10A video/audio switchers; Leitch encoders, switchers and audio equipment; Tekniche 6000 series digital audio embedding; Tektronix monitors/test equipment; Panasonic picture monitors; Telos hybrids for live audio feeds; Yamaha digital reverb systems; *teleport equipment includes:* Scientific-Atlanta Power Vu digital compression and SCPC encoders; General Instrument SCPC encoders and DigiCipher II compression; Scientific-Atlanta and Andrew satellite antennas; Liebert UPS systems.

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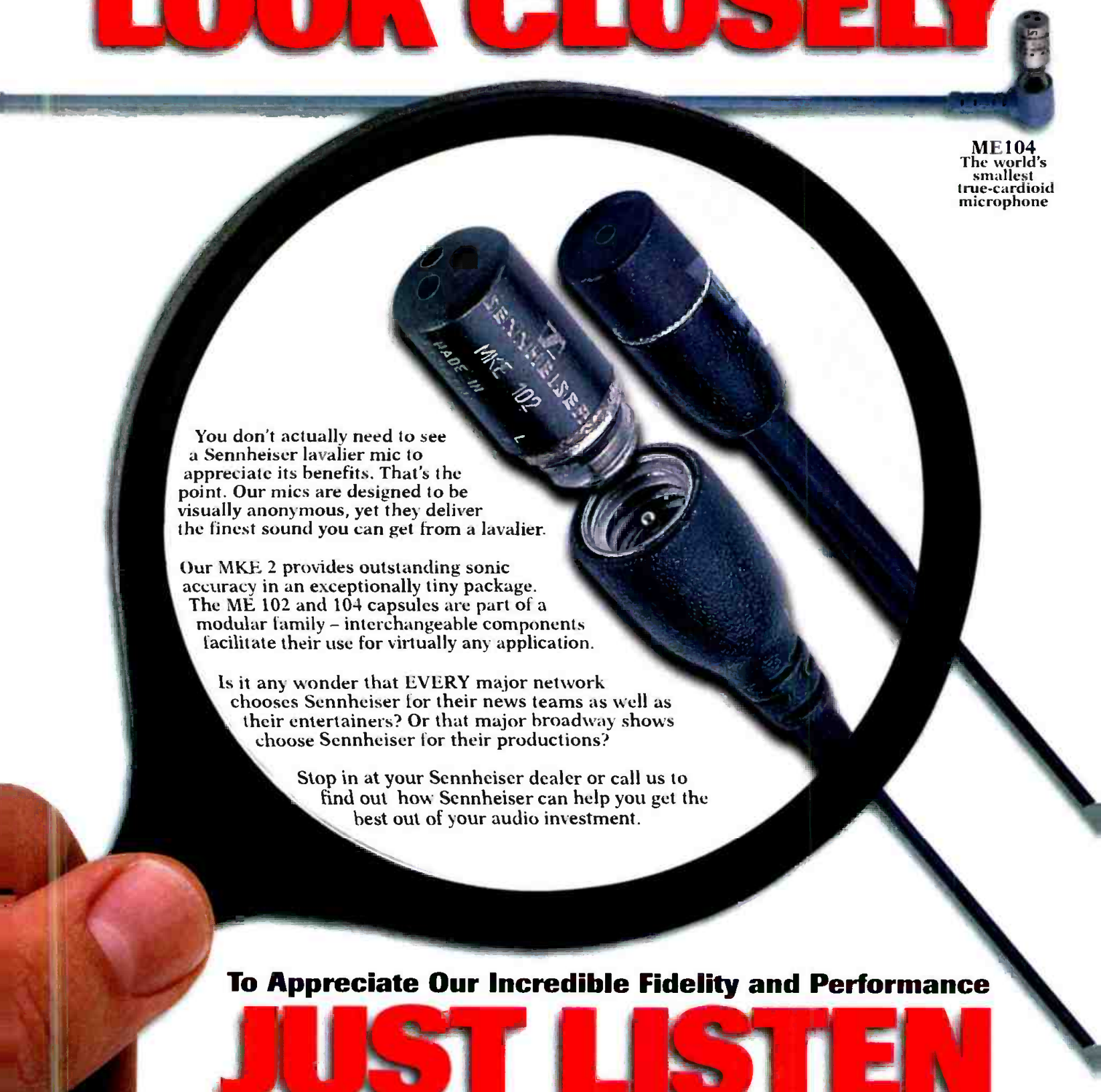

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Chambers Media deploys new digital technology

By Bill Harris

Three years ago, the senior management of Chambers Communications Corporation were bothered by something they saw as they walked through the 3,000-square-foot Eugene, OR, news studio. The sight that greeted them was an on-air suite and approximately $1 million of camera equipment sitting idle from 8 a.m. to 4 p.m. There had to be a way to turn on the equipment and increase revenue at the facility, home to the local ABC affiliate KEZI-TV and Chambers Production Corporation.

The cogitation of company management, chairman and CEO Carolyn Chambers, president Scott Chambers, executive vice president Jack Lawrence and system integrator partner Tektronix, based in Beaverton, OR, have resulted in one of the most advanced facilities in the Pacific Northwest. A decision to invest in a greenfield build-up of a digital facility, instead of migrating the entire existing structure to digital, has

Photo: In 1995, Chambers Communications made the commitment to build a common broadcast and production center using the latest technology. The result is a new 60,000-square foot state-of-the-art broadcast and production facility.

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Chambers Media deploys new digital technology

enabled Chambers to be the first in the market to go digital and tapeless and to earn the distinction of being the largest digital broadcast and production center between San Francisco and Vancouver.

Chambers Communications saw a way to migrate its broadcast and production facilities and be in the data transport services business.

Chambers Communications' new 60,000-square-foot media center and two 14,000-square-foot sound stages are situated in the Willamette Valley. They offer products that span live and post-production, Internet services businesses and engineering and creative resources. The facility also serves as headquarters for Chambers' Northwest cable systems. KEZI is now on the air broadcasting from Chambers' new digital facility with newscasts starting at 6 a.m., 5 p.m., 6 p.m. and 11 p.m., with regular programming in between.

Chambers' original studio completed in 1960 stands only 400 yards away, and is a reminder of how far the company has come. The new facility includes KEZI, the Chambers Production Corporation (formerly the Westcom Creative Group and Westcom Sports Productions) for both production and post, five cable companies with 82,000 subscribers (with a 750MHz hybrid fiber coax architecture and a new two-way cable facili-

The news set relies on new lighting and graphics to create an entirely new on-air look. Philips cameras complete the newsroom setting.

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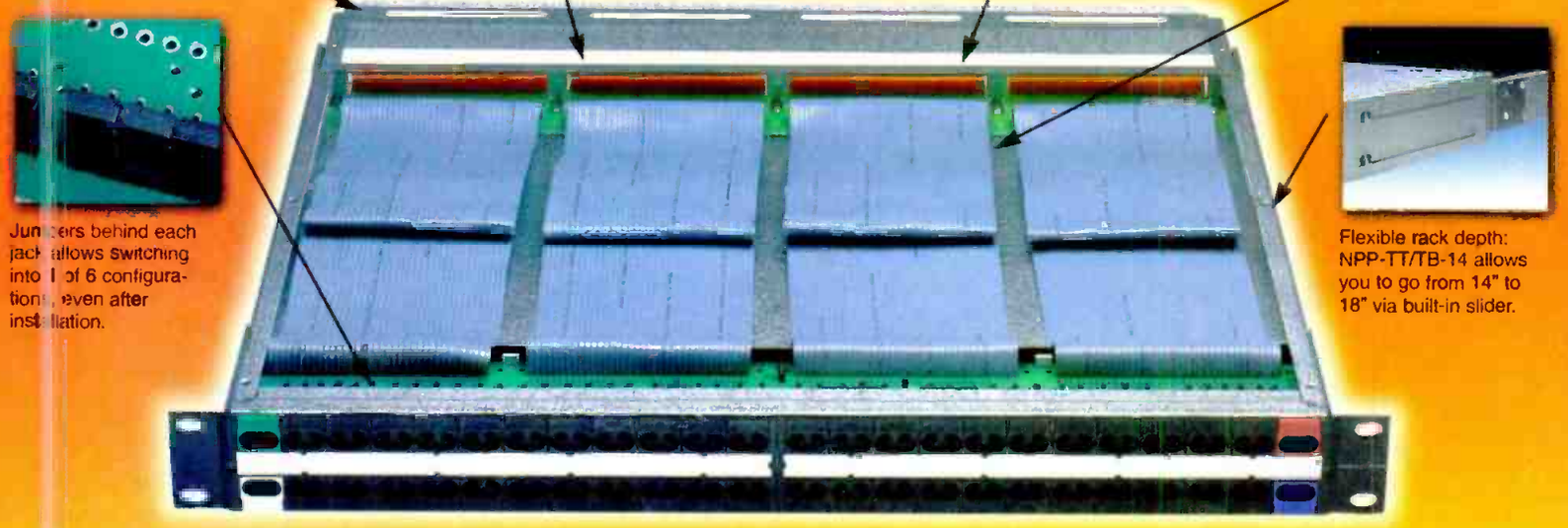

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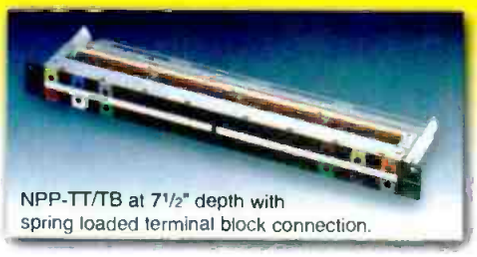

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Transmission & Distribution

Auxiliary power and the problems attendant thereto

BY DON MARKLEY

Surprising as it may seem, this country's electrical power distribution system still leaves a little to be desired, even in the major markets. Stations still have a need for auxiliary power generation, as well as power-conditioning equipment. The need varies from an absolute necessity in areas where inclement weather may bring down power lines for an extended period all the way to the two belts and a pair of suspenders approach where the cost of off-air time can be enormous.

As an example of the latter, the Sears Building in downtown Chicago has a utility company substation on one of the subterranean floors. That substation is fed by two separate power company mains. Multiple risers go up through the building and are paralleled for redundancy. There has never been a power outage on the broadcast floors in the history of the building. Yet, two stations have standby power equipment in place and a third is planning such a system. That is what you call security.

Local regulations vary regarding fuel tank installations. Check with the authorities and your insurance carrier to be sure you comply with all applicable rules and regulations.

In the middle of the spectrum are stations that either face an occasional power outage or that have a problem with the quality of the delivered power. Especially during storms, the primary power can fluctuate as seen by flickering lights or momentary breaks. High-power equipment, especially of the solid-state variety, doesn't care much for such incidents. At the least, transmitters will shut down and recycle when these problems occur. Due to the overanxious application of fingers on the remote, many viewers will immediately switch to another channel, at least for awhile. This represents an inconvenience to viewers most stations prefer to avoid.

Backup possibilities

Some stations are now installing uninterruptible power supplies (UPSs) at the transmitter site. These units provide two functions. First, they condition the incoming power to remove glitches and flickers (formally known as transients), ensuring the transmitting equipment has a smooth, clean source of power. Second, they power the transmitters for a short period of time while the standby power plant is brought on-line. This means that a partial or complete failure of the primary power will not have any effect on the viewer's pictures. Obviously, the period of time during which these monsters will operate a transmitter is usually measured in single-digit minutes. However, that is plenty of time for a standby plant to light off and accept the load.

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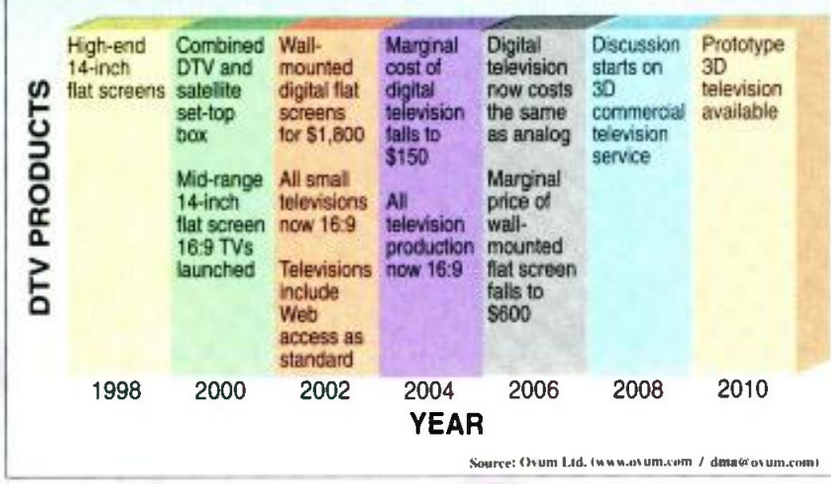

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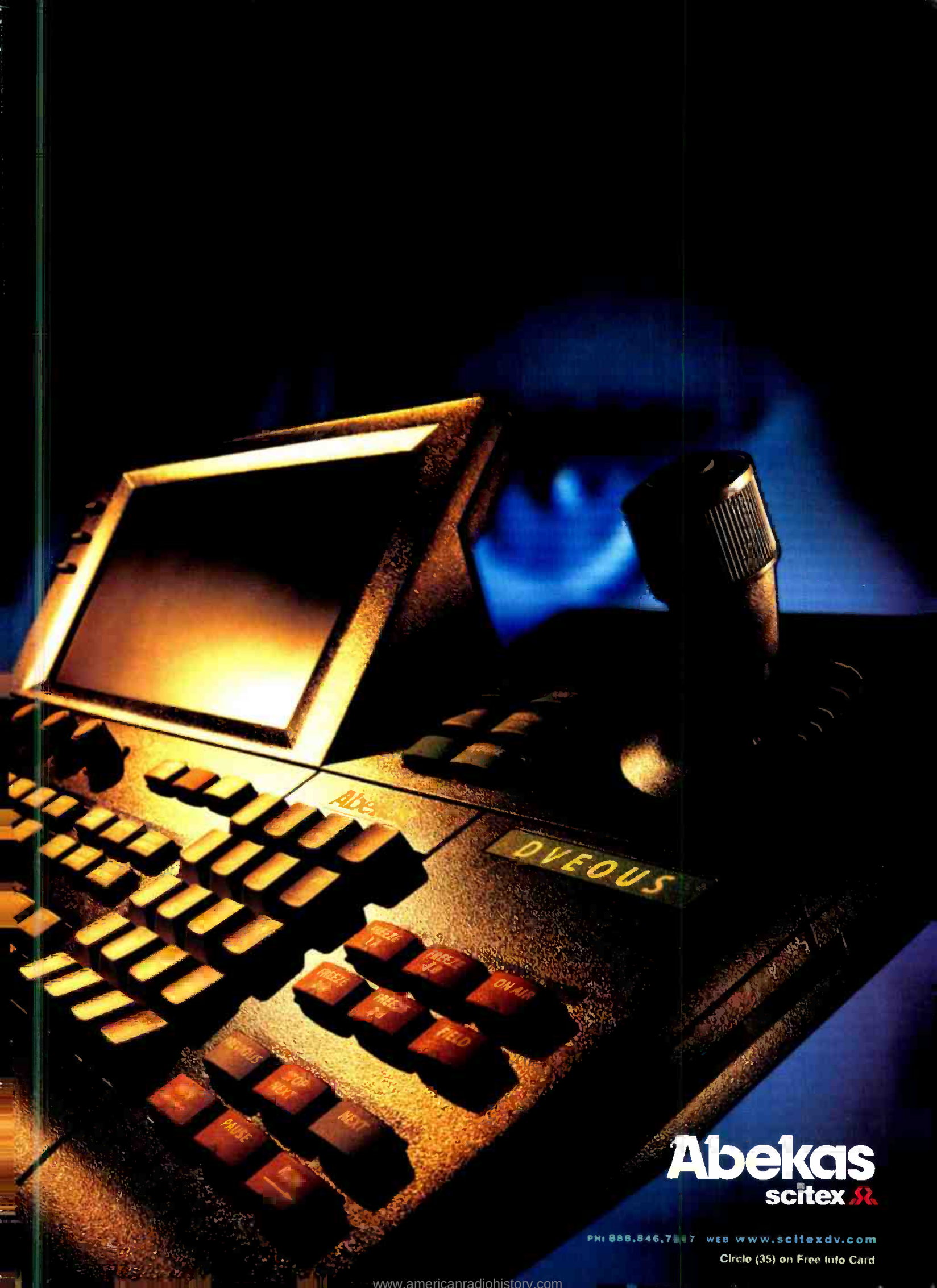

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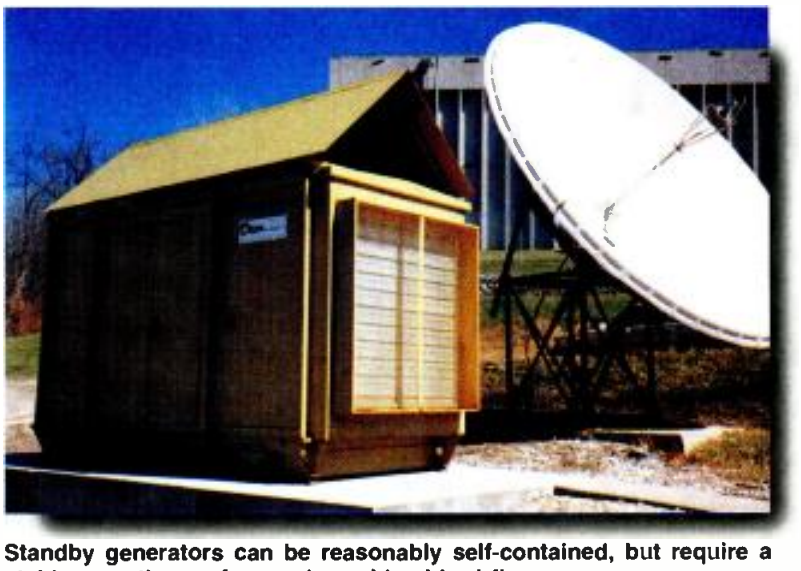
Standby power plants are normally set to start upon sensing the failure of any single phase of the three-phase incoming line. With appropriate options, they may also be set to detect reduction of the source voltage, such as during "brownouts" where the load on a system causes the voltage to drop but not fail. For the most critical cases (i.e., hospitals), the generators will start on the loss of a single cycle of line voltage and will be on-line in well under one second. This requires special facilities that are a little extreme for most broadcast stations. The UPS eliminates the need for panic, just concerned action. The normal system starts on failure as described above. Then an adjustable delay holds the system off-line for a short time, allowing the generator to stabilize and warm up a little. Oil pressure comes up and the system is ready to accept a load with less strain on the machinery.



Standby generators can be reasonably self-contained, but require a stable mounting surface and considerable airflow.

After the system is ready for a load, an automatic transfer panel *first* (emphasis added and needed) disconnects the station from the incoming power lines. Then, the load is switched to the generator. Some transfer panels use two large circuit breakers for this function. The second method, preferred by many, consists of large switches with the current protection provided by separate breakers. When power returns on the mains, the system should be set to ignore it until such time as it has proved to be stable. All of us have observed the condition, especially during storms, when the power returns for a few seconds only to kick back off again. These momentary problems can be ignored if the standby system is on-line and running. The conventional method is to set the equipment to ignore a return of service for several minutes up to half an hour. This gives some assurance that the power is reliable, as well as giving the standby system some exercise.

The reverse procedure is used to return to the main power lines. Commercial transfer panels will not allow the generator to be on-line at the same time as primary power. The alternative is cogeneration where the on-site system shares the load with the utility company, but that requires a much more sophisticated system; something that doesn't offer any advantage to most broadcasters. Following the switch back to the primary power, the system should be set to allow the generator to run for a period of time to cool down. Although most generator sets never return to idle speed, removing the load while keeping the system running cools down the alternator and the engine.

Design considerations

Now to the interesting problems. Standby power plant design always starts with determining the generator size and then selecting a fuel. Most systems are sized to power everything on the site needed for normal operation. It usually isn't necessary to include full power on the standby transmitter for obvious reasons. You can wait to work on it until regular power returns. It is necessary to include terminal equipment, building and tower lighting and the heating and air-conditioning systems.

Once the loads have been determined, it is highly advisable to contact a qualified dealer in the area. They will be knowledgeable regarding the local regulations governing such systems. Regulations, especially those concerning fuel storage, vary widely around the country. At the same time, contact your insurance carrier to check on their requirements. The front office might get a little testy in the event of a loss if it finds out that the new standby power plant voided the insurance policy.

There is no single fuel choice that stands out above all others. Gasoline is readily available and will keep for long periods without going bad. However, it has a big negative due to its volatility. Any boater can tell horror stories about gasoline fumes in confined spaces, usually involving boats going from a marine environment to fully airborne in a few milliseconds. Still, properly controlled, stored and isolated, gasoline is usable. Propane or LPG has been selected by many stations although it is a little more difficult to service. It does have the advantage of being easily storable for long periods. Finally, there is our old friend diesel fuel. You won't be buying a lot of fuel so the cost of the highest-quality product shouldn't be a major factor. However, there are stubborn bacteria that love diesel fuel. These critters must be controlled with additives or they will plug up fuel filters in minutes. A station cannot simply buy a tank of diesel fuel and ignore it without having the system fail unexpectedly.

A primary selection point is going to be the local requirements. Again, your local dealer can guide you through these problems, as well as obtaining the necessary permits. A final point — check the system regularly and actually place it on-line occasionally. This is needed for any engine to maintain its health and is only common sense to ensure that the system is ready to come on-line when needed.

Standby power plants add a degree of reliability to a modern transmitting plant. What's more, they are fun to mess with when you get bored at the transmitter site. ■

Don Markley is president of D. L. Markley and Associates, Peoria, IL.

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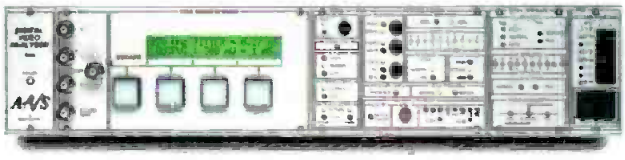

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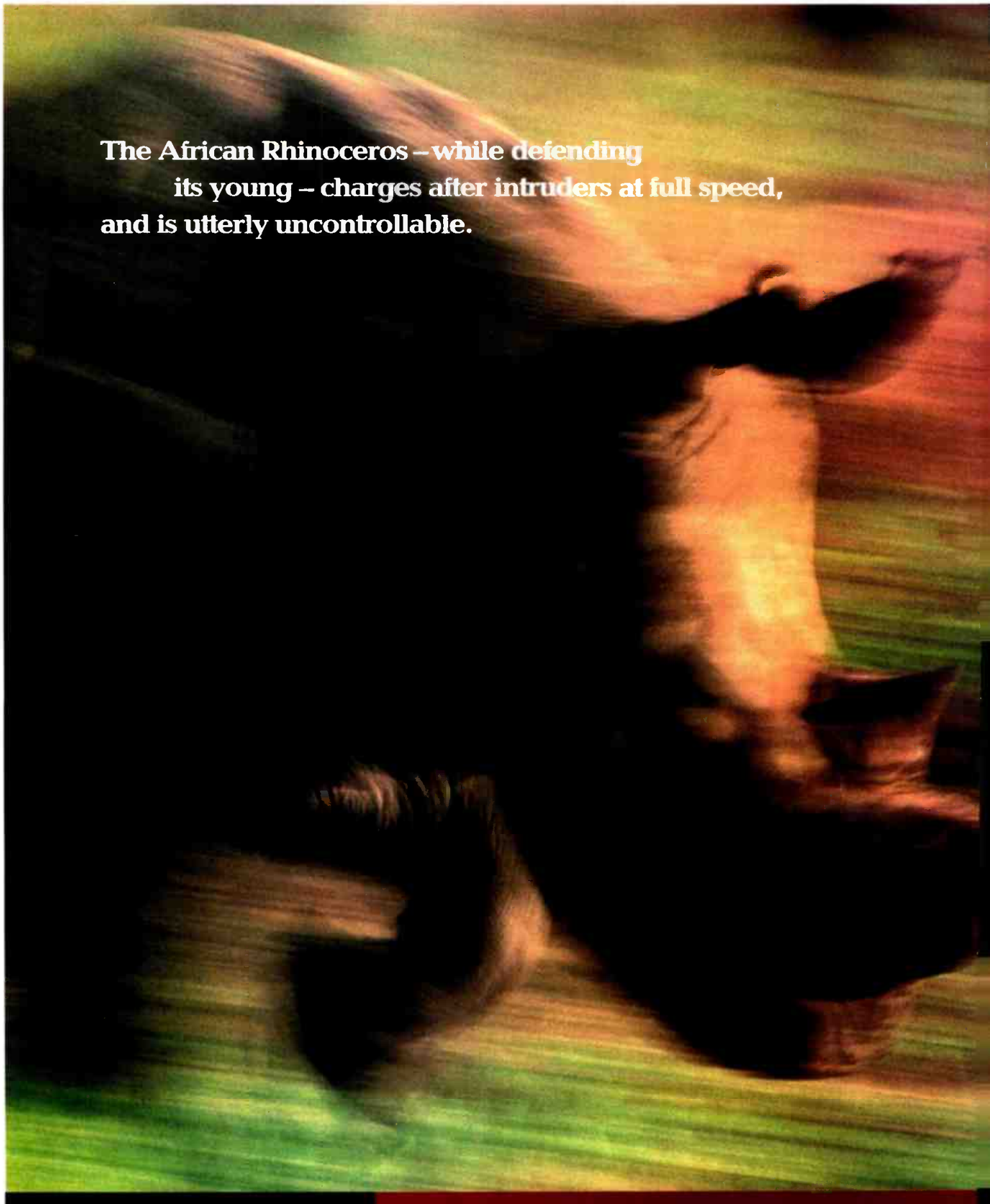

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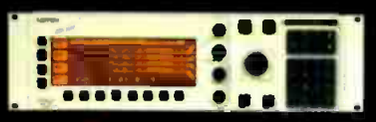

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Java ain't coffee

BY BRAD DICK, EDITOR

Unless you've been asleep for the last two years, Java means something other than a cup of coffee. You've probably used Java and maybe didn't even know it.

Java has been the darling of the Internet set for more than two years. Originally developed from C++, Java is a programming language designed to solve many of the problems common to C++. Developed by Sun Microsystems, Java started out as a part of a larger project to develop advanced software for consumer electronics. Today, we're seeing only the beginning of what could make Java as common as Windows.

One relatively new development has been the use of Java professional applications. The post and production communities were wowed last year by Quantel's announcement that it would support Java. It was that support that placed an industry stamp of approval on Java for professional applications. Since that time, other companies have jumped aboard the Java train. As of this writing, just before NAB, Newsmaker Systems and Sony announced support for Java in various products. Chyron is currently developing a range of applications that rely on Java. Other companies providing professional graphics and control systems are expected to announce Java products at this year's NAB show.

Why use Java?

So why the sudden interest in a new computer language for production and broadcast equipment? In short, third-party support. Hundreds of thousands of Java applications and solutions are being developed and manufacturers realize that being able to use those resources can be a marketing advantage. Such compatibility allows a vendor to add value without significant extra product development cost.

That doesn't mean there are thousands of Java programmers working on new graphics or new applications, rather it means that putting a graphic on the screen, rotating it or making an object jump through a hoop on the screen can be programmed in Java and easily ported to almost any platform, computer or device. The objects (we'll cover them later) don't care what kind of computer, phone, television, paint or editing system they run on. They work on any Java-compatible platform, which can now be just about anything.

This also means that if you want the specific look and feel of one manufacturer's product (for example a CG) on your paint system (or other product), you can have it.

JAVA is designed to be neutral and portable. This means that its applications can be distributed and easily used over work environments.

Object-oriented code

Java is an object-oriented language. Just what the heck are "objects" when it comes to programming? Objects represent other things — tasks or rules/steps. Programmers consider them collections of analysis, designs and programming methodologies that focus design on modeling the characteristics or behavior of real-world systems. In other words, objects are programming models.

For instance, your word processor has a toolbar with buttons that cause certain things to happen. Click on the *file* button and a window opens and a set of options is displayed. Click on the *format* button and a window opens with a different set of options. Each button describes a behavior or set of things that need to happen. It shouldn't matter whether you're working on a MAC or UNIX system, clicking on the file button could cause the same set of things to happen. That's how objects work. Given enough objects, you could model just about anything.

Java is designed to be neutral and portable. This means that its applications can be distributed and easily used over work environments. For instance, in a TV station, this could include a networked Avid newsroom editing system, a Chyron CG and Quantel Hal, all interconnected to a Louth automation system and a Columbine traffic system. (This is an example only and does not indicate that these particular products support Java.) Networked systems can share the Java applications without regard to the type of computer the actual application (program) eventually ends up on.

Architecture neutral

Because Java was designed from the beginning to be used on networks, it is architecture neutral. Networks are composed of a variety of systems, often using a variety of CPU and operating systems. Java applications can be executed anywhere on the network because the compiler generates an architecture-neutral object file format. The complied code is executable on a variety of processors, as long as they have a Java run-time system. This means it doesn't care what computer you're using. The same Java applet could work on a remote control, a set-top box or an SGI Onyx, all equally well.

And it's free

If you're into programming, the best part is still to come. Java is free. (Hear

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that Microsoft!) For a copy of HotJava check out the Sun Microsystems Java web site at www.javasoft.com/docs/index.html. The site contains all you need to get started programming with Java.

Even if you never write a line of code, Java will soon become as common and familiar as that Windows 95 screen. Or, for DOS types, the comforting "C:\" prompt. Java's icon "Duke" could become as familiar as Windows, and best of all might even make your life a bit less complex.

Brewing up Java

Ever wonder where Java really began and how the name came into being? Well, in case you did, here's the answer.

In 1990, one of Sun Microsystems engineer's Patrick Naughton became so frustrated with his company's need to support the hundreds of combinations of software application-specific interfaces (APIs) used within the company, he decided it was time to quit and move to NeXT. In fact, he told Sun CEO and personal friend Scott McNealy of these plans. While Naughton thought nothing of his decision to quit, McNealy decided that Patrick was too good to loose. Before he made the final decision to change employers, McNealy ask Naughton to create a list of complaints and corresponding set of solutions. In addition, he wanted to know how Naughton would go about solving those problems "if [he] were God."

With little to lose and a personal invite to get some things off his chest, Naughton created a long list of suggestions. Foremost among his suggestions was that Sun should scrap its development of its proprietary NeWS software architecture.

Armed with Naughton's complaints and suggestions, McNealy routed the information to other software engineers. Their responses were forwarded to Naughton. Much to his surprise, many of his own concerns were shared by other software engineers.

On the day Naughton was to leave for NeXT, McNealy made him a unique counter offer. If he would stay, the company would form a team of top software developers, but more importantly, they would be free to do whatever they wanted. All they had to do was develop something "cool."

Green team

A team of six engineers code named "Green" was created. The team worked in self-imposed exile. Armed with a refrigerator full of Cokes and Dove bars, the team embarked on a plan to build a better software platform. They began by disassembling and examining products ranging from Nintendos to set-top boxes and even TV remote controls. The focus behind this seemingly unsoftware-like task was to look for ways these and other electronic appliances could talk to each other in a common language.

As any hardware engineer could have told them, the diversity of consumer products was supported by a far-ranging set of CPUs and custom software. About the only thing in common between these devices was their incompatibility. The team quickly realized that the addition of new features and functions to most devices was impossible without having to replace the CPU and its hardwired programming. Also, it was clear that the CPUs used in these devices had a limited amount of memory available. The Green team quickly recognized that this was an important design bottleneck. However, because they had no control over the actual design of the CPUs and, therefore, the amount of on-board RAM, they needed to find a way to cram more code into the same space. What they needed was a new language.

First effort — Oak

The team's first attempt was an object-oriented computer language called Oak. Loosely based on C++, it was actually named for a tree outside one of the team member's office window. Oak was initially a subset of C++ with many features removed.

Now that they had an efficient software language, they could build a product. The team's first actual product was a hand-held, remote-control device called *7 (Star Seven). Using a visual interface, it featured an animated character Duke. Duke was the visual icon used to guide users through the device's graphical interface. Duke later became Java's mascot.

With the software in place, the team was turned into a wholly owned company called First Person. Development began on products for what at the time was a hot topic — interactive television. Two projects were announced: a set-top box interface for Time-Warner and a graphical interface for 3DO. Both products failed for different reasons. Fortunately, an even more exciting development was surfacing.

Web is born

In 1993 the National Center for Supercomputing Applications announced that Mosaic and the World Wide Web were born. By early 1994, the First Person team recognized an opportunity here and began focusing on a software system for on-line multimedia. The next step was to position Oak as a "language-based operating system. It was Naughton who suggested giving the software source code away on the Internet. Thus Oak moved from being an internal development tool for other products to an actual product itself. Software engineer Arthur van Hoff wrote an Oak compiler entirely in Oak instead of C. The first Oak-ready browser was called WebRunner. The first applet used with the browser WebRunner over the Internet showed the icon Duke waving back to its developers.

Sun backed the decision to give the language away, but only after it was renamed Java. Once the software became freely available, it was quickly adopted by the Internet community. Netscape was among the first to support Java. The success of Java is becoming legendary. Now, with literally millions of Java-enabled browsers out there, Team One and their mascot Duke need never look back. ■

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Acknowledgment: Thanks to Bob Pank, technical communications manager, Quantel for his help in preparing this article.

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Photo: Control room for FoxNet and Primetime 24 satellite system. This room runs two channels.

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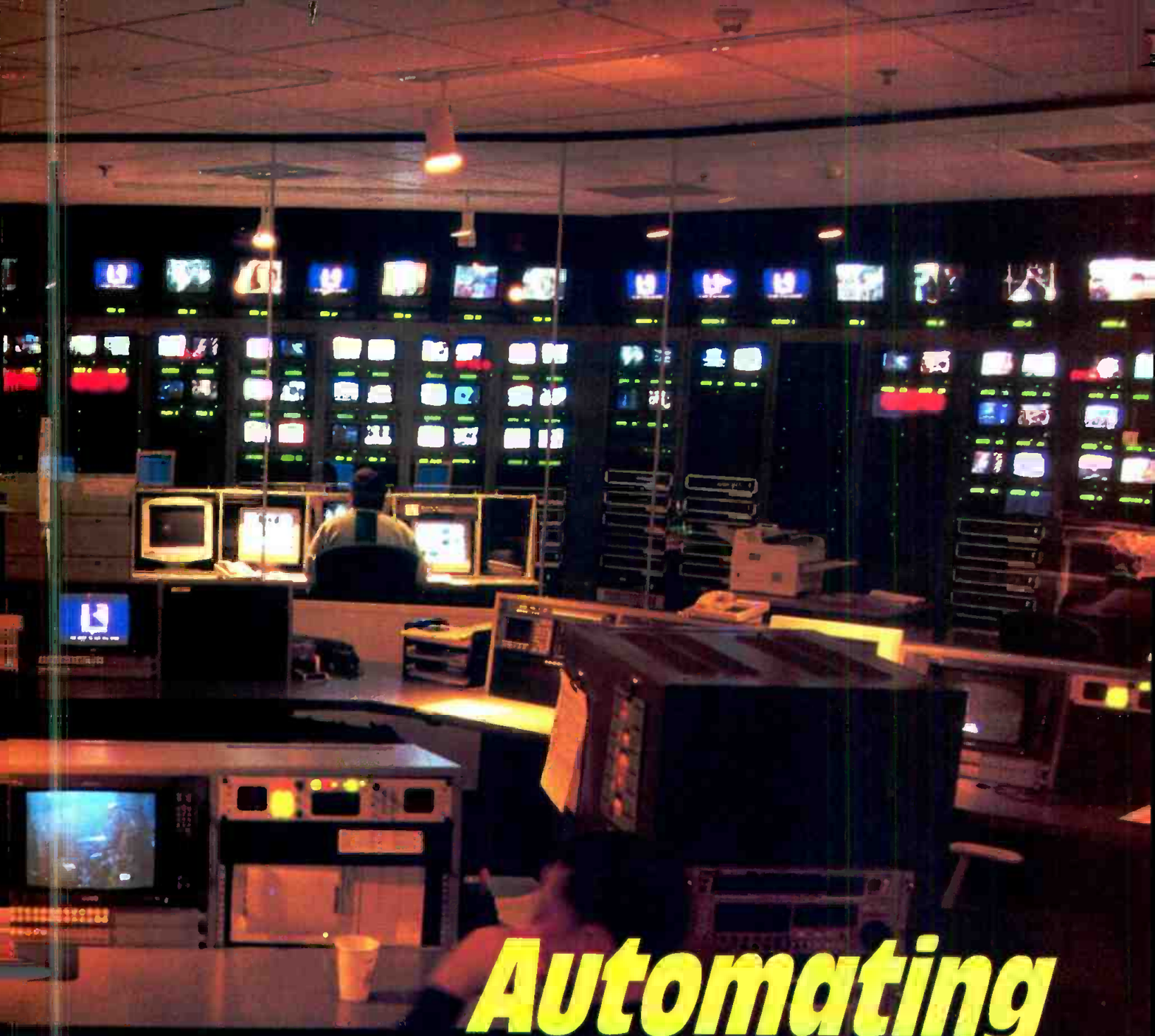

Automating master control for MULTICHANNEL

Robust, modular systems provide the keys for the future: flexibility and extensibility.

BY PETER DOUGLAS

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Control room for Encore, Starz-1, -2 and -3 premium movie services. This room runs four channels, as well as some West Coast feeds.

Automation systems have been around for quite a few years and are common in call-letter stations. The National Digital Television Center (NDTC) is the headquarter's facility for TCI's cable operations. Because of this, our needs are complex, requiring a robust master control automation system.

Up-front considerations

Our principal business is master control playback for a variety of clients, including Encore, Animal Planet, Ovation, FoxNet and Odyssey. Currently, more than 60 channels originate at TCI's NDTC in Englewood, CO. At present, there is really no limitation on the number of channels possible. The system is extensible, based on client needs.

The NDTC is literally a one-stop shop. In addition to master control playback, facilities include production, post-production and digital compression. These include four fully equipped digital studios, with insert stages for production of commercials, movie intros, promos and wraparounds. Uplinking services are available, using either the client's transponder or our own, and facilities exist for uplinking and monitoring TCI's Head-end In The Sky (HITS) service. Although the NDTC is not a direct broadcast satellite service, uplinking and downlinking for the Primestar DBS service is provided.

The original headquarter's facility concept was developed about six or seven years ago, with the understanding that master control operations would have to be automated. A major consideration was staffing. Enough people must be on-board to be effective, but it's too expensive to staff a manual, 24-hour, seven-day-per-week operation. With automation, each operator can accomplish a lot more, running feeds and master control, as well as other tasks, all at the same time.

However, the multichannel facility being planned presented additional challenges. For example, the desire was for each of the master control rooms to be able to run five to 10 channels, depending on programming types. At that time, a big consideration was the need to run pay-per-view (PPV) movies from tape. Because PPV doesn't require commercial spots, only interstitial material, it was felt that one operator could effectively run 10 channels. With more commercial-intensive channels, the number of channels per operator is limited to about five. Currently, a dozen

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master control rooms are used. One room even has two automation systems in it running side-by-side.

Among the other challenges needing to be addressed was the sheer number of switchers and VTRs to be controlled. This required extremely robust software to accommodate the number of operators working on the system at any given time, as well as managing the large number of events taking place.

A variety of technical considerations need to be weighed when selecting an automation ystem, some of which will be discussed later. First, let's consider the matter of your on-air look, something that concerns every TV programming distributor. Frame-accuracy is critical, and just about any automation system these days can provide that. Beyond that, versatility is important. For example, automating control of our master control switchers allows us to control chaining and voice-over functions, as well as fades and other transitions that were once done manually. In many of our multichannel rooms where the router is used as the primary switcher, GPI controls are used to handle things like logos coming in and out or serial control of voice-overs are tied with GPIs to do audio ducking and audio overs.

Automation can greatly enhance your on-air look. And, as we all know, a sharp on-air look can have a positive effect on revenues.

Video servers and automation

Video servers have already had a big impact on our operation and promise even more benefits in the future. Currently, our commercial insertion systems are being migrated to file server systems across the board. Most of the 60-plus channels delivered by the facility are commercial-intensive, making it fairly obvious how important servers — and automation control of them — can be. Servers make life a lot easier, primarily by allowing spots to be changed quickly. We are now so committed to servers that there is no longer a single cart machine operating in the facility.

In the near future, servers will be used for other functions such as archiving. Our goal is to move spots around and get them into an on-line storage area faster. In addition, reducing required operator input will give them more time to deal with other items. At present, each operator in each room needs to input data. In the future, using fiber channel, spot storage will be centralized, then distributed to individual rooms.

Eventually, file servers will be used for net delay. We run a lot of West Coast feeds for multiple movie channels, and servers are used for handling the three-hour delays for each of those. At present, more than 30 servers, including mains and backups, are used. Tape-based feeds go to a server and three hours later out comes the West Coast feed. Servers can also be used for quick turnaround feeds.

Because servers are now such a vital part of our operations, the automation system must be able to effectively interface to the servers. For automated multichannel systems, the importance of an effective server interface cannot be overemphasized.

The move to servers has necessitated the use of compression technology. All the commercial insertion done on our file servers is Motion-JPEG-based. Movies for PPV are compressed using MPEG-2. In the future, a lot of spot playback will also be MPEG-2, because more data can be stored in less space and the data can be moved around a lot faster. Compression technology is also used for uplinking, for the same technical and economic reasons.

Selecting an automation system

With more than six years of experience using automation to run our master control operations, a lot has been learned. For anyone planning a multichannel cable or DBS delivery system, several key points need to be considered. Of course, these points are basic and need to be applied in the context of your system configuration, but every attribute is important.

Master control room for request pay-per-view movies. This room runs five channels, sending feeds in both C-band and Ku-band for uplinking.

• *Scaleability and upgrade potential.* Whether you start out large or small, almost any multichannel facility plans to expand in the future. It should be easy to add channels without having to modify or replace the basic automation system. Ask your potential suppliers what the real upper limit is on how many channels they can support, as well as how many devices they can control. The same principal applies to software upgrades. Every supplier is constantly tinkering with its software in response to customer inputs. Make sure you can install upgrades easily without disrupting the basic system.

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Automating master control for multichannel

• *Modularity and reliability.* A modular or building-block approach to software organization certainly plays a role in your ability to expand and upgrade the system, but it's also important for another reason — reliability. Multichannel automation is necessarily complex, but you don't want a problem in one part of the software to pull down the entire system.

• *Application-specific operational software.* In a way, this is another aspect of modularity. A basic automation system will handle such tasks as router switching and machine control, but depending on your configuration and growth, items such as automated database management, satellite resource management, time shift delay and breakaway channel capability for varying regional content may be needed. These functions should be in separate software modules so they can be added if and when needed.

• *Real-time operation.* Although this almost falls into the "obvious" category, there's a corollary here between automation and almost any other kind of computer processing: No sooner do we get used to one speed of operation than we begin to expect more. Real time may mean seconds to some people and microseconds to others. Hard-pressed operators will soon let you know if your system is holding them back, so find out in advance how fast the system really is.

• *Multiple users.* Systems must be able to support multiple users, as well as multiple channels. There's often too much work for one master control operator to handle, requiring others to attend to routine tasks such as data entry, dubbing, remote viewing and editing lists. Two, three or even more users need to be able to access the same system and do different things at the same time. Password protection is important, because it will allow you to restrict the ability to make changes to only certain authorized users.

Handling multiple users and multiple tasks is largely a function of the operating system software. There are several operating systems currently used with automation products and some are distinctly superior to others.

The move to servers has necessitated the use of compression technology.

• *Machine interfaces.* As you review various automation systems, determine how well they truly interface with a wide variety of broadcast devices, including routing and production switchers, VTRs, servers, cart machines and even still-stores and character generators. This is important whether you are automating an existing facility or designing a new one. In the former case, you'll want to avoid expensive re-equipping dictated by limitations of the automation system; in the latter case, you don't want to be constrained as to what you design into your system, either now or in the future.

• *Dynamic resource allocation.* This term describes the ability to treat all broadcast resources such as digital video servers, VTRs and other machines as a common pool of devices that can be automatically assigned by the automation system to any channel, greatly simplifying the operator's job. In our operation there are rooms with 40 to 50 machines tied to a router and any machine can be assigned to any channel.

• *Automatic conflict resolution.* In busy operations, conflicting requests for the same commercial or other material are possible when a playlist is being created, loaded, edited or during a traffic system download. When that happens, the automation system should alert the operator immediately and/or automatically resolve the conflict. A method of precluding conflicts is to assign unique user bits to each program, commercial or promo. This works quite well in our operation.

• *Interfaces to third-party software.* This is definitely a big consideration now and in the future, so the more dynamic you can be, the better. The principal concern

Eight-channel control room for Your Choice TV. Note servers in left background.

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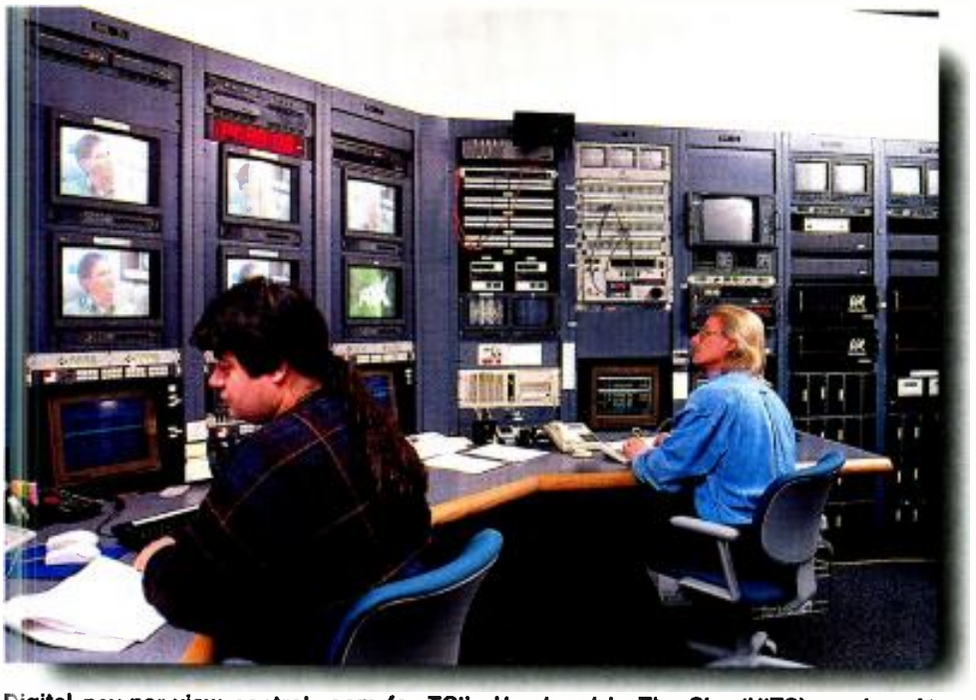

Digital pay-per-view control room for TCI's Head-end In The Sky (HITS) service. At present, the room runs 27 channels, but is capable of handling 36 channels.

is how the automation system interfaces to the traffic system, preferably through a network. The automation system should be able to convert data from a traffic schedule to an automation system playlist, then provide traffic with an as-run log for billing purposes. Ideally, this is done seamlessly with no operator intervention or physical transfer of disk files. This allows you to accommodate last-minute changes to the on-air log, based on client requests. Most automation systems will now interface to the most popular traffic systems, but new traffic systems appear from time to time, so look into this aspect thoroughly.

• *Database management.* Keeping track of all the programs, commercials, promos, IDs and other material in your library is a huge task, especially since the inventory is constantly changing. In our system, this function is done on dedicated computers installed in each master control room. The database management system should also keep track of how many times each tape segment has been played so that a new dub can be made before the old one wears out. Our system also keeps track of the hours of operation on each tape machine so we can schedule maintenance accordingly.

In the future, I would like to see automation systems keep track of databases in a more transparent fashion. For example, if a master control room needs a spot or promo that doesn't happen to be in on-line storage in the room, the system would be smart enough to search for it on a content server. If it's not there, the system would send an archival storage unit to find the spot and load it onto a server, where it would be fiber-channeled back to master control.

• *Error monitoring.* Operators can use all of the help they can get in early detection of glitches. Our system software monitors the main and backup automation computers constantly so corrective action can be taken if it is necessary.

• *Maintenance alerts.* As mentioned, the automation system's database management function tracks tape usage and machine hours. We can even program the points at which we want the system to alert us. In the future, more dynamic utilities, such as automatic paging, are possible. In a large facility with a limited number of technicians, that could be helpful.

• *Remote diagnostics and worldwide manufacturer support.* No automation system should be without this feature. For instance, it's the middle of a holiday weekend and your master control operator runs up against a problem with the automation system. It's reassuring to know they can dial up the manufacturer and get a call back within minutes by a qualified technician or software engineer. The manufacturer's technician should also be able to dial into your system's diagnostic files, analyze the problem quickly and send a fix by modem, all while you're still on the air. You can't afford anything less.

Master control automation is much too important within a multichannel environment to make a snap decision when choosing a system. It's a long-term investment with a lot of ramifications. Take your time to analyze each manufacturer's product, then do what you'd normally do when looking at any product — talk to other users. Although no automation system is perfect, and it may not yet have all the features you'd like, if it's easily upgradable and flexible you'll be able to make the best choice for your needs. ■

Master control automation is much too important within a multichannel environment to make a snap decision when choosing a system.

Peter Douglas is senior vice president, operations & engineering at the National Digital Television Center, Englewood, CO.

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Planning, controlling and automating multichannel digital broadcasting

With all of the possibilities, maintaining control will be a challenge.

By Michael Ledwich, BSc. BE. Ph.D.

The move to DTV has presented TV stations with an almost staggering array of new broadcasting possibilities. What started as a proposal to broadcast in HDTV has branched into proposals for dividing the digital bandwidth into multiple channels, and even proposals for variable channel configurations. Add to this an array of possible ancillary services such as electronic program guides, selectable audio tracks and subtitles, as well as conditional access programming, and it becomes clear that previous broadcasting paradigms no longer apply.

Whichever route a broadcaster chooses, the move to digital television will create a new set of operational challenges that must be addressed. First, there are a variety of new viewer information services that can be supported. Second, the implicit bandwidth flexibility provides opportunities and headaches for planning and delivery. Third, there are more participating modules from multiple vendors to be synchronized in the transmission room. The fundamental questions that must be addressed involve advance planning of the digital broadcast and control and coordination of all processes and devices involved. New systems will require a higher degree of integration and will include more robust traffic system interfaces and multichannel master control automation that are linked through a central transmission database. Only by centralizing control, will stations be able to coordinate all of the equipment in the subsystems of a digital facility and be able to efficiently manage a more complex operation with minimal staff.

A new work flow for digital delivery

To broadcast DTV, a great deal of equipment and control software will need to be coordinated. Increasing the number of channels increases the complexity in itself, but also consider that the channel lineup may vary during the course of the broadcast day and any number of ancillary services may be added to the standard programming. Looking at the digital workflow outlined in Figure 1, it is easy to see the changes that will be required

Photo: The MSNBC control room shown at right is capable of handling 86 simultaneous remotes, 54 satellite receivers, all feeding 24 VTRs and multiple output channels all at once. Although local stations won't need that large of a capability, they will need to be able to source and control six or more channels during non-HDTV broadcast time. This will require the use of sophisticated automation software.

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to move from conventional broadcasting to digital broadcasting.

A major difference between traditional analog broadcasting and what we will face in digital broadcasting is the need to plan the transmission. Planning broadcasts in advance has always been important, but in the analog world stations could always shuffle material at the last minute. That sort of flexibility with digital will still be available, but it will require a coordinated control system to change all of the related digital parameters on all the channels being broadcast for example — bit rate, system information (SI), electronic program guides, conditional access and subtitles.

With digital broadcasting, stations will have 6MHz and 19.4Mb/s of bandwidth that can be allocated as required. Stations may decide to broadcast three or four channels at all times or they might, on occasion, combine the bandwidth of two or three channels to broadcast HDTV. There are a number of possibilities, but in all cases, the bitstream allocation will have to be carefully planned to assure that all channels have sufficient bandwidth to deliver the proper quality. The planning of the quality and the other related digital parameters should occur with the choice of the material many months in advance.

The first step when putting together a DTV broadcast is to plan the number of channels, the periods during the week that they will operate and the general services that will be provided for each of those channels. Service levels include the resolution, the bit rate

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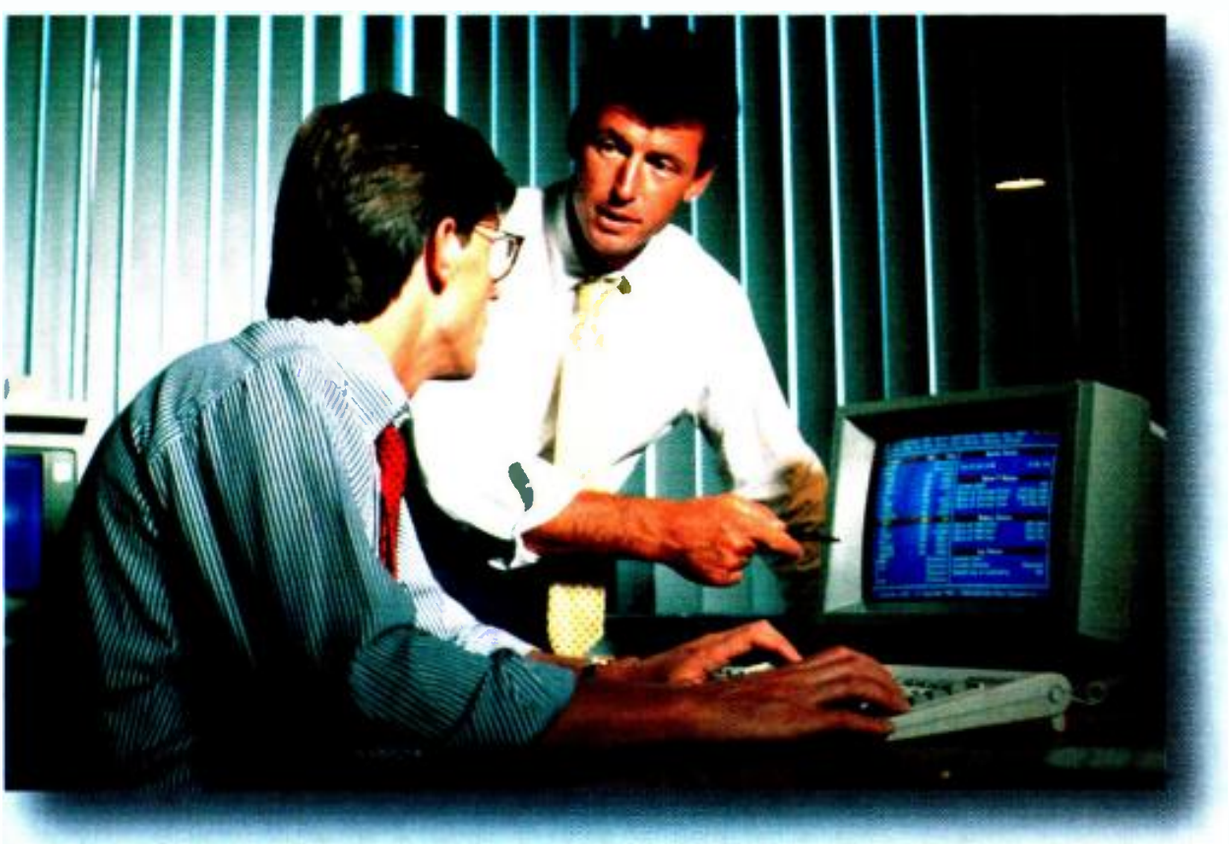
Engineering the computer-based facility



Providing support for computer-based operations requires a new set of skills.

By Skip Pizzi

Unless you've been enjoying an extended sabbatical on another planet, you've probably noticed that broadcasting has become a computer-based enterprise. Increasingly, elements of production and program assembly are created on computer platforms, as the administrative and control elements of broadcast operations have been for some time. Computer networks are now tying these diverse elements into a cohesive whole, and it won't be long before the bulk of a broadcast facility's entire operation will take place within a single, large computer system.

With such a marked transformation in the tools used to produce TV programming, it stands to reason that the nature of technical support required by broadcast facilities is also changing.

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Much of today's — and most of tomorrow's — broadcast engineering skills will be centered on designing, installing and maintaining computer-based systems.

The computer engineer

Most businesses employ or contract technicians who are specifically skilled in computer maintenance. Many large broadcast companies already have an Information Services (IS) director and/or department, whose duties are largely concerned with administrative operations.

As the reliance on computers grows into the actual production side of the broadcast facility, the need for application-specific computer maintenance raises its head. This is where the hybrid "broadcast engineer of the future" has a key role to play. Yet at this early stage, it is not clear just what the skill set of this person should be or how duties should be divided among a broadcast facility's technical staff.

Clearly, there are some common areas between broadcast computing and general computing for which a skilled IS person can provide great service. "Bits is bits" as the saying goes. But in other more specialized computer-based areas of broadcast operations, general IS staff is not well-equipped to help. It is in these crossover zones where it is often easier and more successful to have the traditional broadcast engineer learn about computer-based systems rather than the opposite development path.

Just how the nexus between IS and broadcast engineering takes shape will vary with each facility and its staff, but there is no doubt that general and broadcast-specific computer engineering resources will be required.

IS vs. RF

Another key element of traditional broadcast engineering that will continue to require technical expertise is maintaining the operation's RF side. Naturally, the RF engineer who also has solid computer maintenance skills will be a critical asset on any broadcaster's staff. But the RF environment is also undergoing radical change with the conversion to ATV, so the learning curve is doubly steep for broadcast engineers who want to stay current and viable in these areas.

This gives new meaning to the term "continuing education." Although it's often a difficult sell, smart managers will invest in their best technical staff and allow (or encourage) them to improve their skills through organized training. Broadcasters should take advantage of every opportunity to hone new technologies. This includes short courses at colleges and universities, as well as sessions presented by trade groups and journals or manufacturers. Engineers should bring such opportunities to their management's attention. Management should appropriate funds to this effort and expend them appropriately.

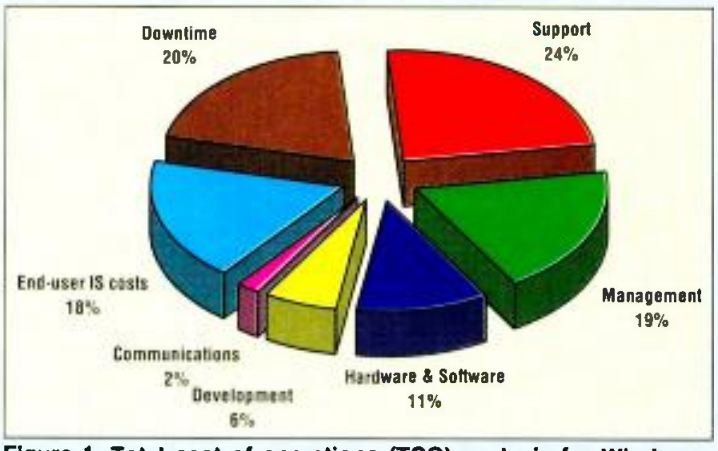

Figure 1. Total cost of operations (TCO) analysis for Windows-based systems, as reported in a recent study. Cross-hatched sections are indirect costs, while solid sections are direct costs. (Source: Interpose, Inc., and Microsoft Corporation.)

Broadcast engineers also bear some responsibility to manage their own ongoing learning in these areas. As "digital immigrants," today's engineers will be largely self-taught on many new technologies. The key to success in this area lies in not being overwhelmed by the volume and pace of new information, but rather in taking a measured approach. Every new item learned makes an engineer more valuable and learning never ends. Also important to the broadcast engineer is keeping the proper balance between development of improved computer and RF understanding. Television will remain a business equally concerned with production and delivery.

Software vs. hardware

Perhaps the toughest transition for the broadcast engineer to manage is the shift from hardware to software or from "real" to "virtual" domains. Of course, the computer environment is one where both elements apply. Familiarity with hardware-based operations is one skill that can allow broadcast engineers to excel beyond many IS staff members. The computer tech's world is often so laden with layers of code that the physical layer is not given adequate attention. The experienced broadcast engineer will recognize the operation's need for reliability and stressing this can help strengthen the facility's computer systems.

This issue can also become a point of contention between IS and broadcast engineers or between technical and financial parties, so managers may be called upon to make difficult decisions on how much computer hardware reliability is enough.

Beyond this, however, broadcast engineers must become familiar with the process of managing the virtual environment. This includes elements of system design, such as making sure that platform and network performances are adequate for the applications intended and that workstations are ergonomically, yet robustly constructed. It also involves creating routine maintenance schedules for computer hardware and software. These are tough judgment calls for which little or no tradition or resource base exists.

Perhaps most important, the broadcast/computer engineer's work involves maintaining the facility's software — a process that can easily become a full-time job. This includes installing new software and upgrades

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Engineering the computer-based facility

(and the subsequent debugging that is often necessary), plus establishing and upkeeping a software inventory for the facility. The latter can be an extremely tedious exercise, but it is a critically important new duty. Only by scrupulously tracking the various versions of software installed throughout a facility can a computer-based operation run smoothly. Simple exchange of files between users via LAN can become a nightmare without such care.

Of course, computer hardware upgrades are also part of the job, but these are easier to cope with in that they are physical assets and usually stay in the place and form of their installation by engineers. Software, on the other hand, is subject to all sorts of user intervention, from well-intentioned tweaking to outright vandalism. Aggressive users may also install their own "rogue" software on the facility's platforms, often creating havoc with other applications on the network. A little knowledge is truly a dangerous thing in the computer-based facility.

A final element of concern is virtual security. This refers to preserving proprietary data for competitive reasons, as well as protecting computer-based assets from infection by viruses and other corruption.

> Broadcast engineers must become familiar with the process of managing the virtual environment.

Virtual troubleshooting

All of this takes place in an environment where engineers are still called upon to put out fires at a moment's notice. New acuity in assessing problems on computer-based systems is, therefore, another requisite skill. Is it a hardware or a software bug? Is it on the platform or the network? What's the real maintenance history on this machine (i.e., what undocumented reconfigurations or installations have been made by non-engineers)?

To minimize problems, it's important to establish an in-house policy for staff that prohibits the installation of any software (or at least any that does not appear on an approved list). The allowable level of platform reconfiguration by users should be specified, as well. It may also be helpful for the troubleshooter to know who used the problematic computer or system last before it failed. Often, a brief interview with this user can provide clues about the source of the problem. Because this is generally not the person who reports the problem, an accurate scheduling program can help the engineer track the previous user down.

This implies that the computer engineer or department may have to play "cop" from time to time. Ideally, however, these problems are better addressed through proper user training and feelings of mutual respect among staff.

The truly computer-savvy facility will use the station's LAN as a reporting mechanism for technical problems. Users can report technical problems via E-mail or open a discrepancy report on the maintenance page of the facility's intranet. The latter will allow users to see if the problem has already been reported and note what repair action has been taken to date. Engineers can report their activity related to the problem on the page, as well as track a device's repair history. The system could also be set up to automatically send E-mail to the user(s) who reported the problem once repair has been completed or to all affected staff. (Of course, the one problem that you can't report on such a system is a complete computer system crash — but engineers probably won't need a discrepancy report to find out about that.)

Multilingual support

Another challenge in some broadcast facilities is the need to support multiple platforms and operating systems. It's not uncommon for administrative and on-air/automation operations to run on Windows-based PCs while non-linear production takes place on Mac-based and/or SGI systems. There may also be some engineering PCs running DOS or even UNIX. Keeping all of these systems running smoothly and interoperating where necessary requires great breadth in the engineering department.

Often, this is best handled by having specialists in each system. Interoperation can be handled by teams. But station management should realize that support costs increase significantly with each new platform or OS introduced to the facility. You'll either have to pay more for a multisystem tech (if you can find/keep one) or you'll need a somewhat larger staff with individual system specialists.

Keeping the number of platforms and OSs to a minimum is recommended. Although a single OS is ideal, this may not be possible at many facilities. A maximum of two (e.g., Windows and Mac or Windows and SGI) may be a more practical goal.

Archival management

The broadcast computer engineer must also maintain the facility's digital archive. The job description is part janitor and part librarian. Keeping the servers from becoming permanent file cabinets is the janitorial part. This includes frequent attempts to have users clear out old files or move them to off-line storage. It is the bane of any IS department's existence and no less so in broadcasting, where uncompressed media files are typically quite large and numerous saved versions of each file are likely to have accumulated on servers.

On the other hand, the archive must also be useful in terms of its search capabilities. If the facility has no dedicated research staff, engineering may be called upon to install and maintain the system's search engine. If there are dedicated researchers on hand, engineers will need to work closely with

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them to develop and expand the search software. In either case, engineering will be responsible for keeping close watch on the removable media and drives used for off-line storage.

A related responsibility is establishing the computer system's backup policy. This includes determining which files will be backed up, the frequency of backup (hourly, daily, weekly, etc.), what media will be used and the recycling schedule of this media.

A team effort

Successful broadcast computer systems require cooperation between specialists in numerous disciplines. Involvement of an experienced broadcast computing specialist is critical at every stage of the process, from initial design through procurement and installation, and then to design and execution of the system's maintenance, support and upgrade operations.

One of the broadcast specialist's most important responsibilities is to emphasize the mission-critical nature of any production and on-air components of the facility's computer system and the extremely stressful conditions and high duty cycles under which these systems operate. Platforms in these areas should be of industrial design, not off-the-shelf desktop systems. Servers should be particularly robust and implemented with adequate redundancy and hot-swappable drive capability (e.g., RAID 3 or higher).

Other points worth stressing during the design phase is scalability and a smart migration path for future development, along with plenty of storage for large media files (including redundancy).

Total cost of operation (TCO)

One of the hottest topics in the computer industry today is TCO. It is defined as the amount that a company will spend on a computer system across its useful lifetime. The usual metric is based on a single desktop PC, for which one recent report indicates that the average company spends in the neighborhood of $7,250 per year.

Figure 1 shows how this cost is broken down. The initial purchase price of hardware and software only accounts for 11% of TCO. Not surprisingly, the single biggest item (at 24% of TCO) was spent on support. Combined with system management (at 19% of TCO), this shows that nearly half of a company's computer costs — or more than four times its hardware/software expenses — go to the personnel, either inside or outside the firm, who keep the computer system running.

The report tributes 20% of TCO to the indirect cost of lost productivity from system downtime. Nearly the same amount (18%) is ascribed to another indirect expense called end-user IS costs or "user downtime." This refers to situations in which the system is up, but users can't do their jobs due to lack of training or understanding of the computer system's proper operation. So, they spend time unproductively by "futzing" with their PCs. In some cases, this is the fault of poor user-interface design or steep learning curves, while in others it stems from insufficient support — either from the software vendor or the computer owner's IS department (notwithstanding the steep costs paid for such support).

A conclusion of this analysis for general administrative operations is that computer systems are expensive to operate and that unless there is some substantial improvement in performance, a business would likely be better off with typewriters and adding machines. Of course, most businesses believe that this improvement comes in the form of greater productivity, quality and creativity that computer-based operations allow and encourage.

But for broadcast operations, the comparative analysis differs. The computer systems used for production and program-stream assembly are often substantially less expensive than equivalent traditional equipment, so broadcasters are in a positive position from the start. As long as support costs are not substantially greater than those expended for traditional equipment, broadcasters come out ahead. Productivity is increased and costs are reduced in the bargain.

What this rosy conclusion doesn't address is the interim process of conversion between traditional and computer-based operations. This can be a rocky and expensive proposition, involving the acquisition of much new equipment and probably also new support personnel. These ostensible start-up costs are not just one-time issues. Moore's Law (i.e., computer performance doubles every 18 months at the same price point) practically mandates that hardware will need to be replaced frequently.

> Unfortunately, Moore's Law does not apply to support personnel.

Unfortunately, Moore's Law does not apply to support personnel. If anything, the same support levels cost more rather than less over time. Good computer support staff are highly prized and hanging on to your best people can get expensive. The more they know, the more valuable they become — to you and to everyone else looking for competent support staff. Like almost everything else in broadcasting, human resources are the most pivotal elements in any operation's success and you get what you pay for.

The computer-based broadcast facility cannot function without proper support. Its most appropriate provider is the broadcast computer specialist, an emerging job title that combines elements of IS and broadcast engineering. Becoming such an asset will virtually guarantee job security for broadcast technologists well into the future. Having such quality staff on board will assure broadcast owners that their substantial capital investments in future facilities are well-protected and operating at peak performance. ■

Skip Pizzi is editor in chief of BE Radio, Broadcast Engineering's *sister publication.*

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Tower augmentation

Some relief for the industry.

By Henry J. McGinnis, P.E.

The base portion of a small 18-inch face tower on which the augmentation process has been completed. The new larger augmented foundation is an indication of the load this tower is now prepared to carry. Also shown is the coaxial cable mounting members extending outward from the tower face. (See Figure 2.)

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The rush is on! Broadcast tower owners are now becoming concerned about the location of their DTV antennae. Although the engineering and fabrication requirements will represent an awesome expenditure of manpower to meet the expected demands, these requirements can be accommodated. The question of manpower required to build these structures has also been a source of concern within the industry for quite some time.

Landmark Tower Corporation has found a way to relieve the demand on labor to a considerable extent. Relief is by way of a more efficient and less labor and time-consuming patented process of in-place tower enhancement.

There is a consensus in the industry that a shortage of experienced manpower may exacerbate safety problems. Several years ago, Landmark was called upon to construct in Cincinnati a self-supporting tower that was 954 feet in height. Because of the short time line, at one point there were 85 tower climbers working on the project. It was soon learned that many men working together on a project can be a potential hazard because of the lack of experience of working together as a team. Because of these kinds of problems, new solutions must be developed to help the broadcasters meet their DTV schedules.

The need for new towers

Landmark Tower Corporation has developed a patent-pending solution that should greatly relieve many tower construction problems. This solution grows out of a similar need in the wireless industry.

The problems associated with the wireless industry are similar to those beginning to manifest themselves in the broadcasting industry. The proliferation of cellular and personal communications systems (PCS) industries has nearly brought about a revolution within some cities, causing many of them to declare a moratorium on the construction of new towers.

Although the demand for tower space has never been greater, unfortunately, most existing towers are already overloaded.

A case study

There is an axiom in the tower business that towers attract antennae. One of our towers was located in a popular location and quickly reached the point of overloading. The potential for continued loading was still growing and something innovative needed to be done to bring the tower into compliance with the EIA code requirements.

At first, the task seemed impossible and we sought to build a new tower. However, land was not available, and even if it was to become available, the chance of obtaining a building permit was unlikely.

The next plan was to construct a new tower beside the existing tower. The idea was once again frustrated because the space was too small. The original tower was less than 50% guyed and it stood immediately adjacent to a highway. The tower topped out at 500 feet and if it was to collapse, it could fall across the interstate. Because the guy lines would have to be interlaced, this only added to the complexity and increased the possibility of collapsing an already overloaded structure. Finally, the tower was already heavily loaded and moving existing transmission lines and antennae onto an adjacent structure was not only expensive, but there was the chance for damage to the antennas and transmission lines, especially those that were older.

The tower in its completed augmented state. The antennae mounts are standing a sufficient distance away from the tower face to allow passage of the multitude of coax up the face of the tower. (See Figure 2.) Note the triple guy line set, consisting of the two augmentation guy lines along with the original, relocated guy line. The corner-mounted climbing steps with associated anti-fall device are visible on the left side of the tower.

Adding "U" shapes

The solution was to design the required U shape and place the formed leg member around the existing leg member in such a way as to construct a tower around a tower. (See Figure 1.) The towers are constructed with a U-shaped member. Because many of our towers are large, the ability to nest several of these shapes into ever increasing thicknesses of composite members allows any loading problem to be solved. For example, one proposed design of a 1,149-foot, self-support tower planned for the Far East, resulted in leg sections 24"x24"x24" by three inches thick. This required four layers of U shapes nested and stitch-bolted together.

This new solution solves many problems. The new leg and

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lacing members are placed in a manner that would shield the existing members from wind load. In doing so, the tower windloading is greatly reduced. The technique creates another benefit referred to as the (Ad2) effect. Here, the total of the structural benefits of the composite shape is much greater than the sum of the individual parts. When you consider the composite load-carrying capacity of the built-up cross section consisting of the old leg working in conjunction with the new leg, the resulting cross-section structural capacities show a staggering increase.

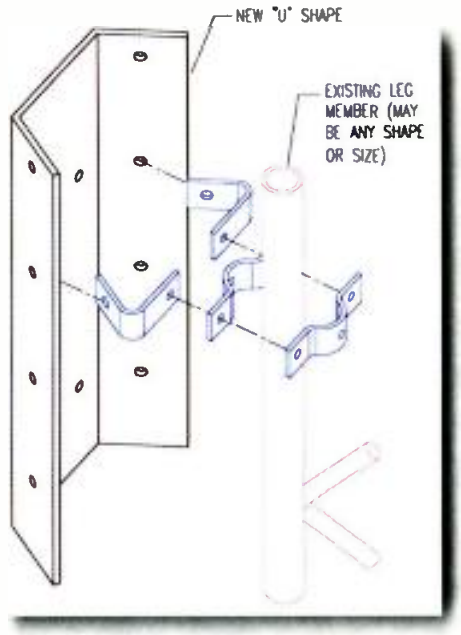

Figure 1. Basic design for tower augmentation. A formed U-shape leg member is attached to each leg of the existing tower.

The actual benefit of the above is further realized when you consider that the contribution to the composite cross section may be factored to allow for deficiencies in the existing leg member, due to deterioration. Many tower inspectors have found towers with pipe legs that have rusted from the inside, thus rendering them dangerously close to collapse. In cases like these, the existing leg is contributing nothing to the strength of the cross section, and the new U-shape member is increased in size or thickness to carry the extra load.

The old and new leg members are clamped together as frequently as needed to effect the transfer of forces to ensure that the legs will work together in the appropriate sharing of forces. However, the clamps are not tightened until the tower is completely stacked. The new tower compresses, due to added weight from being stacked. In order not to place additional loading on the old tower, the clamps are final torqued when the new steel is in place.

Because the objective is to completely shield all existing members with new members to minimize windloading, the new steel is detailed with splice plates of different gap lengths that vary between successive vertical sections. Therefore, the compressive effect will always allow the proper alignment of the shear bracing of the new tower lacing steel to coincide with the existing tower lacing members, thus maintaining proper shielding.

With respect to the clamping mechanism, while the lightweight clamp is usually sufficient for small towers, the clamp interconnecting large members would require fabrication from a heavy structural plate to apply sufficient clamping strength to effect the structural transfer.

Handling transmission lines

Because the new U-shaped legs must be open to fit around the flanged connection of the existing legs, the coaxial transmission lines are moved onto the tower face at the flange intersections. (See Figure 2.) In most cases, the transmission lines are already on the tower faces and the new tower steel is configured to pass over the transmission lines, which remain undisturbed. In some cases, it is desirable to configure the new augmentation steel much closer to the existing steel. This is accomplished by loosening the coaxial transmission lines from the existing tower over a distance of approximately 40 feet above and below the panel where the new steel is being worked, and sliding the new lacing member in behind the coax. The new lacing steel is thus connected to the tower legs and the coax is fastened to the new steel as work progresses upward.

Because many of the towers to be augmented have narrow face widths, it's often necessary to use small bars that extend out perpendicular from the tower face in order to gain sufficient space to allow for the large quantity of coaxial lines to be deployed. (See Figure 2 on this page and the photo on page 121.) The bars may be configured to use the popular snap-in coax mounting devices or any other mounting device requested by the customer. Because most waveguides are mounted inside the tower structures, they are seldom a problem.

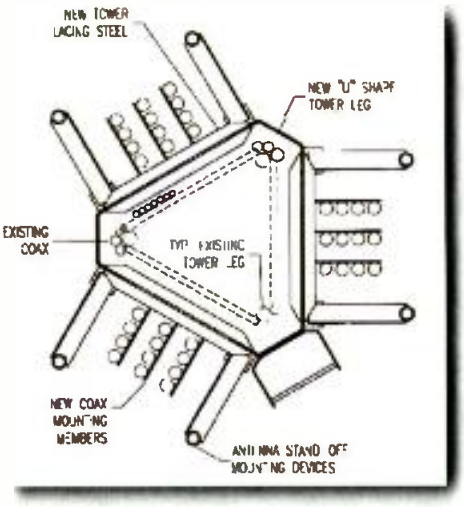

Figure 2. Any feedlines must be moved off the tower leg and onto the tower face. This can usually be done without cutting any of the coax lines.

On towers with small face widths, a new climbing device is mounted on the heel of the outside corner surface of the new U-shape leg. In most cases, the coax will be mounted so closely and densely that climbing the tower by any other means is impossible.

The antenna stand-off mounting de-

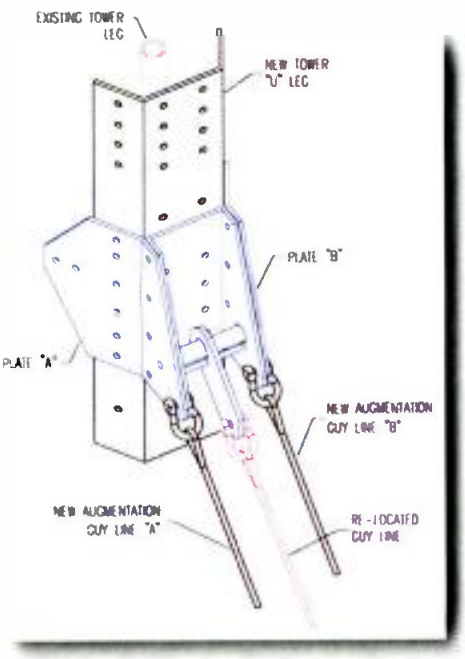

Figure 3. Attaching the new guy lines requires new guy attachment plates on the tower and new anchor footings. The new anchor plate footings for a 1,500-foot tower are shown in the photos on page 123.

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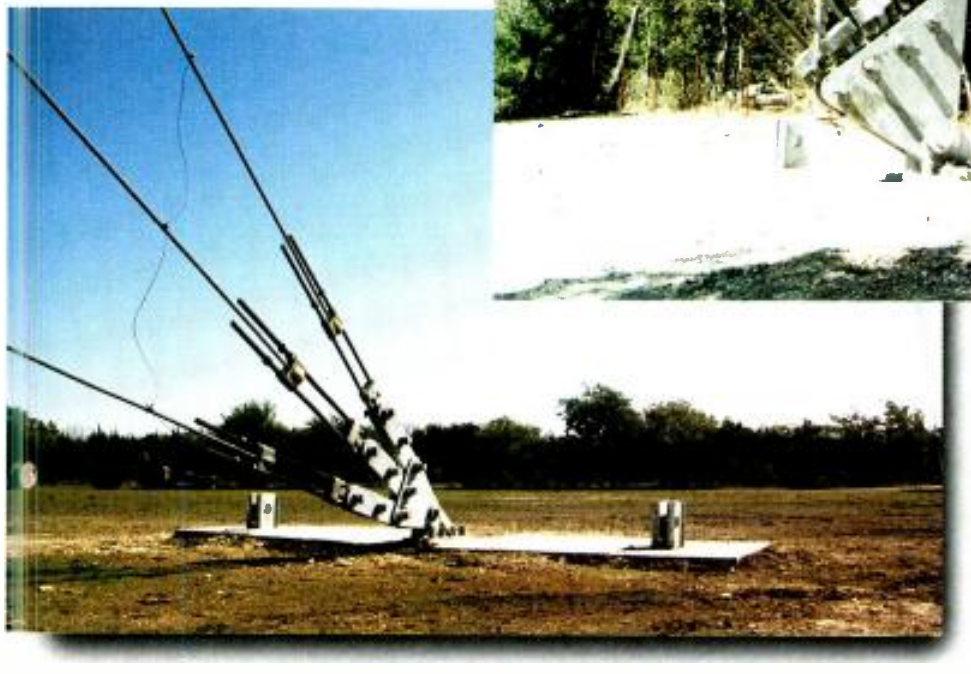
vices are configured in such a way as to facilitate extending the existing antennae mounting structures at a sufficient distance from the tower face to clear the stack of new coaxial lines running up the faces of the tower. The new stand-off brackets are configured to allow the existing antenna mounting arm to be unbolted from the existing tower leg and swung outward from the tower face while suspended by a cable sling from above. The new tower steel is passed behind the mounting arm and it is attached to its new stand-off bracket with the same hardware originally used. The new antennae to be mounted to the tower also use the antenna stand-off brackets to allow clear passage of the coaxial lines up the face of the tower.

Handling guy wires

The augmentation tower steel is stacked to an elevation approximately two to five feet below existing guy line elevation. At this point, plates A and B (see Figure 3) are installed along with the associated hardware and steel shown. The new augmenting guy lines are attached to plates A and B. Once guy lines A and B are attached to their new augmentation footings, the lines are tensioned to ensure the vertical alignment of the new construction to this elevation. Having done so, the original existing guy line is removed from the original mounting bracket and placed on the new hardware. This existing guy line is then retensioned on the existing footing and the stacking process continues.



The inner and outer guy line foundations for a 1,535-foot broadcast tower.

There are many advantages to be realized by the augmentation system:

- Towers that are badly deteriorated may be kept in service.
- Pay load capacities of existing towers may be increased by many times the original capacity.
- In most cases, the customer does not have to be taken off the air, even for a short duration.
- In many cases, a building permit for augmentation is not required.
- There is no requirement for additional land.
- The method is simple and safe because no gin pole is required. The lift line is rigged from an appropriate point on the existing tower.
- At no time is the original or new structure vulnerable.
- Should an increase in height be required, a gin pole is installed as the process reaches the height of the original structure and the process is simply continued with the new steel to the desired height.
- A computer model establishes the condition of the augmented tower. This model can be used to monitor and maintain future management of the structure.
- The overall cost of augmentation is usually less than the cost of building a new tower.
- The augmentation is done in a manner to allow for future augmentation of the augmentation.
- Only that portion of an affected structure need be augmented to a desired elevation.
- Dual guying provides a system of redundancy that allows safe simple maintenance of tower and footings.
- A simple system of obtaining field data allows an accurate computer model to be configured.

Augmentation is a new way to extend the life and load-bearing capacity of towers. Although it may not solve every TV station's need for a new DTV tower, it certainly is worth considering for those who want to maintain their current location for NTSC and DTV transmissions. It may also offer the answer for tower owners who want to increase the structure's capacity in order to rent that "vertical real estate." ■

Henry McGinnis is president of Landmark Tower Corporation, Ft. Worth, TX.

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Selecting a DTV antenna

Choosing the best solution for your system.

By Larry Bloomfield

Now that the FCC has approved channel and power allocations for broadcasters, stations can get on with the business of buying transmitters and antennas. However, getting on the air involves more than just hanging a new antenna from a tower. Although some of the questions looked at here will apply to other areas of the transmitter facility, we will concentrate on the transmission system.

What's the difference?

If a TV antenna is cut for either a specific frequency or a broad band of frequencies and is flat over its designed range, there is no difference between an NTSC antenna and one used in the digital TV service. The RF does not know the difference and the electrical principles apply equally to both.

Most DTV assignments are in the UHF band (Channels 14 through 69). There are about 124 VHF assignments out of the nearly 1,700 for DTV. It would be wise to approach this duality in paralleled operation, where your station will be operating DTV and NTSC, with the concept that it could run for as long as another 15 years.

Keep two things in mind. One, each antenna site is different and a single solution won't meet all needs. Two, some long-range decisions have to be made. Here are the scenarios:

- your NTSC and DTV are both VHF channels;
- your NTSC is VHF, but your DTV will be UHF;
- your NTSC is UHF and your DTV will be VHF; and
- your NTSC and DTV frequencies are UHF.

Addressing all the issues

Crossband situations will require two antennas, but in-band situations can be simple to resolve by using one of several well-designed broadband antennas. If there are several stations sharing a tower and they are in-band, they may be able to share a common transmission system through the use of a combiner network. That's what they're doing at Mt. Sutro in San Francisco.

Remember that you only get to keep one of these two frequencies when this is all over. Are you going to stay with the new DTV assignment and give up the NTSC channel or are you going to convert your DTV over to your old NTSC frequency? Generally, it is best to keep the lowest frequency or channel of the two. However, there may be situations where a station would keep a low UHF channel as opposed to a VHF channel. If all the stations in your market are in the direction of your antenna site were to be UHF over the long term, it would be worth considering. The decision, however, may not be yours to make. If either your NTSC or DTV allocation is outside the designated *core spectrum* of Channels 2 through 51, you will have to surrender your Channel 52 through 69 allocation. (Editor's note: For a complete discussion of this rule, see the FCC's Sixth Report & Order "Decision" section, paragraph 55 and 56.)

The next step is where are you going to locate your

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An optimum installation for stations would be a top-mounted omnidirectional antenna. Shown here is an Andrew UHF TRASAR at WPME-TV.

antenna? Most stations will try to make use of their existing towers. Of course, this raises a number of questions about the structural integrity of the tower. In some instances, the DTV facility will not be co-located with the NTSC facility.

Two things need to be done initially. First, conduct a preliminary RF study. Examine your channel assignment, ERP and licensed transmitter power. Second, select an example transmission line and type of antenna. Also, do an inventory of the equipment already on your tower. You'd be amazed at how much extra stuff is on some towers that has been forgotten or no one knew existed.

With the RF study and your inventory done, it's time to review your findings and do a structural tower analysis. A reputable structural engineering firm with an established track record should do the structural study. The company will need to know what kind of antenna you want, where to locate it and how you plan to feed it. They can give you information about windloading, reinforcing the tower and other considerations. They will also tell you if your tower is worth upgrading or if it should be replaced.

Don't forget to tell the company about any tenants (FM or other TV stations), STL, TSL, IRL or ENG antennas that you may need to install on the tower at a future date. With all of this information, the structural boys will be able to tell you if you're on track or if you have to go back to the drawing board.

Always keep your long-range plans in mind. It is not good engineering or economic practice to be penny wise and dollar foolish at this point. Investing the extra now may save you a bundle down the road.

First, the transmission line

Before addressing the antenna, let's talk about the transmission line. There are two basic options:

1. install an additional transmission line; and
2. replace the old NTSC with a new DTV line where one transmission line handles both signals.

There are three types of transmission line: rigid coaxial, semiflex coaxial (both cables) and waveguide. The semiflex becomes more rigid as its size increases. Transmission lines

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Selecting a DTV antenna

come in either 50Ω or 75Ω impedance. There are exceptions, however.

All things being equal, all three types of feedline will work for DTV just as well as for NTSC. There are trade-offs, however. The larger the size, the greater the power-handling capability and the higher the efficiency, but the greater the windloading. Windloading is the main problem with waveguide. Towers may not be able to handle the additional loading when compared to coaxial cable. Also, the frequencies of operation can impose some limitations when it comes to using coaxial cable. Large-size transmission line has an upper usable channel limit before it starts to support higher-order modes, which is not good. For example, an 8 3/16-inch 75Ω line can be used successfully up to Channel 52, but is not suitable for higher channels of operation.

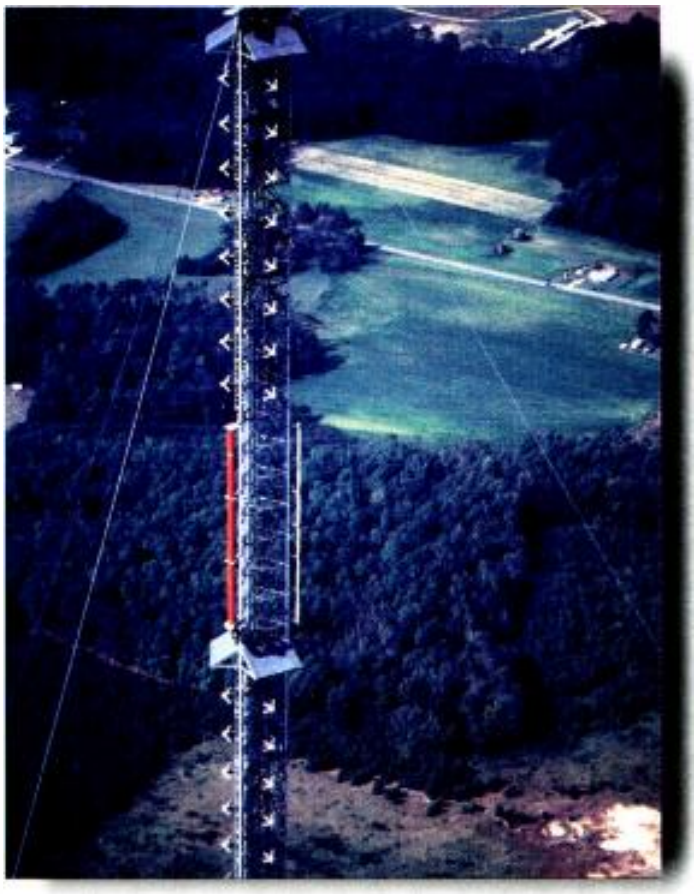
Field trials have demonstrated that the DTV signal is robust. In coaxial lines, there is no group delay, as a function of frequency, so this is not an issue. In waveguide, the group delay slightly varies with frequency. However, this figure is constant, usually negligible and can be corrected if it is a problem. The transmission line's job is to deliver as much power to the antenna as the transmitter is putting out. Ideally, the only losses will be resistive. To achieve this, impedances must be matched. To help understand how this plays a role, remember that the surge impedance of air-dielectric coaxial transmission line is determined by the equation:

$Z = 138 \log (d1 \div d2)$

To state this equation, the log of the inside diameter of the shield (d1) is divided by the outside diameter (d2) of the center conductor, times the constant 138, therefore, equals Z or the impedance.

Any change in this relationship (dents, couplings and improper connections) will have a dramatic impact on the impedance of the transmission line at that particular point. Transmission line is like a chain; it is only as good as its weakest link. Any discontinuity will be seen as either inductive or capacitive reactance and will reflect power back to the transmitter.

Use a time-domain reflectometer to ensure that you do not have any problems with your transmission line. It will tell you if you have any discontinuities, what kind they are and where they are located in the transmission line. All discontinuities should be corrected before the system is put into service. A reverse wattmeter will indicate any reflected power, but it won't tell you where the discontinuity is. (For a review of transmission line-matching techniques, see "Transmission & Distribution" in the February 1998 issue.)



For many stations, a second DTV antenna will need to be mounted near their current NTSC antenna. Shown here is an Andrew ALP-series UHF (right side of tower) for WRAL-HD in Raleigh, NC. An Andrew TRASAR for WRAZ-TV is shown on the left side of the tower.

On to antennas

First, some theory. The pattern from a perfect or *point source* antenna — an isotropic device — is a sphere like a round balloon. The outer edge of the balloon can be compared to a given signal level; its cross-sectional pattern would be a circle.

Because there is no such thing as a perfect or point source radiator, the next best thing is the dipole — an antenna with two poles. If you are standing and looking at the tower some distance away with its dipole on top, its cross-sectional pattern will look like two circles on each side of the antenna; sort of like a donut had been dropped down onto the tower and cut, top to bottom. This is the horizontal plane.

Most TV stations radiate in the horizontal plane. This is called a horizontally polarized signal. Antennas can also be made to radiate vertically, elliptically or with circularly polarized signals. If you were to step on the balloon from on top, this once perfect sphere would bulge out in the horizontal plane equally in all directions eventually taking on the shape of a pancake. If dipoles are added by stacking them in elevation, it will have this exact same effect on the pattern. The more dipoles, the flatter the pattern and the more energy that is directed into what becomes the main beam.

This has the effect of concentrating the power into a given direction and is measured in effective radiated power (ERP). This is how we get a 5kW transmitter to appear to transmit 132kW. One disadvantage to having multiple arrays (dipoles) is if you're on a high mountain and you've got too much gain in your antenna you could shoot right over the tops of the homes in the nearby foothills. Yet, on the other hand, viewers some distance away will get a better picture.

There is one other feature that may or may not be advantageous or desirable with respect to your antenna pattern and that is electrical down tilt also called *electrical beam tilt*. With some electrical down tilt, perhaps those folks

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at the bottom of the hill will get your signal when they would otherwise not get it without the electrical down tilt. Just remember, the flatter the pattern, the more you will probably need some down tilt. There are also situations where mechanical beam tilt is appropriate. But remember, while electrical beam tilt is the same all around the azimuth pattern, mechanical beam tilt is set in only one direction.

One other problem with multiple-element antennas is that this tends to create nulls in the signal for viewers within a few miles of the transmitter site. Basically, a null is a lack of signal that can be caused by any number of factors. The higher the gain, the more nulls. The higher the gain, the further out from the antenna the nulls will extend. NTSC systems having high gain antennas create poor reception and possible ghosting to close-in viewers. This is not much of a problem if the transmitter site is located outside of town in unpopulated areas. However, if the transmitter site is in town, this could be a serious problem.

Despite all of this, typically NTSC full-power VHF antennas have from 6dBd to 12dBd gain and NTSC UHF have even more. An NTSC UHF antenna with 20dBd to 25dBd is considered to have relatively low gain. Because DTV has lower ERP requirements, it is not difficult to understand why one manufacturer recommends a maximum vertical plane antenna gain of 28dBd for DTV situations.

The FCC made one important change when it clarified its report and order; it allowed UHF DTV stations to increase power up to 200kW or modify their antenna height, as long as they don't increase interference to another station's service area where it would affect more than 10% of the population. Now, within the service area, the station can increase ERP up to 1MW, but in those cases what the station must do is increase its electrical beam tilt such that the fringe radiation does not exceed the comparable 200kW limit. For further clarification see the FCC's web page at: www.fcc.gov/daily_releases/daily_business/1998/db980223/fcc98024.txt.

Typical NTSC antennas will also work NTSC and DTV. Single-channel antennas, such as the slotted coaxial cylinder, also known as the pylon, are not suited to solve today's problem of doubling the number of stations at the same locations. Broadband panel-type antennas have the ability to accommodate two or more DTV stations or combinations of DTV and NTSC.

The slot antenna gets its gain from the layers of slots. Increasing the slots at predetermined locations increases the gain. Panel antennas are usually

A stacked antenna solution is used by stations' KRQE, Channel 13 (top) and KASY-TV, Channel 50 (side). Both antennas are from Andrew. Note the two riggers working at the base of the top-mounted antenna.

two- or four-dipole elements at a fixed distance from a reflecting screen inside a protective covering like a radome. The dipoles are connected together with internal wiring and phasing harnesses. The purpose of the screen is to reflect or direct the energy back out in the direction of the dipoles and to reduce the inter-reaction of the dipoles with the mounting structures. The gain of one panel is relatively low, so a multiple array of vertically stacked panels is usually used, interconnected in much the same way the internal wiring of each panel is done. A desirable advantage of the panel antenna is its broadband characteristics. One panel can cover the UHF frequency band from 470MHz to 800MHz. The trick is keeping the gain constant over the bandwidth. Relatively flat gain characteristics are important in DTV applications.

Of the two basic types of antennas that are used for broadcast service, the most common type in UHF is a slot antenna. It can be resonant (standing wave) or non-resonant (traveling wave). The other variety employs a dipole radiator. These are most commonly configured as batwing antennas and panel antennas. Generally, slotted antennas are used in high-band VHF and UHF service where the need is confined to one or two adjacent channels that must be transmitted. If there is a requirement to broadcast more than one non-adjacent channel, from a single antenna, then the best choice may be a batwing antenna if both channels are high-band VHF or a broadband panel antenna for UHF.

When comparing a panel antenna with slot-type designs for UHF, bear in mind the following:

- Panel antennas have lower power-handling capability than a slot antenna with the same peak gain. A single-panel antenna will probably not handle two full-power (5,000kW) NTSC UHF broadcast facilities.
- The interpanel cabling will require occasional inspection and repair. In comparison, a modern slot-type UHF antenna, particularly if it is fully radome enclosed, is often maintenance free for its useful life.
- The pattern (azimuth and elevation) for a single UHF panel antenna system will perform differently for each channel that it broadcasts. This is because the fixed panel spacing has different electrical lengths, depending on the channel broadcast. When reviewing operating specifications, the manufacturer generally only specifies gain

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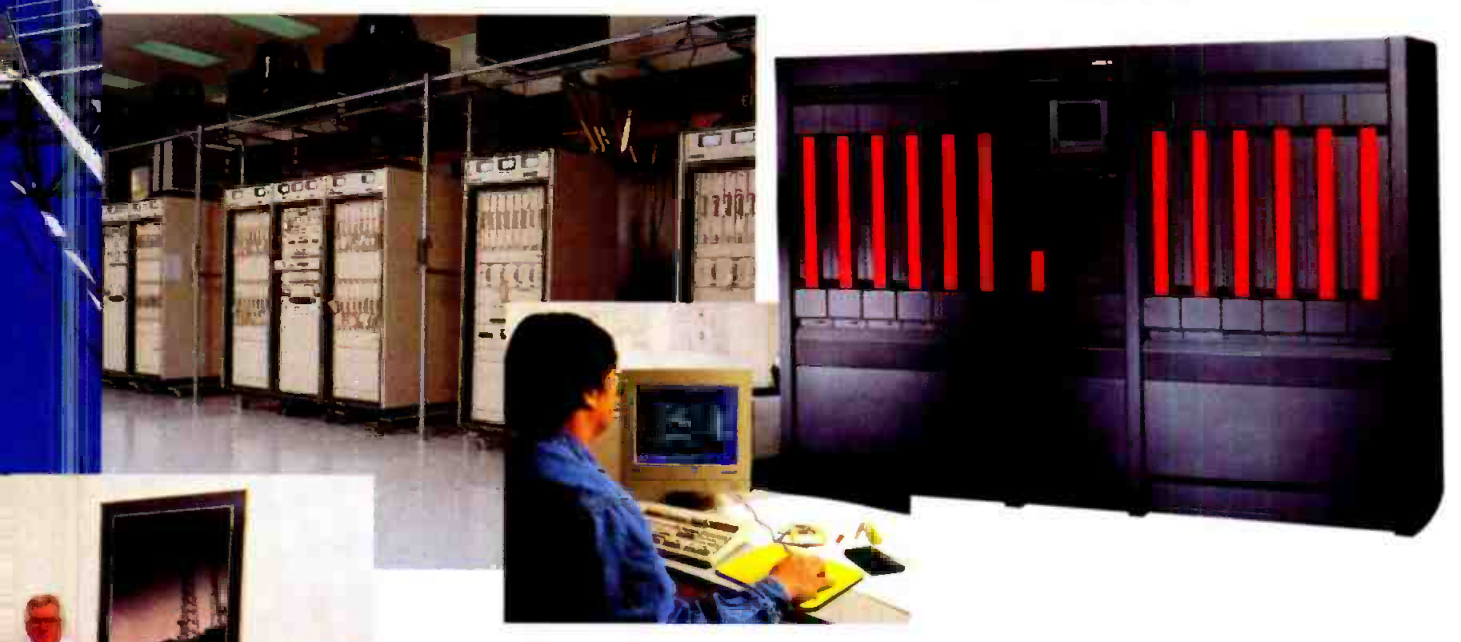

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Management

Ready to change for the better?

BY KARE ANDERSON

"Everyone thinks of changing the world, but no one thinks of changing himself," wrote Leo Tolstoy. There is a Tibetan saying, "If you want to know your future, look at what you are doing in this moment." I find it easiest to make a change by picturing a specific reward for the change. What new experience will I get to have? Conversely, what boring, unpleasant or fear-provoking task or person will I experience in a more comfortable light or no longer have to experience at all? The more specific, vivid and deadline-related you make your goal, the more likely that you will achieve it.

I know a broadcast engineer who is going for all his major rewards in 1998. On his own time, he is learning how to take his organization on-line for better customer service and value-added new ways to offer their information, thus creating new profit centers. He plans to propose that he be in charge of this expanded area of the company.

He also plans to stop smoking by the time his first child is born and will reward himself by learning to scuba dive. He's surrounded himself with reminders to his commitments: posting messages on the bathroom mirror and car dashboard, telling his friends and colleagues and penning a cigarette image, crossed out, on his palm for the first week of his new life.

As Beverly Sills once told a reporter, "You may be disappointed if you fail, but you are doomed if you don't try."

Find your "true north"

There is a Thai word, "sanuk," which means whatever you do, you should enjoy it. Be clear about choosing a habit-changing goal that is valuable to you. Why put effort in an "ought to do" goal based on others' wishes for you, when you can go for the one that you'll find most satisfying? Keep picturing the experience of your success when you are tempted to fall back. As Soren Kierke-gaard, the 19th century Danish theologian said, "People celebrate achievements and spotlight heroes, but the truly heroic act is not the outcome but in starting out and not knowing if you will succeed." "A vivid imagination," wrote Aristotle, "compels the whole body to obey it." Emile Couce wrote in *Willing*, "It is the imagination and not the will that is the dominating faculty of man. It is a serious mistake to advise people to train their wills; they should learn to control and direct their imaginations."

Rather than talking about what you are giving up or how you might fail, think and talk about your goal as the inevitable future.

Use your homing device

Look inside for your "homing device," your powerful motivation or passionate interest that can be related to your goal. As Dr. Beverly Potter wrote in her book, *Finding a Path With a Heart: How to Go From Burnout to Bliss*, "When we pay attention to our homing devices and follow their guidance, we invariably feel right about ourselves and in perfect harmony with people and activities in which we are involved in the moment. . . Not all targets (goals) are the same. Some are easier to hit. Some are more fun. Compelling targets have a magnetic force that pulls you toward them."

How do you get detoured?

"The hardest thing to learn in life is which bridge to cross and which to burn," wrote David Russell. Notice your pattern for avoiding your course toward your goal. What activities do you use to get sidetracked? What time of day or day of the week is it most likely to happen? What else happens that can numb you into avoidance? What colleagues and friends help or hinder you? Discover these patterns and you will be more productive toward this and all the next goals you set for yourself. But don't be too hard on yourself when you're not perfect. As Charles Garfield wrote in *Peak Performance*, "On course doesn't mean perfect. On course means that even when things don't go perfectly, you are in the right direction."

Confirm that you're on the right path

Look at what happens to you as you are moving toward a change. What new experiences happen? As Jean Shinoda Bolen wrote in *The Tao of Psychology*, "Synchronistic events can assure us when we are on the right life path; and advise us when we are not; at the most profound level, they assure us that we are not mere observers, but always participants in an interconnected cosmic web." See how the changes you make affect your self-image and your relationships with others. Simply speaking, do you enjoy your life more?

Be your best

Those who gain the most professional satisfaction in an increasingly changing and competitive world will be those who get good at one single skill. In broadcast engineering, it might be the combination of a technical skill for a certain kind of organization serving a certain kind of market.

Before you start a new habit, plan how you will celebrate when you meet your goal. The bigger the change, the larger the reward you deserve. Let others who supported you, savor it with you. You might be just the inspiration to help them make their own big life change. ■

Kare Anderson is a speaker and author. Visit her web site at www.sayitbetter.com.

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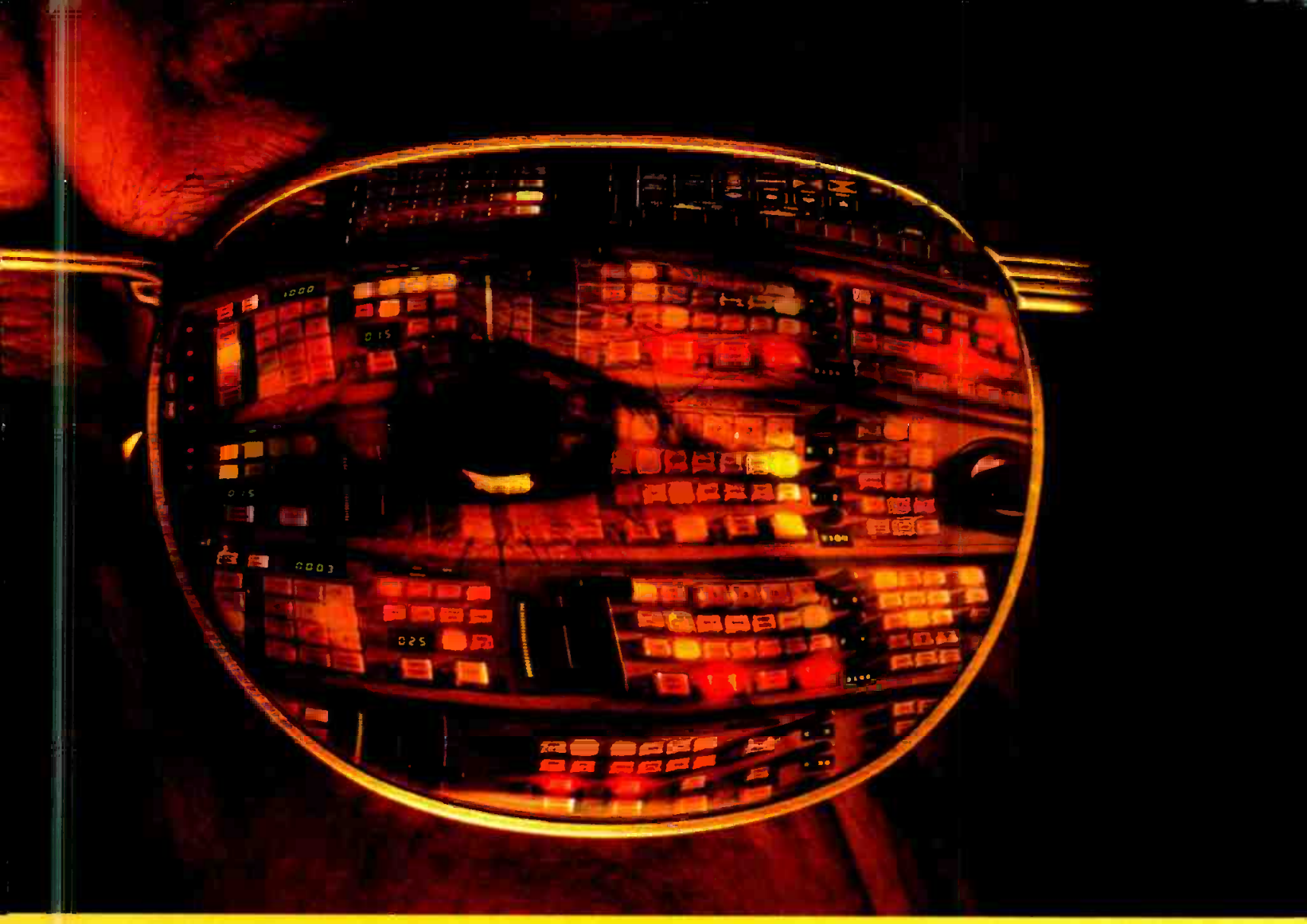

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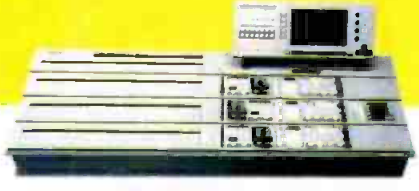

DVS-7300 System

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Field Report

University of North Carolina upgrades statewide microwave system

BY WAYNE ESTABROOKS

The University of North Carolina UNC-TV operates a statewide public TV broadcast system consisting of 11 full-service transmitter stations, 23 translators and a statewide video microwave system to provide program delivery. The video microwave system has approximately 1,000 miles of terrestrial paths and is mostly one-way. Over the past few years the audio has been upgraded using the MRC DigiPro digital audio system.

Performance at a glance

- Digital ready
- Digital or analog video Modulation
- Simplex, full-duplex and hot standby
- SMART network management system
- Overall on-site monitoring and equipment configuration
- Time stamping, recording and display of alarm events

In 1996, funds became available to purchase new microwave equipment to replace some portions of the statewide microwave system and to extend the system to a new station. In September 1996 we placed the order and in March 1997 we took delivery and began installation.

The makings of an upgrade

With DTV looming on the horizon, one of the most important criteria was to purchase equipment that could be used in the future to carry digital signals. We included the requirement for 45Mb/s digital capability in our purchase specifications.

Another important requirement was for some type of fault-reporting system. Previously when a failure occurred, it could take considerable time to locate a problem. For example, power would fail and the system would continue on battery power without our knowledge until the low-voltage cutout was activated. Technicians would then travel to sites along the system until the failed site was located. It would have been advantageous to have had a warning. We felt that a fault-reporting remote monitoring system was a necessity.

We asked two microwave equipment manufacturers that submitted bids for the equipment to provide sample equipment to be tested. Fortunately, we had access to a 70MHz digital modem made by Farinon and a Hewlett-Packard 3782B bit-error-rate test set. Henry Morrow, microwave supervisor for UNC-TV, performed analog and digital tests on the vendors' equipment. The Microwave Radio Communication' (MRC) equipment was superior in the digital bit error rate tests. After 24 hours, the MRC FLH-DAR equipment was making less than 10 to 12 bit errors, which is essentially errorless. Inserting path attenuation between the transmitter and receiver being tested until the receive carrier level was –82dBm RCL did not result in a significant bit error rate increase. Based on these tests and other criteria, such as mechanical construction, front-panel metering for power supplies and direct-reading dBm metering for receive carrier level or transmit power, power-on indicator and a comprehensive remote monitoring system, MRC was awarded the bid for microwave transmitters, receivers and repeaters and the Smart Control System for 13 sites in the UNC-TV system.

Microwave Radio Communications' digital-analog heterodyne microwave radio.

A smart system

UNC-TV shares a statewide 600 chan-

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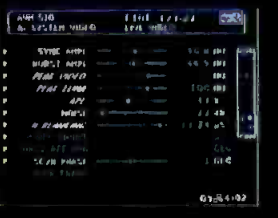
Whether the requirement is in a corporate video facility or large broadcast operation, the new AVM 510 Automated Video Monitor is the economical solution for video signal error detection, reporting and equipment set up in all facets of production. It is an advanced, multistandard/multiformat, measurement system with all the traditional waveform/ vector displays you would expect and more. Choose from an array of measurement sets with easy to read graphic displays and numeric read outs on key video signal parameters. When a problem occurs, the operator is alerted with an onscreen display flag for the specific error. Performance reports can also be generated with a PC or printer which indicate each error occurance with a time/date stamp or time code.



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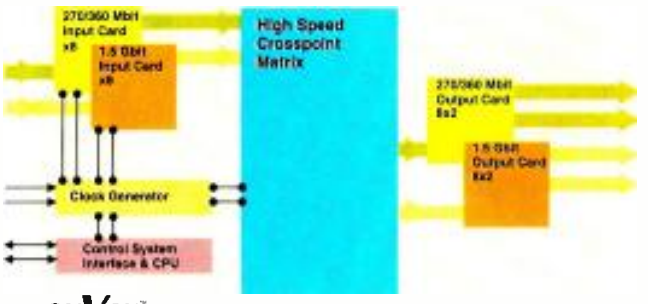
GOING FOR THE GOLD – NVISION Receives High Marks for its New *enVoy*™ Series of Universal Digital Routing Switches

As a long time leader in the digital audio market, NVISION is bringing its 'customer driven' formula for success to the video market with the ENVOY series of digital video routers. Since 1989, this Grass Valley, California company has earned a solid reputation for providing high quality/high value digital audio, time code and data routers to the television industry.

NVISION routers typically solve problems that have been ignored by other manufacturers. As proof of this statement, NVISION routing switches can be found in almost all of the Hollywood post-production facilities, as well as in major network operation centers around the world, with the majority of these switches operating under other manufacturers' control systems - and the ENVOY should prove to be no exception.

With 1998 seeing the start of DTV transmissions to the home, broadcasting organizations need to build systems that can include multi-channel NTSC, HDTV and surround sound. To accommodate these immediate requirements, the industry needs equipment that has the flexibility to fit today's needs, without being outgrown tomorrow. NVISION has anticipated this need for operational flexibility and has designed the ENVOY series with this in mind.



enVoy™ **Series Routing Switch, Block Diagram**

At the heart of this new router family is a high speed crosspoint architecture that will handle data rates in excess of 1.5 Gigabits. This structure is combined with various I/O modules to accommodate several data rates. ENVOY users will be able to route any standard rate SDI and HD-SDI signals, within the same switch – at the same time.

This fact, combined with the ability to control the switch from an existing control system, provides incredible power and flexibility.

With the ENVOY series, digital video routing is available at competitive pricing and a compact size; a 128 x 128 frame with dual outputs fits in a mere 16 rack units.

Input and output modules include SDI (143, 177, 270 & 360 Mbits) and HD-SDI (1.5 Gbits) modules. Different I/Os can be included in the same switch, as can dual references to allow simultaneous dual standard 59.94 and 50Hz vertical interval switching. Output options include dual connectors for each destination, to minimize DA requirements.

NVISION's proprietary technology makes this universal digital video switch a reality, and at a remarkably low cost. In addition to these new technologies, NVISION has developed unique circuits for data reclocking, high speed internal interconnect, and cable driving. ***See Fig 1.***

This new router series will enable users to purchase an expandable SDI router that can also have 1.5 Gbit HD added incrementally, as and when required. ■

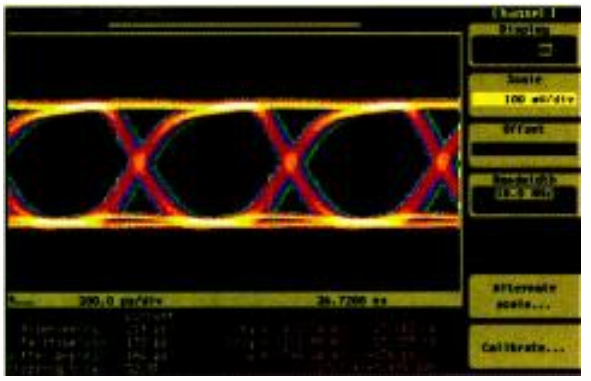


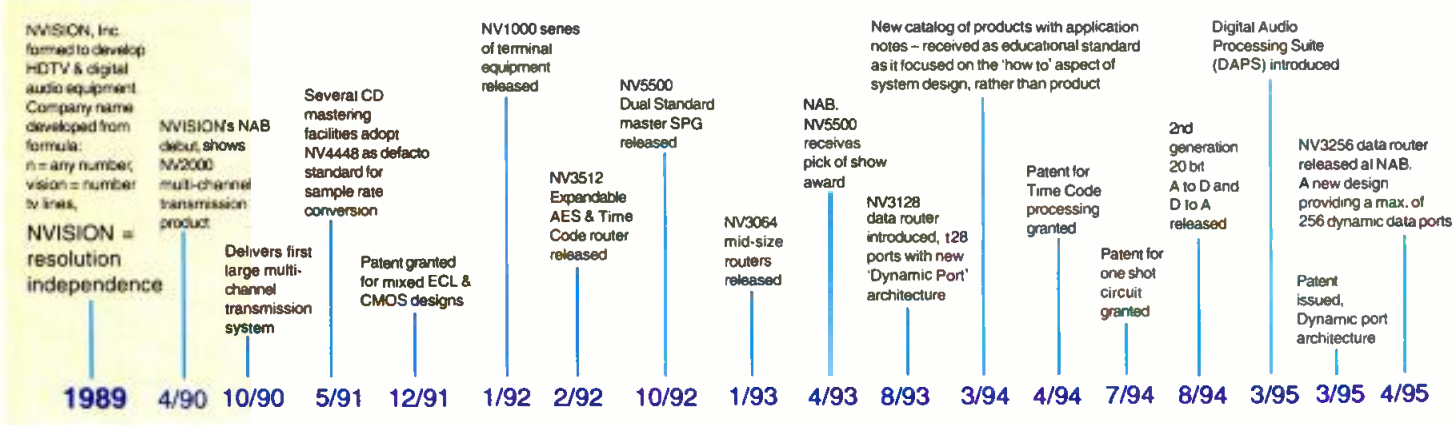
Figure 1. ENVOY 1.5Gbit data output after 75 feet of cable

ENVOY Series Routers

EN6064 11RU frame to accommodate up to 64 x 64 with dual outputs

EN6128 16RU frame to accommodate up to 128 x 128 with dual outputs

EN6256 23RU frame to accommodate up to 256 x 128 with dual outputs



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CBS Selects ENVOY for HD-SDI Routing

CBS Network operations center in New York has purchased NVISION equipment for HD-SDI routing and distribution.

Scheduled for installation in September 1998, the initial package includes the ENVOY series 128 x 128 router frame and the 4000 series 1.5 Gbit fiber optic transmission equipment.

The ENVOY router has been chosen to provide the network operations center with an HD-SDI routing layer that will be controlled by a local NVISION panel network. This router is initially loaded as 32^2 and is expandable to 128^2 in increments of 8 inputs and 8 outputs. The router will be connected to local HD-SDI sources via coax with longer runs being distributed over 1300nm fiber optic cable.

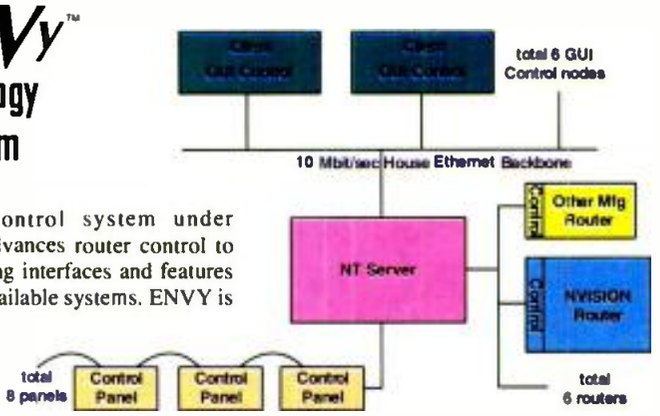
New 4000 series fiber optic transmitter and receiver modules have been included in this purchase to provide an affordable method of HD-SDI connectivity throughout the facility.

The ENVOY series will provide CBS with room for expansion as well as the ability to add extra SDI layers within the same switch, if desired.

The selection of these new NVISION products provides CBS with an affordable and flexible HD-SDI layer that is easily expanded as needs grow. ■

Green With *enVy*™
New Control Technology for the Next Millenium

ENVY, the new router control system under development by NVISION, advances router control to the next generation by providing interfaces and features that will supercede currently available systems. ENVY is being designed to replace current routing control systems for users who require far greater flexibility and operational ease than existing systems provide.



enVy™ **Router Control System (Minimum Requirements)**

ENVY Incorporates:

- Easy to understand GUI for configuration using industry standard database.
- Intuitive GUI for control allowing different modes for control and status.
- Easy to use, operator friendly hardware control panels.
- Intelligent routing and conversion through automatic tie lines.
- Standard hardware using Pentium PC technology.
- Standard operating and networking system using Microsoft Windows NT©.
- Controls all NVISION routers and will control many other manufacturers' installed routers.
- ES-Bus serial port for connection to most automation systems.
- Easily expandable for more routers and control interfaces.
- Virtually unlimited router sizes, 2048 inputs x 2048 outputs.

Sierra Design Labs uses NVISION HD-SDI at NAB '98

Sierra Design Labs (SDL), a leading manufacturer of video and audio disk recorders, will utilize NVISION routing at NAB. SDL will be demonstrating new compressed and uncompressed HD disk recorders, as well as their existing SDI machines.

At the show, they will use an NVISION universal video router to switch HD-SDI and SDI signals around the booth. This new NVISION router has the unique ability to allow all SDI data rates and 1.5 Gigabit HD-SDI to be managed within the same switch.

NVISION will also provide a 1.5 Gigabit fiber optic link between the SDL booth and their own (both located at the Sands). ■

Minimum switch size	8 x 8
Input expansion increment	8
Output expansion increment	8 (x2)
I/O options	SDI input module HD 1.5 Gbit input module SDI output module HD 1.5 Ghit output module
Control System Compatibility	NVISION NVISION ENVY Tektronix SMS7000 Philips BTS ES Bus Pesa Utah Scientific

EN6064 EN6256 EN6128

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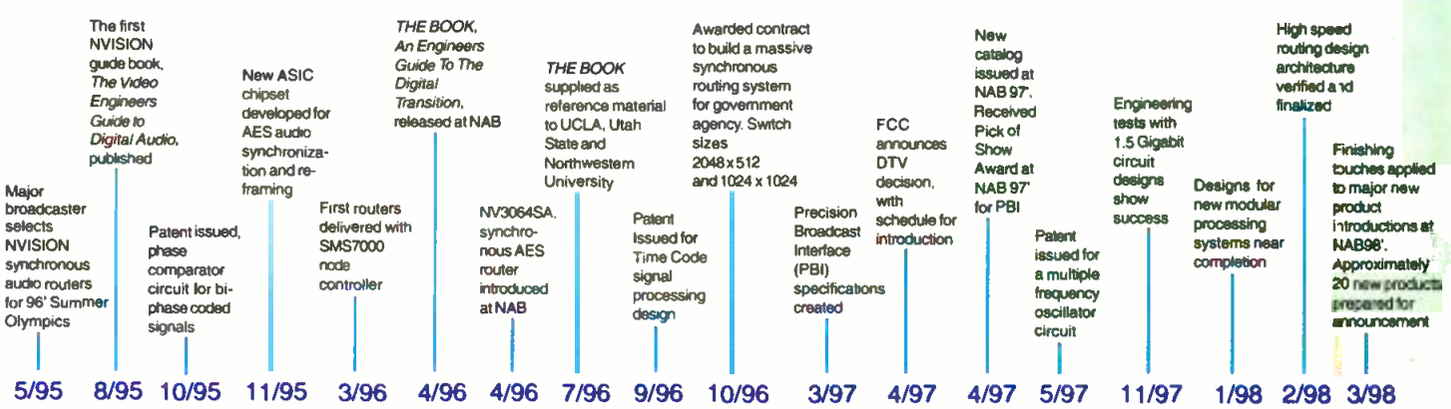
See NVISION at NAB'98 Booth #S2967 at the Sands.



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nel voice and data MUX microwave system with the North Carolina State Highway Patrol. This system would be used to provide the communications paths for the SCS-32 remote monitoring system. We presently use it for transmitter remote-control telemetry, telephone and data circuits.

The Smart System (SCS32) consists of a master computer terminal that communicates with all of the newly purchased microwave receivers and transmitters in the system over a common four-wire radio circuit. Additionally, separate remote terminal units were purchased as part of the package to monitor several of the older microwave repeater sites in the state that were critical sites on the backbone of the system. The master terminal records all alarms events with date and time stamp. The software permits sorting of the history and the data can be analyzed to see where the most attention is needed. We have learned a lot about the statewide system with the Smart monitoring.

The equipment was installed and checked out by the staff of UNC-TV, which presently consists of the microwave supervisor and one technician.

We are monitoring 16 sites with the Smart System. Some of the items we monitor include the battery charger alarm, waveguide pressure, utility power, tower light operation and failure, indoor and outdoor temperature, as well as the several alarms and metering points incorporated into the FLH-DAR radios including transmit power and receive carrier level. The functions and capabilities of the Smart control system are too numerous to be covered in this article. We recently obtained a software upgrade that permitted us to have paging capability with the Smart System. With the paging capability, sites and alarms can be programmed to call a designated technician. The technician can then call the Smart System from a remote home computer or laptop using the remote access software and observe where and what the alarm specifically is and then travel to that site to take necessary action. As I was writing this, my pager went off. I called the system and observed that there was a tower light alarm at our Wendell microwave site. We verified that one of the beacon bulbs had burned out and scheduled the tower for relamping. We are delighted to have the remote monitoring capability and it has made our life better. ■

Wayne Estabrooks is chief engineer of transmission at the University of North Carolina Center for Public Television.

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"Very few things happen at the right time, and the rest don't happen at all . . ."

Herodotus

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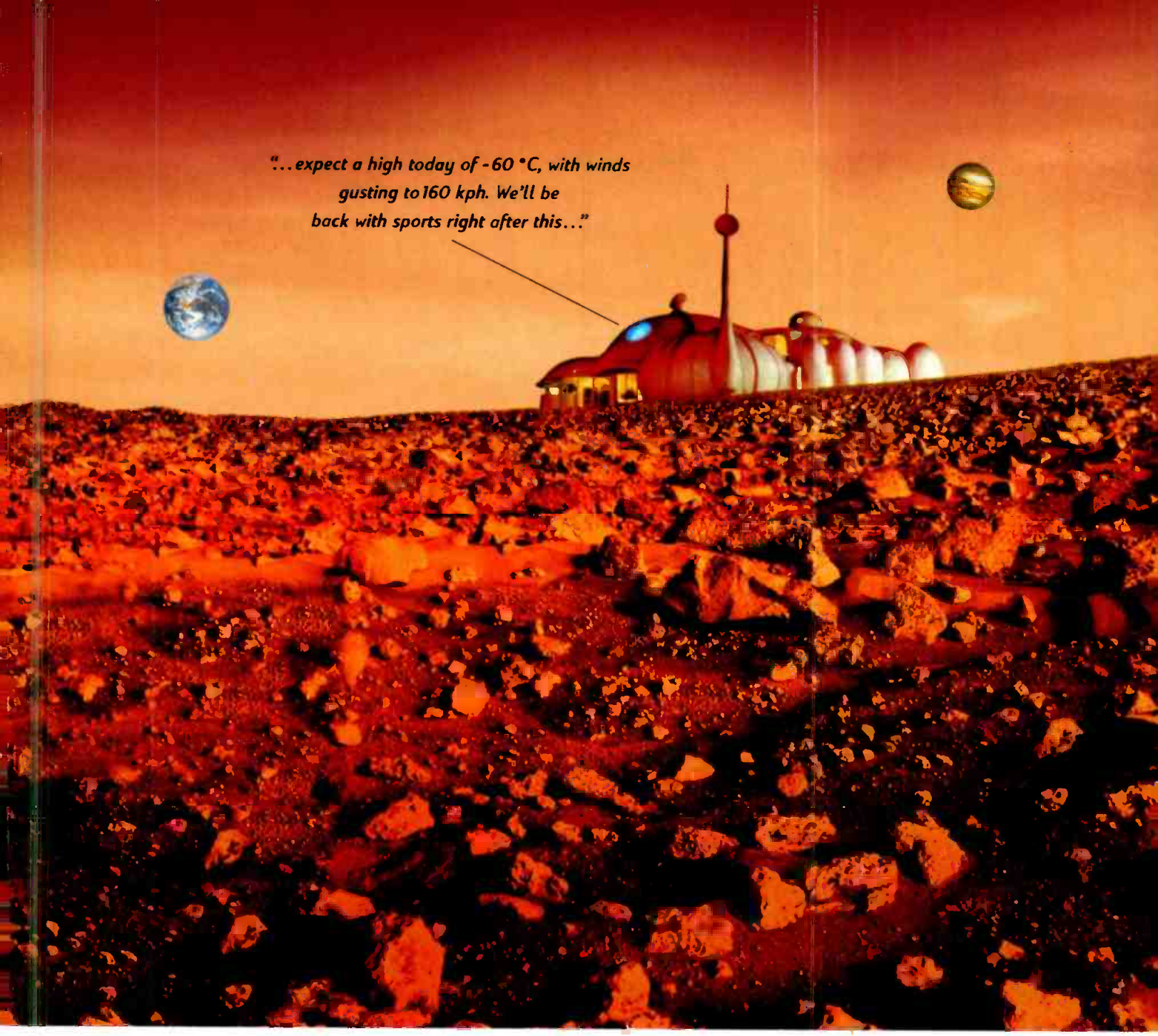

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- Visualization of every detail from DVB and ATSC tables to video elementary stream analysis, including MPEG 4:2:2.
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Field Report

Rosco: Distributed power and control systems

BY JIM CROOKS

KRON-TV (Chronicle Broadcasting) is the NBC affiliate in San Francisco. The station has two production studios housed in a purpose-built facility. Studio design and equipment were "state-of-the-art" when the building opened more than 20 years ago. Cameras and other portable equipment have been updated over the years. The lighting control systems and other fixed equipment were, until recently, little changed.

Performance at a glance

- Ability to reconfigure the studio quickly with minimum labor.
- Ability to identify and resolve equipment problems quickly.
- No need to compensate for dimmer, lamp and harmonic noise problems.
- No need to construct a dimmer equipment room.
- No net contribution of the dimming system to HVAC loading.
- Less wire and termination required; lower electrical installation costs.
- Distributed system architecture makes catastrophic failure rare by eliminating choke points.
- Consistent lumen output and color temperature are supplied throughout the studio.
- Control of voltage and current flow are provided.

Updating the lighting control system

Dimming systems, like most, were designed to control incandescent and quartz-halogen lighting loads only. Design of these systems are familiar to most — lighting loads on a pipe grid fed by fixed connector strips, in turn fed by a cross connect (patch) panel and a silicon-controlled rectifier (SCR) dimmer rack. Both the patch panel and the dimmer rack were installed in equipment alcoves, adjacent to each studio.

These dimming systems had served KRON-TV well. However, advancing age made them a maintenance headache. Parts and service were difficult to find.

More important, the needs of the station had changed. KRON-TV couldn't use its SCR dimmers to power or control new fluorescent lighting, automated lighting, monitors and other grid-mounted studio equipment. The station was also obliged to compensate for buzzing, RFI and harmonic noise generated by the dimming system. Frequent use of wireless audio gear made this a particular concern. Finally, KRON-TV management wanted to minimize production costs to the greatest extent possible. The SCR dimming systems made poor use of three expensive resources: studio setup labor, stage/studio lamps and electric power.

Horizon Windows 95 compatible lighting control system.

Choosing and installing the right system

KRON-TV operations manager, Larry Shenosky, chose the Intelligent Power System (IPS) to address all of these concerns. With the assistance of lighting designer Bill Holshevnikoff, installation of a new IPS distributed power and control system was recently completed in KRON-TV studio B.

Distributed controls locate IPS dimmers within the studio itself, usually in close proximity to the loads controlled. The new dimmers are silent, lightweight, compact and portable. Thus, the size and configuration of the control system can be easily changed in response to changing needs.

Installation of this system was simple. The studio B patch panel and dimmer rack were removed and standard circuit breaker panels installed in their place. Large parts of the old load conduit system were reused. New wiring devices now distribute raw power throughout the studio. Portable IPS dimmers, fixtures, studio monitors, chain motors and other gear can all be hung where they're needed and plugged into the closest power outlet with a flexible cord and connector.

Control of these devices is also simple. USITT DMX512 compatible control outlets are spaced throughout the studio. Powered devices are interconnected locally by a DMX daisy-chain

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control cable then plugged into a nearby outlet. The USITT DMX512 protocol is a standard in the entertainment lighting industry. Virtually all newer studio lighting products are compatible with this protocol.

Dimmer technology

What makes this distributed control system practical is the onset of silent insulated gate bipolar transistor (IGBT) dimmer technology. Use of IGBTs to control lighting is relatively new (less than eight years). Motor controls are the better known application. By contrast, SCR dimmer technology is ancient and little changed from its introduction in 1959.

IPS-DS-2403, 3x2.4kW 800µs dimmer bar.

A microprocessor and two power devices are used in each IGBT dimmer to control a wide range of load types. No passive filter chokes are needed, as voltage transition time is a function of software, the microprocessor and the power devices. IGBT dimmers are free of magnetics and vibration; they're lightweight (1.5 pounds/dimmer); they're compact (half the size of a VHS tape); and they're efficient (<2.5V drop across an 800µs dimmer set at full). SCR dimmer noise, which would normally necessitate a remote dimmer room and heavy dimmer filtering is eliminated.

The microprocessor on each IPS dimmer allows it to sense and intelligently respond to changes detected in incoming power, load size, load type, temperature and other conditions. For this reason, IPS dimmers can power or control inductive and other odd load types without difficulty. Furthermore, the microprocessor enables each dimmer to diagnose problems and report dimmer and load status to the system operator via the DMX control line. This important feature is called IPS TalkbackTM.

The manufacturer of IPS dimmers also offers a wide range of DMX512 compatible control products. The most powerful of these integrates control of dimmers, automated lighting and other loads. This system is based on the PC computer hardware platform and MS Windows 95-compliant software. Use of standard hardware and software makes the IPS control system scaleable, easy to operate and maintain.

The Intelligent Power System equipment installed at KRON-TV was manufactured by ROSCO/Entertainment Technology Inc. of Portland, OR. Additional information about this equipment is available at: www.rosco-et.com. ■

Jim Crooks is vice president of marketing, Rosco/Entertainment Technology, Deephaven, MN.

Editor's note: Field Reports are an exclusive Broadcast Engineering *feature for broadcasters. Each report is prepared by well-qualified staff at a broadcast, production or consulting company.*

The reports are performed by the industry, for the industry. Manufacturer's support is limited to providing loan equipment and to aiding the author if requested.

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Fluorescent light fixtures in the film and TV industries are frequently used. You can imagine an instrument such as a light reflector, which is broadly used in film production, made out of EL that can be placed as close as two inches away or around the subjects. Cool-Lux uses this EL technology to enable a cameraperson to literally wrap the subject. There is no heat or eye discomfort.

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Although other companies may have the capability to produce a predesigned stamped EL panel of one square foot or less, Pana-Tek is licensed for the worldwide patent process of manufacturing EL up to 22 inches in width with continuous runs to 1,500 feet. It can also be sliced and/or customized to any width. Pana-Tek offers the product in any length and widths of one, three, five, 12 and 22 inches. The lighting system comes with power supply, ballast, control panel, connectors and adapters. The control panel allows the user to adjust the brightness level from a brilliant glow to a soft light. This system can be dimmed and can also be traced or chased with computer programming.

The light is available in two colors, a sky blue or a white. When the unit is not lit, the sky blue panel looks white and the white panel looks salmon. It can be overlaid with any color gel or an inkjet printer to create any desired image on its surface.

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Just cut the Pan-EL-Lite with a pair of scissors to any size and put it where better light is needed. From creative to difficult — film, stage and TV lighting requirements are easily satisfied as a result of EL in this form. Pan-EL-Lite will be sold in reels, much the same as film. ■

George Panagiotou is president of Pana-Tek, Inc.

Technology In Transition

Routing switchers

BY THE *BE* STAFF

Facilities have always had to deal with multiple signals and signal types. For most, the answer has been a routing switcher. Today, facilities are faced with the challenge of handling not only composite analog video, but also analog component video, as well as component and possibly composite digital video. Audio in both digital and analog formats must be routed throughout facilities and data and control signal routing has also become common. Compressed signals are more common today, and the future is likely to bring in even more audio and video signal types as we transition to DTV.

Replacing or augmenting an existing routing switcher is a task many would prefer to avoid because most are central to facility operations. Careful planning is required to replace a routing switcher without disrupting normal operations. One of the first steps in the planning phase is to chose a router and determine whether it will replace an existing system or simply be used to expand the existing routing infrastructure. The ability to control several different routers with a single control system makes operation simpler and less error-prone.

Vendors of routing switchers were contacted about the size, flexibility and control of their routers. Their responses are summarized in the following table. For more information, use the Reader Service numbers shown in the first column.

Mfgr	Model	Small matrix size	Large matrix size	Expansion possibilities	Rack space required (RU)	Signal types	Control systems	Support other vendor's control systems?	Redundant systems
Artel Video Systems #280	Various	16x16	512x512, 32 levels	In groups of 16x16	32 frames-2RU, 64 frames-7RU, 128 frames-12RU	Analog audio/video, digital audio/video	SC-2 and SC-3	Pro-bel, NVision, Horizon	Power Supplies/Control Systems
AutoPatch #281	8Y-XL	8x8	256x256	In increments of 8 inputs or 8 outputs	6	Composite, Y/C, Audio, RGB Digital	Local/remote XY panels, single bus remote panels, Windows software	AMX, Crestron, Phast	None
Datatek Corporation #282	D2600/D2800	32x8	1024x1024	Sources and destinations	1, 2 and 11RU building blocks	Video, audio, digital video, digital audio, time code, data	Coax and RS-232/422	No	Control and Power
Di-Tech #283	Meridian 5875	32x16	64x64	Larger than 64x64	6 for 64x64	SDI digital/analog video/DS3	Graphical virtual matrix	Sony	Power Supplies
Extron Electronics #284	MAV 1616 Series	16x16	16x16	None	2	Composite video and/or 2 Ch. audio	Front panel, RS-232/422 and Windows software		Power supply (optional)
Extron Electronics #285	CrossPoint 1616 Series	16x16	16x16	None	6	Various models can handle RGBS, RGBHV, Composite, S-Video and 2 Ch. audio	Front panel, RS-232/422 and Windows software		Power supply (optional)
Knox Video Technologies #286	Various	4x1	64x64	Insertion cards, 8x8 up to 64x64	2 and 8	NTSC/PAL, Y/C, RGB	Windows driver, front panel keypad, remote keypad (hand held and rackmount)	AMX, Crestron, Leightronix	Control and Power
Kramer #287	2516	16x16	16x16	96x96	2	Composite, Y/C, YUV and RGBS	RS-232, Manual, Microprocessor	Yes, by custom software	Protocol
Leitch #288	Xpress	12x1	12x1	None	1	Serial digital video, analog video, analog audio, AES audio	Local or remote panels, RS-232/422	Yes	None

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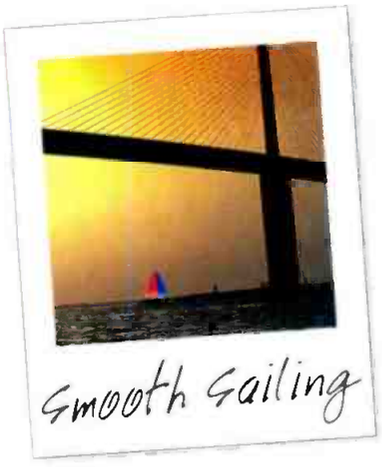

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DVB Digital Video Broadcasting

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Mfgr	Model	Small matrix size	Large matrix size	Expansion possibilities	Rack space required (RU)	Signal types	Control systems	Support other vendor's control systems?	Redundant systems
Leitch #289	VIA32	32x16	32x32	64x32 or 32x64	2	Serial digital video, analog video, analog audio, AES audio	All current Leitch control systems	Yes	Power Supplies
Leitch #290	Xplus	4x1 and 4x4	64x1 and 16x16	4096x1	1 or 2	Serial digital video, analog video, analog audio, AES audio	All current Leitch control systems	Yes	Power Supplies
Leitch #291	Integrator	32x32	128x64	To 128x64	4, 6 and 8 RU	Serial digital video, analog video, analog audio	All current Leitch control systems	Yes	Power Supplies/Control Systems
Metawave #292	MX 32	4x4	32x32	None	2	143, 177, 270, 360Mb/s	RS-232/422	No	Control and Power Supply
Metawave #293	MXA 256	32x32	256x256	Slave Chassis	11U for 128x128	AES 3	RS-422	Pro-bel, Utah, BTS Horizon	Control and Power Supply
Metawave #294	MX 64	16x16	64x64	Can be plugged into our 128x128	11	143, 177, 270, 360Mb/s	RS-422	Pro-bel, Utah, BTS Horizon	Control and Power Supply
Metawave #295	MX 256	32x32	1024x1024	Extra Chassis	11U for 128x128	143, 177, 270, 360Mb/s	RS-422	Pro-bel, Utah, BTS Horizon	Control and Power Supply
Miranda #296	SEL-1604	16x4	16x4	None	1	4:2:2 and 4fsc (143, 177, 270, 360Mb/s)	RS-422	No	None
Miranda #297	SEL-402i	4x2	4x2	None	4 in a single RU	4:2:2 and 4fsc (143, 177, 270, 360Mb/s)	RS-422	No	None
Network Electronics #298	Various	16x2 and 8x8	16x16 and 32x32	16x2 expandable to 128x2	1RU for 16x2 and 8x8	Analog/digital, audio and video, telecom	RS-232, MIDI	AMX, Crestron	Power supply (optional)
Nova System #299	NovaRouter	8x8	32x32	Up to 32x32	1-4	Analog/digital video (composite, Y/C, component, SDI), bal./unbal. analog audio, digital audio	XY control, remote software, AFV or Breakaway	Software control allows flexible support	None
PESA Switching Systems #300	Tiger	8x16	144x144 per frame	512x512	12 (video) 8 (audio)	Composite analog/digital video, 2ch analog or 2 levels of asyncronous AES/EBU audio	PESA 3500 controller		Power Supplies and Controller
Philips #301	Triton	8x8, 16x16, 16x2	16x16	None	1	Analog video/audio, digital video (all bit rates), digital audio (75/110 ohm), telecom data from 34Mb/s to 155Mb/s	Local and/or remote panels. Optional connection to Jupiter Control System	Yes	Power supplies
Philips #302	Mars	24x8	24x8	None	1	Analog video/audio, digital video (all bit rates), digital audio (75/110 ohm), telecom data from 34Mb/s to 155Mb/s	Jupiter control system supports a wide range of control types.	Yes	Power supplies/System controller. Auto-switching for redundant signal paths.
Philips #303	Venus Gigabit Router	16x16	16x16	None	2	Digital video up to 1.5Gb/s HDTV	Jupiter control system supports a wide range of control types.	Yes	Power supplies/System controller. Auto-switching for redundant signal paths.
Philips #304	Venus	32x32	1024x1024	Unlimited flexibility up to 1024x1024	11RU for 64x64 VAA or 96x96	Analog video/audio, digital video (all bit rates), digital audio (75/110 ohm), telecom data from 34Mb/s to 155Mb/s	Jupiter control system supports a wide range of control types.	Yes	Power supplies/System controller. Auto-switching for redundant signal paths.
Pro-bel #305	Freeway	16x16	64x64	Up to 64x64 in 16x16 increments	3 (includes built-in control system & dual power supplies)	Serial digital/analog video, AES/EBU and stereo analog audio. Any combination can be mixed in a frame.	Built-in, Pro-bel's System 2, 3 or Procion	Through a general-purpose protocol	Control module and power supply (optional)
Sierra Video Systems #306	Manzanita	5x1	32x4	None	1	Component, composite, sync pulses and balanced audio	Digital logic	AMX, Crestron, Leightronix	None
Sierra Video Systems #307	Tahoe series	16x16	32x128 and 48x48	From 16x16 to 16x48, from 32x8 to 32x128	3-18	Component, composite, sync, TTL and balanced audio	RS-485 control panel, RS-232/422 serial control	AMX, Crestron, Leightronix	Power Supply (optional)
Sierra Video Systems #308	Shasta series	8x8	128x128	Up to 128x128	4-8	143, 177, 270, 360Mb/s, 8- and 10-bit serial digital video and digital audio	RS-485 control panel, RS-232/422 serial control	AMX, Crestron, Leightronix	Dual Power Supply
Sierra Video Systems #309	Ponderosa series	64x64	1024x1024	Up to 1024x1024	19-205	143, 177, 270, 360Mb/s to 2Gb/s 8- and 10-bit serial digital video and digital audio	RS-485 control panel, RS-232/422 serial control	AMX, Crestron, Leightronix	Power, Control, Signal path
Sigma Electronics #310	Various	4x4	128x128	From 4x4 to 16x16, from 16x16 to 128x128	1-24	Composite, CAV, RGB, RGBS, RGBHV, Digital video and analog/digital stereo audio	RS-232/422	AMX, Crestron, Leightronix	Power Supply (optional)
Tektronix #311	SMS 7000	16x16	1024x1024	In groups of 16 inputs and 16 outputs	Depends on pre-wired matrix size	Analog video/audio, digital video (all bit rates), HDTV digital video (1.5Gb/s), AES audio, RS-422 data	Serial control with open architecture to other manufacturers control systems	Pro-bel and AVS Omnibus	All power supplies and control systems
Videotek #312	SDR Series	4x4	16x16	Inputs, Outputs, Levels and Depths	1	Composite, component, SDI video, and Stereo, AES/EBU audio	Internal, External Panels, External PC	Lighthouse	None

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Videoframe Systems' VF100/Tally32: a tally expansion unit that can be configured with a variety of switchers including the Tektronix M2100; it offers 32 dry closures and 16 opto-isolated inputs in a compact 1RU format; setup and configuration are accomplished with a Windows 95 application provided with the unit; 530-477-2000; fax 530-478-0212

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J15ax8B

A next generation internal focusing lens with the shortest MOD and widest angle of any standard lens, the J15ax8B IRS/IAS is a standard ENG lens that lets you shoot in tight or restricted areas at the closest minimum object distance ever possible and capture more of the subject. It incorporates all the great features of IF+lenses including a built-in 2X extender, high MTF performance, Hi-UD glass, square lens hood and Canon's "Ergonomic Grip"

J20ax8B IRS/IAS

Excellent for ENG, sports and production, the J20ax8B IRS/IAS lets you squeeze in shots from 8mm and still take you all the way out to 320mm with its built-in extender. Incorporates all IF+ features, plus is the only lens (besides the J9ax5.2B IRS/IAS) with aVari-Polar lens hood, enabling rotation of attached filters.

NEW! XL-1

3-CCD DV Camcorder with Interchangeable Lens Mount System

With 3-CCDs, exclusive interchangeable XL Lens Mount System, unmatched optical technology, SuperRange Image Stabilizer, DV recording and output, and simultaneous four channel audio recording, the new XL-1 offers video producers and semi-pro videographers unmatched image quality and shooting versatility.

Interchangeable XL Lens Mount System
- Interchangeable XL lenses provide unsurpassed flexibility and superior range. Designed for the maximum potential of the DV format, XL lenses incorporate the highest quality multi-coated optics to achieve 600 lines of horizontal resolution.
- In addition to the standard 16:1 lens, there is an optional 3X wide-angle lens, a 1.6X extender and an EF to XL mount adapter. Therefore, the potential focal range of the XL-1 in 35mm camera equivalents -- from extreme wide to super telephoto -- is 24mm to 17.280mm (EF 1200mm lens and Extender EF 2X).

16:1 Optical Zoom with SuperRange Image Stabilizer
- The 16:1 zoom has a focal length range of 5.5 to 88mm (35mm equivalent of 39 to 633mm). It has high speed motors for autofocus and zoom, a six blade iris and a 1.5X ND filter. Externally the lens provides a variable speed zoom, manual zoom and manual focus control options and a one-push auto-focus button.
- 16:1 also incorporates SuperRange Optical Image Stabilization. Besides a gyro sensor to detect camcorder vibration, it uses a motion vector to examine the image after it is received by the CCD to detect any shake missed by the gyro. This data is fed back to refine the movement of the vari-angle prism --resulting in the most advanced stabilization system available today.

3-CCD Image Sensor with Pixel Shifting Technique
- Three 270,000 pixel CCDs with advanced Pixel Shift technology achieves 530 lines of resolution while applying significant improvements to the video signal. It also favorably affects image quality of the XL-1's digital zoom (sharper diagonal lines and reduced moiré patterns) when extended magnification is required.
- Large (72 micron) CCDs deliver a 4dB improvement in sensitivity. Vertical smear from bright light s is also dramatically reduced.

Three Digital Audio Modes
- Three digital audio modes (16 bit and two 12 bit modes) and simultaneous recording of four separate tracks. You can also output each signal independently.
- Audio inputs with independent level controls include one stereo mini-jack and two pairs of stereo RCA jacks. The optional MA-100 Microphone Adapter-Shoulder Pad allows use of two XLR-type mics, plus it makes shoulder mounted shooting possible.

Three Recording Modes:
- Three recording options. Capture of high resolution full motion video (Normal Movie Mode), high resolution stop action images of moving subjects (Frame Movie Mode) and perfect stills (Digital Photo Mode). Frame Movie mode continuously records 30 frames a second and effectively eliminates motion flicker by capturing a full image with every scan. Record high speed action for the purpose of extracting high resolution frame video images which can then be displayed, printed or digitized.
- For SLR-Style flash photography, the Digital Photo mode can accommodate the Canon 380EX E-TTL Speedlite using the optional FA-100 flash adapter.

Unique Design & Dual Action Carrying Handle
- A unique shoulder mount design and carrying handle can accommodate a variety of shooting positions. In addition to the normal side grip,the handle includes an additional start/stop switch and zoom control for dual-action shooting. Also ideal for low-angle recording. The adjustable shoulder brace enhances the shoulder mount design, serving multiple users and ensuring maximum comfort.

Additional Features:
- Extra large 180,000-pixel color viewfinder allows you to shoot with the left or right eye and move from close range to short distance (sports finder) at the flick of a switch.
- Zebra pattern and color bar generator to prevent over exposure and ensure accurate color display during monitor set-up.
- Automatic and manual white balance, gain (five preset levels from -3 to +12dB) and exposure lock.
- Records DV time code for as well as data code -- date, time, shutter speed and exposure settings. The information remains hidden until selected for display.
- Composite, S-Video & DV (IEEE 1394) output. Control L terminal.
- Slow speed shutter 1/8, 1/15 and 1/30 of a second.
- LP Mode extends recording time of tape by 1.5 times.
- Digital fader and wide screen TV effect.
- Headphone jack with level adjustment.
- Remote control with jog/shuttle dial.

SONY

UVW-100B

3-CCD Betacam SP Camcorder

Betacam SP one-piece camcorders are still the mainstay of field acquisition,--and the UVW-100B is no exception. An enhanced version of the best-selling UVW-100, the new UVW-100B further extends performance and functionality. Equipped with Sony's state-of-the art Power HAD CCD sensors, the camera virtually eliminates vertical smear (1/10 that of the UVW-100) and achieves much higher sensitivity, F11 at 2000 lux. And while more affordable than ever, the UVW-100B also offers 700 lines of resolution, 60dB S/N ratio, 26-pin VTR interface, compact design and ease of operation--making it ideal for field shooting applications.

Power HAD CCD Sensors
Three 1/2-inch IT (Interline-Transfer) Power HAD CCD sensors with 380,000 pixels attain incredible sensitivity of F11 at 2000 lux (low light is 4 lux at f1.4, +18dB), S/N ratio of 60dB and and 700 lines of resolution. Improved the structure of the IT CCD pixels also drastically reduces vertical smear so you have more freedom when shooting a high-lighted subject.

Selectable Master Gain
Under poor lighting, you can adjust the output level with the master gain selector to obtain brighter pictures. Gain-up value can be preset in 1dB steps from 1dB to 18dB.

Intelligent Auto Iris
When a subject is framed in a backlit situation or very bright lighting against a dark background, the subject is shown rather dark or too bright using the conventional auto iris. Intelligent Auto Iris detects the lighting conditions and adjusts the lens iris for the proper exposure.

Total Level Control System
Even if the incoming light exceeds the limit of the automatic iris control, the UVW-100B offers proper picture brightness by using the iris control in combination with AGC, Auto Exposure and Intelligent Auto Iris functions.

Clear Scan
Clear Scan records computer monitors without horizontal bands across the screen. Shutter speed in 183 steps within a range of 60.4 to 200.3 Hz can be set to match the monitors scanning frequency. Also has a variable high speed shutter from 1/100 to 1/2000 of a second.

Built-In Time Code Generator
SMPTE longitudinal (LTC) time code and User-bit generator and reader. Functions such as Rec Run/ Free Run, Preset/Regen are easily set. For multi-camera operation, time code genlock to an external time code is provided.

Audio System
Recording inputs to the two longitudinal audio tracks are via XLR connectors. (with supplied on-camera mic or through rear inputs). Recording level for each track is adjustable and noise reduction can be switched in.

Genlockable
Genlock Input for synchronizing with other professional cameras. Also has a built-in color bar generator.

26-pin VTR Interface
With the 26-pin VTR interface the UVW-100B can feed component, composite and S-Video signals to another VTR for simultaneous recording. Functions such as start/stop are controlled through the 26-pin interface. External VTR status, such as Rec, Tally and Alarm will be shown in the viewfinder.

OXF-601 Viewfinder
Made of diecast aluminum, the ergonomic 1.5-inch OXF-601 viewfinder is rugged and durable yet ensures comfortable and easy operation while providing a remarkable 600 lines of resolution. Large diameter eye cup reduces eye strain and simplifies focusing. Diopter adjustments (-3 to 0) compensates for differences in eye sight.
Zebra level indicators, safety zone and center marker generator. Shows tape remaining and audio levels.

Optional VA-300 Playback Adapter
Full *color* picture playback is available in the field by connecting the optional VA-300 playback adapter to the 20-pin interface of the UVW-100B. The VA-300 provides composite output and VHF signal output (with the optional RF Unit RFU-89A) for reviewing the recorded pictures on the monitor. The VA-300 is also equipped with two audio channels.

LCD Multiple Display
An 8-digit LCD display indicates time data, warning indications and video status. Battery status and two-channel audio level are also shown in a bar graph meter and in the record mode, remaining tape quantity is shown.

Interactive With Anton/Bauer
With Anton/Bauer Digital Batteries the amount of remaining battery power is accurately displayed on the LCD panel and through the viewfinder. Using Anton/Bauer's UL-2 Ultralight, lighting power is turned on and off according to the VTR Start/Stop function.

Compact, Lightweight and Well Balanced
Weighs 6.9 kg (15lb 3oz) with the viewfinder, battery, cassette and lens. It is well balanced, with a low center of gravity. Shoulder pad is adjustable, so you maintain optimum balance when using different lenses and batteries.

QUICK DIAL 74

Panasonic

Broadcast & Television Systems

AG-DP800H

S-VHS 3-CCD Digital Signal Processing Camcorder

- Three high-density 380,000 pixel CCDs with half-pitch pixel offset achieves 750 lines of horizontal resolution, S/N ratio of 60dB and sensitivity of f8 at 2000 lux. Additionally the Frame Interline Transfer (FIT) CCDs minimize vertical smear even in very bright illumination.
- Digital Signal Processing circuitry provides four valuable benefits:
  1) Consistently reliable up-to-spec performance.
  2) Fine adjustment of a wide range of parameters.
  3) Memory storage and instant recall of specific settings.
  4) More flexible and higher quality image processing, easier maintenance.
- Super High Gain mode allows shooting under illumination as low as 2 lux while retaining detail and color balance.
- Synchro Scan function allows flicker-free shooting of computer monitors. Electronic shutter increments can be set variably from 1/61 seconds to 1/253 of a second.
- Built-in internal time code generator lets you record with SMPTE LTC/VITC (Longitudinal/Vertical Interval) time code.
- Two Hi-fi stereo audio channels with a dynamic range of 80 dB as well as two linear audio channels with Dolby NR.
- Has a 26-pin connector for convenient backup recordings using an additional VCR equipped with a 26 or 14-pin connector.
- Phantom power can be supplied to an optional mic. Power can be switched off to prevent battery drain when not in use.

QUICK DIAL 72

sachtler

VIDEO 14/100 FLUID HEAD

- Sachtler Touch and Go System
- Integrated sliding battery plate
- Strengthened dynamic counterbalance in 2 steps
- Frictionless leak proof fluid damping with three levels of drag
- Vibrationless vertical & horizontal brakes
- Built in bubble for horizontal leveling

HOT POD TRIPOD SERIES

Especially developed for use in ENG, the Hot Pod tripod is the fastest in the world. The central locking system is activated on all three legs at the same time, while the pneumatic center column easily makes it possible to have the lens at a height of over 7 feet. The elevation force of the center column is factory set and doesn't require any setup. When moving to another location it can be carried by its handle located at the center of gravity.

ENG TWO-STAGE TRIPOD SERIES

Sachtler two-stage tripods have an enlarged height range (lower bottom and higher top position) so they are more universal. Legs can be locked in seconds with Sachtler's quick clamping. There are also heavy duty versions for extra stability. The heavy duty aluminum has a 20mm diameter tube vs. 16mm and the heavy duty carbon fiber has a 24mm diameter tube vs. 22mm. All heavy duty two-stage tripods have a folding tripod handle.

Sachtler CADDY systems

Now Sachtler quality is available to low budget users. The price of a CADDY system includes the new 7-step dampened CADDY fluid head, ultra-light but rugged carbon fiber tripod, lightweight spreader and either a soft bag or cover. The CADDY fluid head features an adjustable pan arm, 7 step adjustment for quick counter balance and the self-locking Sachtler Touch and Go System.

CAD 01 Single-Stage ENG Carbon Fiber System:
- CADDY Fluid Head • ENG Single-Stage Carbon Fiber Tripod
- SP 100 Lightweight Spreader • Transport Cover 100

CAD 2A 2-Stage ENG Carbon Fiber System:
- CADDY Fluid Head • ENG 2-Stage Carbon Fiber Tripod
- SP 100 Lightweight Spreader • Soft padded ENG Bag

MILLER

Fluid Heads and Tripods

The silky, smooth action of each Miller Fluid Head is the product of the finest quality cast and machined parts functioning together in a fluid environment. They are engineering masterpieces, built to operate under extreme conditions. They're engineered to exceptionally fine tolerances and their mechanisms are protected effectively against ambient moisture and dust.

Miller 20 -Series II Fluid Head

- Dynamic fluid drag control
- Sliding/quick release camera platform
- Weighs 4 lbs. -- handles up to 22 lbs.
- Counterbalance system compensates for nose heavy or tail heavy camera configurations and permits fingertip control of the camera throughout the tilt range.
- Includes independent pan and tilt locks, bubble level, dual pan handle carriers and integrated 75mm ball levelling.

Miller 25-Series II Fluid Head

- 100mm ball level fluid head • Robust, lightweight, low profile design
- Quick release camera platform • Weighs 7lbs -handles up to 25 lbs
- Multi-step fluid drag system and integrated counterbalance system provide ultra-smooth, repeatable pan-and-tilt fluid control and finger-tip camer balance for ENG camcorders, industrial CCD cameras or small studio cameras

#601-Lightweight Tripod

- Weighs 4.5 lbs., supports up to 30 lbs.
- Minimum height down to 24", maximum height to 57".
- Folds down to 33" • Engineered from thermoplastic mouldings, diecast alloy and hard anodized tubular alloy.
- Fast, one turn, captive leg locks.
- Includes 75mm (3") ball levelling bowl.

#649-2-Stage Tripod

- Two extension sections on each leg. Operates at low levels as well as normal heights without the use of mini legs.
- High torsional rigidity, no pan backlash.
- Weighs 6.6lbs., supports 50 lbs. • Very portable, folds to 27".
- Includes 75mm (3") ball levelling bowl.

System 20 #338—Miller 20 Head, 601 Lightweight Tripod, On Ground Spreader
System 20 ENG #339—Miller 20 Head, 649 2-Stage Aluminum, On Ground Spreader
System 25 #500—Miller 25 Head, 611 Lightweight Tripod, On Ground Spreader
System 25 ENG #502—Miller 25 Head, 641 2-Stage Aluminum, On Ground Spreader

Vinten

Vision SD 12

Pan and Tilt Head with Serial Drag

The Vision SD 12 head features "Serial Drag" pan and tilt system. System consists of a unique, permanently-sealed fluid drag and an advanced lubricated friction drag. You achieve the smoothest pans and tilts regardless of speed, drag setting and ambient temperature.
- Patented spring-assisted counter-balance system permits perfect "hands-off" camera balance over full 180° of tilt.
- Instant drag system breakaway and recovery overcome inertia and friction for excellent "whip pans".
- Consistent drag levels in both pan and tilt axis.
- Flick on, flick off pan and tilt caliper disc brakes.
- Greater control, precision, flexibility and "touch".
- Touch activated, time delayed illuminated level bubble.
- Working conditions from as low as -40° up to +60°C.
- SD 12 weighs 6.6 lbs and supports up to 35 lbs.

Vision 12 Systems

Vision 12 systems include #3364-3 SD 12 dual fluid & lubricated friction drag pan/tilt head, single telescoping pan bar & clamp with 100mm ball base.

SD-12A System
- SD-12 pan and tilt head
- 3518-3 Single stage ENG tripod with 100mm bowl
- 3363-3 Lightweight calibrated floor spreader.

SD-12D System
- SD-12 pan and tilt head
- 3513-3 Two-stage ENG tripod with 100mm bowl
- 3314-3 Heavy-duty calibrated floor spreader

Vision Two Stage ENG and LT Carbon Fibre ENG Tripods

The ultimate in lightweight and innovative tripods, they are available with durable tubular alloy (Model #3513) or the stronger and lighter, axially & spirally wound carbon fiber construction (Model #3523). They incorporate torque safe clamps to provide fast, safe & self-adjusting leg clamps.
- "Torque Safe" requires no adjustment, its unique design adjusts itself when required, eliminating manual adjustment and maintenance and making for a much more reliable clamping system.
- New hip joint eliminates play and adds rigidity.
- They both feature 100mm levelling bowl, fold down to a compact 28", and support 45 lbs.
- #3513 weighs 6.5 lbs - #3523 CF (Carbon Fibre) weighs 5.2 lbs.

VIN-5ST and VIN-10ST
- Compact & lightweight, they maintain Vision performance and quality.
- Provide total stability and durability with payloads up to 33 lbs.
- Ideal for the latest generation of dockable and one-piece camcorders.
- Compatible with all Vision accessories.

VIN-5ST includes Vision 5LF head, single stage toggle clamp tripod, spreader and soft case.
VIN-10ST includes Vision 10LF head, single stage toggle clamp tripod, spreader and soft case.

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QUICK DIAL 71

SONY

DSR-200 3-CCD Digital (DVCAM) Camcorder

Incorporating DVCAM technology, the DSR-200 records an incredible 500 lines of horizontal resolution on its 5.5MHZ. To complement the video, the DSR-200 also records audio digitally for a breathtaking dynamic range of 96 dB. And since video and audio signals are recorded digitally, you can copy or edit multiple generations with no loss in picture quality.

3-CCD Camera System

Three CCDs, each with 410,000 active pixels deliver incredible color fidelity and dramatically improved S/N ratio. Also offers superb sensitivity of only 4 lux minimum illumination.

10X Optical/20X Digital Zoom

Variable servo 10X optical power zoom lens goes from 5.9 to 59mm in 1.7 to 24 seconds. The manual zoom rocker is continuously variable right up to where the digital 20X zoom kicks in.

Super SteadyShot

Using a proprietary motion sensing system, Sony's Super Steady Shot reduces high frequency camera shake without compromising image quality. SteadyShot uses horizontal and vertical motion sensors that allow it to work accurately while zooming, moving (even shooting from a car), and shooting in low light conditions.

Digital Effects

- Effects include audio and video fade, Overlap and Slow Shutter. In overlap mode, the last frame of the preceding scene dissolves to the action being recorded. In slow shutter it is possible to record in very low levels of light, albeit with MTV strobe-like effect.
- Time lapse record capability is selectable from 0.2 to 2 seconds in intervals from 30 seconds to 10 minutes.
- Frame recording mode lets you record with a stop motion animation effect. You move the subject a little and the camera can record six frames before going into standby mode.

Exposure Control

- Automatic and manual focus, iris, shutter, gain and white balance. Iris is adjustable in 12 levels from F1.6 to F11, shutter from 1/4 to 1/10000 of a second in 12 steps. Gain from -3dB to +18dB in 8 steps.
- Zebra Pattern indicator for adjusting shutter speed & exposure.
- Custom Preset function lets you preset, store and recall custom settings for color intensity, white balance (bluish or reddish), sharpness and brightness.
- Built-in ND filter cuts down the amount of light letting you to work in the middle of the camcorder's f-stop range even under bright conditions.

Time/Data Codes

- Stores Photo, Date/Time, Shutter Speed, Iris, Gain and F-stop for easy recall. So if you have to reshoot, you know your original settings for every scene and frame.
- Records Drop/Non-Drop Frame time code. Time code can be read either as RC time code or as SMPTE time code.

Professional Viewfinder

1-inch B&W viewfinder with 550 lines of resolution for easy focusing even in low contrast lighting situations. Also has a separate information sub panel for displaying time code, battery time, tape remaining and other camcorder functions without cluttering up the viewfinder.

Digital Audio

- Records 16-bit 48kHz audio on one stereo track or 12-bit/32kHz with two pairs of stereo tracks (L1/R 1, L2/R2), so you can add stereo music or narration.
- One-point stereo electret condenser mic for clear stereo separation. Directivity can be selected from 0°, 90° and 120°. Audio DSP provides wind noise reduction without harsh filtering to maintain audio quality.
- Automatic & manual (20-step) audio level record controls. Monitor audio with headphones or from the LCD panel which has an active VU meter. • XLR input connectors for mics and audio equipment.
- Since audio and video are recorded on separate areas of the tape, you can add audio tracks later and insert-edit video without affecting the original audio track.

DSR-200 Field Package:
- DSR-200 Camcorder • NPA-1000/B Battery Case Adapter
- 3 NP-F930/B 7.2v 4000 mAH Batteries
- AC-V900/B AC Adapter, Triple Battery Charger
- VCT-U14 Tripod Adapter • LC-2000CP System Case

DSR-30 DVCAM Digital VCR

The DSR-30 is Sony's first industrial grade DVCAM VCR. Industry standard 4:1:1 8-bit digital component recording with a 5:1 compression ratio provides spectacular picture quality and multi-generation performance. This feature packed VCR handles both Mini and Standard DVCAM cassettes for up to 184 minutes of recording time, as well as playback of consumer DV tapes. PCM Digital Audio is recorded at 48kHz (DAT quality) stereo.

Dual Cassette Mechanism

Dual cassette mechanism allows use of both standard DVCAM and mini sizes without an adapter.

Digital Audio

PCM (Pulse Code Modulated) Digital audio can be recorded at either 48kHz 16-bit 2 channel) for DAT quality audio, or at 32kHz 12-bit 4 channel) where an additional two tracks of audio can be added over previously recorded portions.

Editing Capabilities

Equipped with Control L, the DSR-30, when hooked up to another LANC-based recorder, is capable of SMPTE Time Code based accurate editing even without an edit controller. Built in editing functions include separate video and audio insert. Or assemble editing with up to ten scenes automatically assembled in any order chosen by the "In" and "Out" points. By searching for either an Index point or Photo Data recorded by the DSR-200 camcorder, the DSR-30 can drastically cut the time usually required for editing. The DSR-30 can record up to 135 Index points on the Cassette Memory thanks to its 16K bits capability.

Audio Lock

Audio lock ensures audio is fully synchronized with the video for absolute precision when doing an insert edit.

IEEE 1394 Interface

DV In/Out (IEEE 1394) connector on the VCR allows digital dubbing of video, audio and data ID with another VCR having this connector, with no loss in quality.

Clear Frame Picture

Using Frame Interpolation technology the DSR-30 can detect motion between two fields within a frame and compensate for picture blur providing a clear frame picture even from moving images.

Built-in Edit Control Unit

Built-in control tray has a jog/shuttle dial, VCR and edit function buttons. The jog/shuttle dial allows picture search at ±1/5 to 15X normal speed and controls not only the DSR-30 but also a player hooked up through its LANC interface.

Backward and Forward Compatible

Analog audio and video input/outputs make it fully compatible with non-digital equipment. Playback compatibility with consumer DV tapes allows you to work with footage recorded on consumer-grade equipment. Tapes recorded in the DSR-30 are also compatible with Sony's high-end DVCAM VCRs.

PVM-14N1U/14N2U & 20N1U/20N2U

13" & 19" Presentation Monitors

With high quality performance and flexibility, Sony's presentation monitors are ideal for any environment. They use Sony's legendary Trinitron CRT and Beam Current Feedback Circuit for high resolution of 500 lines as well as stable color reproduction. They also accept worldwide video signals, have a built-in speaker and are rack mountable. Four models, the PVM-14N1U/20N1U are designed for simple picture viewing, the PVM-14N2U and 20N2U add RGB input and switchable aspect ratio for more sophisticated applications.

They Feature:
- 500 lines of resolution to match DV, DVCAM and DVPRO recording capabilities.
- Beam Current Feadback for color temperature stability.
- The ability to handle four worldwide color systems: NTSC, NTSC 4.43, PAL and SECAM.
- Built-in speaker for small audiences without the expense of an additional sound system.
- On screen display in five languages. Picture adjustments (chrome, phase, contrast, brightness) and setup adjustments (volume, aspect ratio) are displayed as easy-to-read on screen menus.
- Closed captioning is available with the optional BKM-104 Caption Vision Board.
- Designed with a sturdy metal cabinet for stability, durability and rack mounting. The 13-inch series mount in a 19-inch rack with the MB-502B Rack Mount Bracket. The 19-inch monitors with the SLR-103A Slide Rail Kit.

PVM-14N2U/20N2U Only:
- Remote Control (Last Input Switch) - Contact closure remote control allows you to wire a remote to an existing system so that the monitor's input can be remotely controlled to switch between the last previously selected input and the current input.
- With the PVM-14N2 and PVM-20N2U Series, the aspect ratio is switchable between 4:3 and 16:9 simply by pressing a button.

PVM-14M2U/14M4U & 20M2U/20M4U

13" & 19" Production Monitors

Sony's best production monitors ever, the PVM-M Series provide stunning picture quality, ease of use and a range of optional functions. They are identical except that the "M4" models incorporate Sony's state-of-the-art **HR Trinitron** CRT display technology and have SMPTE C phosphours instead of P22.
- HR Trinitron CRT enables the PVM-14M4U and 20M4U to display an incredible 800 lines of horizontal resolution. The PVM-14M2U and 20M2U use an aperture grille dot pitch of 0.25mm to offer 600 lines of resolution. M4 models also use SMPTE-C phosphours for the most critical evaluation of any color subject.
- Dark tint for a higher contrast ratio (black to white) and crisper, sharper looking edges.
- Beam Current Feedback Circuit • 4:3/16:9 switchable aspect ratio.
- Each has two composite (BNC), one S-Video and component input (R-Y, B-Y, analog RGB) for flexibility. For more accurate color reproduction, the component level can be adjusted according to the input system. Optional serial digital interface kit BKM-101C (video) and BKM-102 (audio) for SMPTE 259M component serial digital input.
- True multi-system monitors they are equipped to handle four color system signals: NTSC, NTSC 4.43, PAL and SECAM.
- External sync input and output for synchronization with other equipment. Can be set so that it will automatically switch according to the input selected.
- Switchable color temp: 6500K (broadcast), 9300K (pleasing picture). User preset (3200K to 10000K).
- Underscan and H/V delay capability. In underscan mode the entire active picture area is displayed, allowing you to view the entire image and check the picture edges. H/V delay allows viewing of the blanking area and sync/burst timing.
- Using color bars as a reference, Chroma/Phase setup mode facilitates the complex, delicate procedure of monitor adjustment. Especially convenient when used with computer-based editing systems.
- On-screen menus for monitor adjustment/operation.
- Parallel remote control and Tally via 20-pin connector.
- Sub control mode allows fine on screen adjustment of the center detent value of the contrast, brightness, chroma and phase knobs.
- PVM-14M2U/M4U mount in a 19-inch rack with the MB-502B Rack Mount Bracket. The 20M2U/M4U monitors mount with the SLR-103A Slide Rail Kit.

QUICK DIAL 72

SONY

UVW-1600/UVW-1800

Betacam SP Editing Player • Betacam SP Editing Recorder

The UVW-1600 editing player and UVW-1800 Editing Player/Recorder are the other half of the UVW series. They provide the true superiority of the Betacam SP format with sophisticated editing features. They are equipped with RS-422 9-pin interface, have built-in TBC's, and Time Code operation. A variety of inputs and outputs, including R-Y/B-Y component, S-Video and Composite are provided as well. When controlled from an edit controller with RS-422 capability, the UVW-1600 and UVW-1800 form an excellent editing system. They also offer an easy and economical way to enter the Betacam SP format with all its excellent virtues of superior performance, versatility, and reliability.

All the features of the UVW-1200/1400A *PLUS*—

Built-in TBC

Optional BVR-50 TBC Remote Controller allows remote TBC adjustment. The BVR-50 connects via a D-sub 15-pin cable to the rear panel.

Time Code

The Betacam SP format has an independent time code track so an audio track doesn't have to be sacrificed for time code. Frame accurate A/B roll editing is achieved with LTC time code. Functions like Drop Frame/Non-Drop Frame, FREE-RUN/REC-RUN are easily selected by the setup menu keys on the sub-control panel.

RS-422 Interface

An RS-422 9-pin serial interface is provided for versatile editing system expansion. A host of edit controllers can be used, including the Sony PVE-500, BVE-2000, Panasonic AJC-TAD and Videomedia stand-alone or computer-based edit controllers.

Multiple Outputs

They provide two types of component output through three BNC connectors or a Betacam 12-pin dub connector. The component signal interface allows full advantage to be taken of the superb performance of the Betacam SP format. They also output composite and S-Video. The UVW-1800 features composite, S-Video, component and 12-pin dub inputs as well.

UVW-1800 Only

When connected to an RS-422 equipped edit controller, the UVW-1800 functions as an editing recorder for assemble or insert editing. Frame accurate editing is assured, thanks to the sophisticated servo control and built-in time code generator/reader. In the insert mode of the UVW-1800, video, audio channel 1, audio channel 2, and time code can be inserted independently or in any combination.

PVW-2600/PVW-2650/PVW-2800

BETACAM SP 2000 PRO SERIES

Use of the world standard Betacam SP recording system results in the superior picture quality of the SP 2000 PRO series. Betacam SP is a component recording format in which the chrominance signals (R-Y, B-Y) are time compressed and recorded on one track by using the CTDM system (Compressed Time Division Multiplex). The luminance signal meanwhile is recorded on a separate track so that cross color and cross luminance effects don't exist in the Betacam system. This component two-track recording technology is combined with high frequency FM carriers for each track, providing very wide bandwidths for both the luminance and chrominance signals. The result of all this is that detailed luminance and chrominance information is superbly reproduced, characteristics which create the excellent multi-generation picture performance of the Betacam SP format.
- Performance is further enhanced with the use of metal particle tape. The PVW-2800 uses metal particle tapes exclusively for recording. In playback all three can use both metal particle and oxide tape assuring compatibility with BVW broadcast series Betacam SP VCRs.
- Two longitudinal audio channels with Dolby C - type NR deliver high quality audio with a wide dynamic range, minimum distortion and excellent S/N ratio.
- Built-in TBC's provide stable pictures and eliminate the need for additional correction. Digital dropout compensation also ensures consistent picture performance.
- Remote TBC adjustments can also be done using the optional BVR-50 TBC Remote Controller connected via a D-sub 15-pin cable to the rear panel connector.
- The PVW-2600, PVW-2650 and PVW-2800 (generates as well) read VITC and LTC time code as well as UserBits. LTC can be automatically recorded on the dedicated time code track. Ext/Int time code, Regen/Preset, or Rec-Run/ Free-Run selections are available on the sub-control panel.
- Built-in character generator with output superimposed on the video or monitor output. It displays time code (VITC/LTC U-BIT) or CTL data. VTR function status can also be displayed by accessing the setup menu. Character display is On/Off switchable from the sub-control panel.
- An easy to use set-up menu allows many functional parameters to be preset. The initial setup menu is scrolled and modified by the search dial while being monitored via video or monitor out.
- RS-422 (9-pin) serial interfaces for versatile editing and flexible system control.
- Picture search provides recognizable monochrome pictures at up to 24X normal speed in forward and reverse. Reproduced in color at speeds up to 10X.
- The PVW-2600 and PVW-2650 both provide two types of component output: three BNC connectors or a Betacam 12-pin dub connector. The PVW-2800 provides two sets (for input and output).
- The PVW-2600 and PVW-2650 also have composite and S-Video outputs. The PVW-2800 has input and output of composite and S-Video.
- Comprehensive self-diagnostics for easy maintenance and servicing. A digital hour meter indicates accumulated time of power on, drum rotation, tape running and number of threading/unthreading operations.
- Their control panels can be tilted at up to 90° or be detached from the machine. With optional BKW-2010 Control Panel Extension Kit and BK-803 Control Panel Case offers remote control from up to 15 feet away.
- Optional RMM-110 Rack Mount Kits allow mounting into a 19" rack without taking off the side panels.

PVW-2600
- More than 90 minutes of playback time using L-size metal or oxide cassettes.
- High-Speed picture search provides recognizable color pictures at up to 10X normal speed in forward and reverse (also 24X normal speed in monochrome).
- Two longitudinal audio channels with Dolby C-type NR.
- Equipped with RS-422 9-pin serial interface.
- TBC with high quality digital dropout compensator.
- Optional BVR-50 provides remote control of the TBC.
- LTC/VITC/User Bits reader and character generator.
- User friendly dial menu operation, enhanced serviceability with built-in self diagnostics.
- Y/R - Y/B-Y component signal outputs via BNC or 12-pin DUB connectors, also equipped with S-Video output.

PVW-2650
- Dynamic Tracking (DT) playback from -1 to +3 times normal speed.

PVW-2800
- Built-in comprehensive editing facilities.
- Dynamic Motion Control with memory provides slow motion editing capability.
- More than 90 minutes of playback and record time using L-size metal or oxide (playback only) cassettes.
- Built-in LTC/VITC/User Bits Reader and generator.
- Y/R - Y/B-Y component output via BNC or 12-pin Betacam DUB connectors also equipped with S-Video output.

UHF WIRELESS MICROPHONE SYSTEM

- 800 MHz UHF band is not affected by external noise and interference caused by other wireless systems.
- A PLL (Phase Locked Loop) synthesized system controls the transmission and reception frequencies, allowing stability and easy access to multiple channels.
- Memory back-up recalls the last frequency used when powered up.
- To ensure accurate audio reproduction, the System is equipped with tone squelch circuitry control.
- Wireless channels are preset in each tuner for use in a multi-channel operation at one location. There are 6 channel plans with up to 19 channels for simultaneous multi-operation use.
- All transmitters and receivers are equipped with backlit LCD displays, providing group, battery & AF level status.
- Employs a Companander system for optimum transmission over a wide dynamic range with low noise and interference.
- A space diversity, with two or more antennas used to eliminate noise and signal dropouts.

WRT-810A UHF Handheld Wireless Microphone

- PII Synthesized Control Transmission.
- 8 hours of continuous operation with two AA batteries.
- Selectable RF output of either 2.5 mW or 10 mW depending on transmission distance and operating environment.
- Easy-to-read illuminated LCD display of operating channel, battery status, etc.

WRT-830A UHF Handheld Wireless Microphone

- Incorporates an electret condenser mic capsule with unidirectional design.
- Ideal for vocals at film production and broadcasting stations.
- On/Off switch is located inside the body to prevent accidental turnoff.
- PLL Synthesized Control for easy access to all 94 selectable frequencies.

WRT-820A UHF BELT PACK Transmitter

- Accepts all Sony lavalier mics including the ECM-166BC, ECM-44SC/BC, ECM-55 SC/BC, ECM-66 SC/BC and ECM 77 SC/BC. WRT-820A can also be used for wireless guitar applications, using the optional K-1161 instrument cable.
- Backlit LCD information display.
- 8 hrs of operation with 2 AA batteries.

WRR-820A and WRR-840A Sythensized Diversity Single and Dual Reception Systems

- Employ space diversity reception system to eliminates noise and signal dropout. Diversity reception also assures highly stable reception at greater distances.
- Six channel configurations are factory-preset in the tuners for multi-channel operation.
- Selectable outputs of -60dB, -48dB or -20dB for interfacing with other audio devices, such as mixers, recorders, or amps.
- PLL synthesized tuning control ensures stability and easy access to 94 frequencies.

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Panasonic
WJ-MX50
Digital A/V Mixer

- Four input switcher and any two sources can be routed to the program busses
- Two-channel digital frame synchronization permits special effects in each A/B bus
- Combination of 7 basic patterns and other effects creates 287 wipe patterns
- External edit control input for RS-232 or RS-422 serial controls. Also has GPI input.
- Wipe boundary effects: soft/border (bold, 8 background colors available)
- Digital effects: strobe, still, mosaic, negative/positive, paint, monochrome, strobe, trail, and AV synchro
- Real-Time compression - entire source image is compressed inside a wipe pattern
- "Scene Grabber" – move a pattern while upholding the initially trimmed-in picture integrity
- Non Additive Mix (NAM) selects between A and B sources, passing only the signal with the highest luminance value
- Fade-in and fade-out video, audio, titles individually or synchronously faded
- Down stream keyer with selectable sources from character generator or external camera.
- Eight separate memories enable instant recall of frequently used effects
- 8 preset effects including: Mosaic Mix, Position Stream, Corkscrew, Bounce, Flip, Shutter, Vibrate, and Satellite
- Audio mixing capability of 5 sources with 5 audio level adjustments.

HORITA
BSG-50
Blackburst/Sync/Tone Generator

The BSG-50 provides an economical means for generating the most common RS-170A video timing signals used to operate various video switchers, effects generators, TBCs, VCRs, cameras and video edit controllers.

- 6 BNC video/pulse outputs
- Now available: 6 blackburst, 4 sync, 2 subcarrier
- Each sync output individually settable for composite sync, composite blanking, H-drive, or V-drive.
- Separate buffer for each output–maximum signal isolation
- 1KHz, 0dB sinewave audio tone output, locked to video
- Outputs can easily be configured to meet specific user and equipment needs $269

CSG-50
Color Bar/Sync/Tone Generator

- Generates full/SMPTE color bars, blackburst and composite sync signals
- Built-in timer can automatically switch video output from color bars to color black after 30 or 60 seconds. Easy and convenient for producing tape leaders and striping tapes with color bars and black.
- Front panel selection of full-field or SMPTE color bar patterns or colorblack (blackburst) video output.
- Includes crystal-controlled, 1KHz, 0dB audio tone output.
- Outputs: video, sync, rel frame, 1 KHz, 0dB
- Audio tone switches to silence and color bars change to black when using 30/60 second timer
- Fully RS-170A SC/H phased and always correct. No adjustment required $349

WE STOCK THE FULL LINE OF HORITA PRODUCTS INCLUDING:

WQ-50 -	Window Dub Inserter
TG-50 -	Generator/Inserter
TRQ-50 -	Generator/Inserter/Search Speed Reader
TRQ-50PC -	Has all of the above plus RS-232 control.
VQ-50 -	VITC Generator, LTC-VITC Translator
VLT-50 -	VITC-To-LTC Translator
VLT-50PC -	VITC-To-LTC Translator / RS-232 Control
RLT-50 -	Hi8 (EVO-9800/9850)TC to LTC Translator
TSG-50 -	NTSC Test Signal Generator
SCT-50 -	Serial Control Tiller "Industrial" CG. Time-Date Stamp, Time Code Captioning
SAG-50 -	Safe Area, Convergence Pattern and Oscilloscope Line Trigger and Generator

GLIDECAM
V-16 AND V-20
Professional Camera Stabilization Systems

The GLIDECAM V-16 and V-20 Camera Stabilization Systems allow you to walk, run, go up and down stairs, shoot from moving vehicles and travel over uneven terrain without any camera instability or shake. Designed primarily for professional video and 16mm motion picture cameras, the Glidecam V-16 stabilizes cameras weighing from 10 to 20 pounds and the V-20 from 15 to 26 pounds. They are both perfect for shooting the type of ultra-smooth tracking shots that take your audience's and client's breath away – instantly adding high production value to every scene. With either of the "V" series stabilizers you'll be able to offer the type of professional shooting techniques that were previously available only to clients with full budgets. Whether you are shooting commercials, industrials, documentaries, music videos, news, or full length motion pictures, the Glidecam "V" series will take you where few others have traveled.

The Glidecam Support Vest

The lightweight and comfortable Support Vest can be adjusted to fit a wide range of operators. High endurance, closed cell, EVA foam padding and integral T6 aluminum alloy create a vest which can hold and evenly distribute the weight of the Glidecam V-16 and V-20 system across the operator's shoulders, back, and hips. For safety, quick release, high impact buckles allow the vest to be removed quickly.

The Three Axis Gimble

A free floating, precision Gimble incorporating Integrally Shielded Bearings creates the Super-Smooth and pivotal connections between the front end of the Dyna-Elastic Arm and the Camera Mounting Assembly. The Three Axis Gimble provides the operator with finger tip control over fluid tilting, panning and rolling. A locking mechanism allows the Gimble to be placed at varying positions on the Central Support Post. Moving the Gimble effectively adjusts the Systems Center of Gravity. The upper portion of the Sled's central support post includes guide markings. These markings allow for accurate gimble positioning.

The Dyna-Elastic Arm

The Exoskeletal, Dyna-Elastic Support Arm is designed to counteract the weight of the combined camera and Camera Mounting Assembly by employing high carbon alloy springs. The arm may be boomed up and down, as well as pivoted in and out, and side to side. It is the combined booming and pivoting action of the arm which creates the shock absorption necessary for ultra-smooth camera movement and mobility. The spring force is field adjustable to allow for varying camera weights. For safety, a Dual-Spring design is employed to reduce spring failure damage.

lowel
ViP Video Lighting System

Designed for video, ViP systems provide 55 to 500 watt capabilities, powered by AC or DC. Mount one on-camera, on-stand, or hand hold it. Some ViPs feature adjustable beam angles. All are light weight and convention cooled.

V-light

Efficient enough to light a small room yet small enough to fit in a large pocket, the V-light provides a broad, key light, back light or fill light (with umbrella or gel).

- Extreme wide-angle multi-use halogen source
- Mounts on stand, clamps, boom, wall, window, door-top
- 500 watt, AC powered (lamps not included)

i-light

Battery powered light provides excellent fill light, eye-light, or high-lights, with good contrast control for news and documentary shooting.

- Small and lightweight (18 oz.) for on camera use
- Multi-use 6:1 focusing range with i-100 lamp (lamps not included)
- 55 or 100 watt (12/14 volts DC)
- Includes cig. lighter connector or optional 4-pin XLR

Pro-light

Can be used as a low-level key or accent light, fill light (w/diffusion), backlight or background light.

- Multi-use halogen, focusing/tilting controlled with one hand.
- 125 or 250 watt AC, 100 watt 12 volt, or 200 watt 30 volt DC
- Optional cigarette, 4-pin and 5-pin XLR connectors
- Lamps not included

Tota-Light

Provides a base or bounce light, backlight, or background light. Use it with an umbrella or gel frame with a diffusion kit. It is an ideal fill light or small soft key or illumination for copy work.

- Multi-use halogen source with 360° no-yoke tilting
- Choice of 300, 500, 650, or 750 watt AC lamps (not included)
- Gull-wing reflectors close compactly for storage and travel

Omni-Light

Produces the ideal key or back-light, and with diffusion or an umbrella, it becomes a great soft fill source. With accessories, hand-hold the Omni, camera mount it, or choose from a wide variety of mounting systems.

- Multi-use halogen source provides a non-crossover beam
- Choice of optional quick-change Super-Spot Reflector for exceptionally long throws at all voltages
- Choice of lamps: 420 or 500 watt 120v AC, 650 watt 220-240v AC, 250 watt 30 volt DC, 100 watt 12 volt DC (lamps not included)

DP System

Only 3.9 pounds the DP Light offers a very powerful key, backlight, or background light with or without diffusion. When used with its umbrella or diffusion it provides a soft key, fill, or side light. It includes a #1 reflector for an 8:1 focusing range and a large cool-operating hand grip and knobs.

- Multi-use halogen source with 170° no-yoke tilting
- Choice of 500, 750, or 1000 watts 120 volts; 650 or 1000 watts 220/240 volts (Lamps not included).

Complete line of Lowel lights, lighting kits and accessories in stock...Call

anton bauer
Logic Series DIGITAL Gold Mount Batteries

The Logic Series DIGITAL batteries are acknowledged to be the most advanced in the rechargeable battery industry. In addition to the comprehensive sensors integral to all Logic Series batteries, each DIGITAL battery has a built-in microprocessor that communicates directly with Anton/Bauer InterActive chargers, creating significant new benchmarks for reliability, performance, and life. They also complete the communications network between battery, charger and camera. With the network in place, DIGITAL batteries deliver the feature most requested by cameramen: a reliable and accurate indication of remaining battery power.

DIGITAL PRO PACS

The ultimate professional video battery and recommended for all applications. The premium heavy duty Digital Pro Pac cell is designed to deliver long life and high performance even under high current loads and adverse conditions. It's size and weight creates perfect shoulder balance with all camcorders.

- **DIGITAL PRO PAC 14 LOGIC SERIES NICAD BATTERY**
  14.4v 60 Watt Hours, 5 1/8 lbs. Run time: 2 hours @ 27 watts. 3 hrs. @ 18 watts
- **DIGITAL PRO PAC 13 LOGIC SERIES NICAD BATTERY**
  13.2v 55 Watt Hours, 4 3/4 lbs. Run time: 2 hours @ 25 watts. 3 hours @ 17 watts

DIGITAL TRIMPAC

Extremely small and light weight, the Digital Trimpac still has more effective energy than two NP style slide-in batteries. High voltage design and Logic Series technology eliminate the problems that cripple conventional 12 volt slide-in type batteries. The professional choice for applications drawing less than 24 watts.

- **DIGITAL TRIMPAC 14 LOGIC SERIES NICAD BATTERY**
  14.4 v 43 Watt Hours, 2 3/4 lbs. Run time: 2 hours @ 20 watts, 3 hours @ 13 watts

InterActive 2000 Power/Chargers

QUAD 2702/2401
Four-Position Power/Chargers

The lightest (and slimmest) full featured four position chargers ever. They can fast charge four Gold Mount batteries and can be expanded to charge up to eight. They also offer power from any AC main; all in a package the size of a notebook computer and weighing a mere four lbs! The 40 watt 2401 can charge ProPacs in two hours and TrimPacs in one. Add the Diagnostic/Discharge module and the QUAD 2401 becomes an all purpose power and test system. The 70 watt QUAD 2702 bundles all Power/Charger features in the ultimate professional power system.

Dual 2702/2401
Two-Position Power/Chargers

The DUAL 2701 (70 watt) and 2401 (40 watt) are sleek, rugged and economical two position Power/Chargers that have all the features of InterActive 2000 technology including DC camera output and LCD display. The DUAL 2701 will charge any Gold Mount battery in one hour, the DUAL 2401 charges ProPac batteries in two hours and Trimpacs in one. Their compact, lightweight package design makes them the ultimate travel Power/Chargers. They can also be upgraded with the Diagnostic/Discharge Module and/or with the Expansion Charge Modules to charge up to six batteries of any type.

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PG-30	2.39	PG-60	2.59	PG-120	2.79

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SG-30	3.39	SG-60	3.99	SG-120	4.49

H471S S-VHS Double Coated

ST-30	6.99	ST-60	7.49	ST-120	7.99

M221 Hi 8 Double Coated

Metal Particles			Metal Evaporated		
P630HMP	4.99		E630HME	8.39	
P660HMP	6.49		E660HME	10.49	
P6120HMP	8.49		E6120HME	13.99	

M321SP Metal Betacam (Box)

05S	17.95	10S	18.49	20S	19.95
30S	22.95	60L	31.95	90L	49.95

DP121 DVC PRO

12M (Med.)	8.29	23M	9.99	33M	12.99
63M	22.49	64L (Lg.)	23.99	94L	33.99
123L					43.99

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HiB Metal Particle (XRM)

P6-120 XRM	6.59

Broadcast Quality HiB Metal Particle

P6-30 HM BQ	5.39	P6-60 HM BQ	6.09
P6-120 HM BQ			7.99

P/I PLUS VHS

T-30 Plus	1.69	T-60 Plus	1.99	T-90 Plus	2.09
T-120 Plus		2.19	T-160 Plus		2.69

HGX-PLUS VHS (Box)

HGXT-60 Plus	2.69	HGXT-120 Plus	2.99
HGXT-160 Plus			3.99

BQ Broadcast Quality VHS (Box)

T-30 BQ	5.49	T-60 BQ	6.19	T-120 BQ	7.39

BQ Professional S-VHS (In Box)

ST-31 BQ	7.19	ST-62 BQ	7.99
ST-126 BQ	8.39	ST-182 BQ	17.49

Betacam SP

B5MSP	15.75	B10MSP	17.75	B20MSP	19.75
B30MSP	20.75	B60MLSP	29.75	B90MLSP	46.45

Panasonic

Mini DV Tape

AY DVM-30	9.99	AY DVM-60	11.99

DVCPRO

AJ-P12M (Medium)	8.49	AJ-P23M	9.99
AJ-P33M	13.49	AJ-P63M	22.99
AJ-P64L (Large)	24.99	AJ-P94L	34.99
AJ-P123L			44.99

SONY

Hi-8 Professional Metal Video Cassettes

P6-30 HMPX	4.59	P6-30 HMEX	7.99
P6-60 HMPX	6.59	P6-60 HMEX	11.49
P6-120HMPX	8.89	P6-120HMEX	15.49

Hi-B Metal Evaporated Editor (HMEAD)

E6-30 HMEAD	10.49	E6-60 HMEAD	14.89
E6-120 HMEAD			20.19

PR Series Professional Grade VHS

T-30PR	2.39	T-60PR	2.59	T-120PR	2.79

PM Series Premier Grade Professional VHS

T-30PM	3.49	T-60PM	3.99	T-120PM	4.79

BA Series Premier Hi-Grade Broadcast VHS (In Box)

T-30BA	3.59	T-60BA	3.99	T-120BA	4.79

MQ Master Quality S-VHS (In Box)

MQST-30	7.49	MQST-60	7.99	MQST-120	8.39

BRS 3/4" U-matic Broadcast Standard (In Box)

KCS-10 BRS (mini)	8.29	KCS-20 BRS (mini)	8.99
KCA-10 BRS	8.19	KCA-20 BRS	8.69
KCA-30 BRS	9.69	KCA-60 BRS	13.39

XBR 3/4" U-matic Broadcast Master (In Box)

KCS-10 XBR (mini)	8.79	KCS-20 XBR (mini)	10.19
KCA-10 XBR	9.29	KCA-20 XBR	10.69
KCA-30 XBR	11.99	KCA-60 XBR	15.69

KSP 3/4" U-matic SP Broadcast (In Box)

KSP-S10 (mini)	9.59	KSP-S20 (mini)	11.09
KSP-10	10.09	KSP-20	11.59
KSP-30	12.99	KSP-60	16.99

BCT Metal Betacam SP Broadcast Master (Box)

BCT-5M (small)	12.29	BCT-10M (small)	13.99		
BCT-20M (small)	15.99	BCT-30M (small)	16.49		
BCT-30ML	21.49	BCT-60ML	24.99	BCT-90ML	37.99

Mini DV Tape

DVM-30EXM w/Chip	15.99	DVM-60EXM w/Chip	19.95
DVM-30EX "No Chip"	12.99	DVM-60EX "No Chip"	14.99
DVM-30PR "No Chip"	9.99	DVM-60PR "No Chip"	12.99

Full Size DV Tape with Memory Chip

DV-120MEM	29.95	DV-180MEM	34.95

PVD Series Professional DVCAM Tape

PDVM-12ME (Mini)	24.95	PDVM-22ME (Mini)	26.95
PDVM-32ME (Mini)	29.95	PDVM-40ME (Mini)	31.95
PDV-64ME (Standard)	39.95	PDV-94ME (Standard)	44.95
PDV-124ME (Standard)	49.95	PDV-184ME (Standard)	59.95

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TARGA 1000/MCXpress

Professional Video Production Workstation

Incorporating the award-winning TARGA 1000 digital video engine and Avid MCXpress NT non-linear editing software, this fully-configured video production workstation is designed to meet the needs of demanding video production professionals, corporate communicators, educators, training professionals and Internet authors. It includes full screen editing, unlimited compositing and unlimited layering of two video tracks, all from the easy-to-use and intuitive MCXpress NT interface. It also delivers pristine image quality, superior audio-video synchronization, support for NTSC and PAL video standards and composite or S-Video input/output.

TARGA 1000 Features:

Designed for high performance PCs, the TARGA 1000 delivers incredible processing speed for video and audio effects, titling and compositing. With high-speed PCI interface it lets you capture, edit and playback full-motion, full-resolution digital video with fully synchronized CD-quality audio.

- Records/playback video directly to/from hard drive at full frame rate (50 fields/sec –PAL, 60 fields/sec–NTSC). Video is stored and played back at the highest resolution for each format (768 x 576–PAL, 640 x 480 –NTSC). Compression can be adjusted on the fly to optimize for image quality and/or minimum storage space. Equipped with composite and S-video inputs/outputs. Also available with component input/output (TARGA 1000 PRO).
- Genlock using separate sync input for working in professional video suites
- Audio is digitized at 44.1KHz or 48KHz sampling rates, for professional quality stereo sound. Since all audio and video processing is done by on-board DSPs, you are assured of perfectly synchronized sound and images.

MCXpress Features:

A powerful non-linear, on-line editing solution, MCXpress for Windows NT is the ideal tool for independent and corporate video and multimedia producers who require predictable project throughput and high-quality results when creating video tapes and digital media content for training, promotional/marketing material, local television and cable commercials, CD-ROM and Internet/Intranet distribution. Based on Avid's industry-leading technology, it combines a robust editing functionality with a streamlined interface optimized for ease-of-use. It offers integration with third-party Windows applications, professional picture quality, professional editing features, powerful media management, a robust title tool and a plug-in effects architecture. It also features multiple output options including MPEG-1 and AVI so you save time and money by reusing media assets across a range of video and multimedia projects.

Input

- Delivers 200KB/frame images (3:1) compression using the TARGA 1000 board.
- Supports component, composite and S-Video providing high-quality 640 x 480 or 720 x 486 images –meeting CCIR-601 specifications. Before digitizing, you can turn video and audio on/off, adjust the incoming signal with the built-in waveform monitor and vectorscope, and adjust the levels of the incoming audio (up to 16-bit 44.1 kHz CD-quality). Dial-a-Duality feature lets you meet specific system, storage and delivery needs.

VCR Control

- Offers batch digitizing when used with time code and an RS-422-equipped VCR. Digitize and edit source material at low resolutions, saving valuable hard drive space, then when you're finished, batch digitize at the highest resolution only the material you need for the final version.

Editing Tools

- Display clips in Frame View for storyboarding or Text View, and quickly locate shots using search and sort utilities. Create programs interactively using timeline editing, frame-accurate trimming and full-screen playback. Unlimited compositing, 32 levels of undo/redo and extensive online support help keeps you productive at all times.
- Timeline window (where you create and edit your project) displays two video tracks – the top track is for creating titles, alpha, chroma and luminance keys, transitions and layered effects. Transitions include smooth motion FX as well as support for Hollywood FX and Boris FX plug-ins. The second track is for your video clips and four audio tracks (A1 to A4). The timeline viewer lets you view your project on the computer and video monitor simultaneously so you can watch the actual video output.

Digital Effects

- Over 100 transition effects
- Key effects including alpha, chroma, luma
- Ability to invert alpha channel • Picture-in-Picture
- Color effects including hue, brightness, saturation, blur, posterize, and invert. Smooth motion effects including slow, fast, strobe, freeze-frame, reverse, fit-to-fill.

Character Generator

- Embedded in the software is a subset of Image North's Inscriber CG titling software–the industry standard. Create rolling and crawling titles with any TrueType font or imported graphic. Control position, kerning, leading, transparency levels. Also has eight built-in templates

Audio

- Four audio tracks for real-time audio monitoring and mixing (with unlimited layering)
- Two channels of 44.1 kHz audio for I/O
- Real-time audio levels and pan
- Digital audio scrub
- Adjustable digitize gain
- Waveform display in timeline
- Single-track audio crossfades
- Volume controls for entire sequences as well as volume control of channel, track, clip or within clip

Import/Export

- Import and export a range of Windows-based file formats and seamlessly integrate 3D animation, graphics and audio from other sources. Import and export standard Windows file formats including WAV audio and FLC animation as well as over 20 graphics formats. Rapidly exchange full-screen, 24-bit color AVI images between applications on your system. Through OMF interchange, you can import video and audio files from other OMF-compatible applications such as Avid's Media Composers system or MCXpress for Macintosh, Elastic Reality and DigiDesign Pro Tools.
- When you're finished, print your program to tape in real time or export your project as an MPEG (bundled with Heruis/Pulitzer MPEG encoder) or AVI file for use with any authoring or Internet publishing application.
- *For EDL export, it comes with a separate application called MCXEDL that exports EDL formats (CMX, GVG, Sony) from an MCXpress sequence.*

TARGA 1000/MCXpress Turnkey Systems:

- 300-watt, 6-Bay Full Tower ATX Chassis
- Pentium ATX Motherboard with 512K Cache
- Pentium II- 300 MHz Processor
- Matrox Millenium II AGP 4MB WRAM Display Card
- 64MB 10ns 168-Pin (DIMM) S-DRAM
- Quantum Fireball 6.4GB IDE System Drive
- Seagate Barracuda External 9.1GB SCSI-3 Ultra Wide Capture Drive
- Adaptec AHA-2940UW Ultra Wide SCSI-3 Controller Card
- Teac CD-532e 32X EIDE Internal CD-ROM Drive • 3.5" Floppy Drive
- Altec-Lansing ACS-48 3-Piece Deluxe Speaker System
- Viewsonic G771 17-inch (1280 x 1024) Monitor (0.27mm dot pitch)
- Focus 2001A Keyboard • Microsoft MS Mouse
- Windows NT 4.0 Operating System Software
- Avid MCXpress for Windows NT
- Truevision TARGA 1000 or 1000 Pro Video Capture Card

With TARGA 1000 .....$7495.00
With TARGA 1000 Pro (component input/output) $7995.00

QUICK DIAL 74

CHYRON Graphics

PC-CODI & PC Scribe

Text and Graphics Generator and Video Titling Software

A PC-compatible (ISA bus) board, the PC-CODI incorporates a broadcast quality encoder and a wide bandwidth linear keyer for the highest quality, realtime video character generation and graphics display. A video graphics software engine running under Windows 95/NT, PC Scribe offers a new approach and cost effective solution for composing titles and graphics that is ideal for video production and display applications. PC Scribe lets you use an unlimited number of fonts to create titles and graphics and is designed as an open platform so the feature set is flexible and can be expanded. Combined with the PC-CODI board, PC Scribe becomes a total solution for real-time character generation with the quality you expect from Chyron. Ideal for use in information displays, broadcast, video production or multi-media applications.

PC-CODI Hardware:

- Standard PC/AT ISA bus interface; 2/3 length form factor
- Fully-antialiased displays • Display & non-display buffers
- Less than 10nsec effective pixel resolution
- 16.7 million color selections • Fast, realtime operations
- Character, Logo and PCX image transparency
- Bitstream typeface library selection • Variable flush
- Variable edges, border, drop shadow, and offset
- Full position and justify control of character & row
- User definable intercharacter spacing (squeeze & expand)
- Multiple roll/crawl speeds • Automatic character kerning
- User definable tab/template fields
- Shaded backgrounds of variable sizes and transparency
- User definable read effects playback: wipes, pushes, fades
- High Quality composite and Y/C encoder
- Integral composite and S-video linear keyer
- NTSC or PAL sync generator with genlock
- Module switchable NTSC or PAL operation
- Software controlled video timing
- Board addressability for multi-channel applications
- Auto display sequencing • Local message/page memory
- Preview Output with safe-title/cursor/menu overlay
- Composite and S-video input with auto-genlock select

PC-Scribe Software:

- Uses the entire TrueType library of fonts, so the number of fonts is virtually unlimited. Using the font library also means PC-Scribe can support most international language character sets. Fonts load instantly with no conversion and the level of anti-aliasing applied to characters is selectable
- Adjust a wide range of character attributes. **Typefaces:** color, size, aspect, rotation, italic, shear. **Edges:** color, size, transparency, softness, position. **Shadow:** color, size, position, drop transparency, softness
- Wide choice of composition tools. Sizing of text and composition graphics including imported elements is fully interactive and placement is entirely free-form. Graphics may also be layered using cut, copy and paste operations. Multiple preview windows can be displayed simultaneously and the SVGA monitor may be used as an independent preview channel in on-air situations
- Create a text window anywhere on the screen. Colors and fonts can be picked up off the screen and used for page creation. And a definable safe title marker can be set to ensure viewable video output.
- Import elements to build graphics. This includes OLE objects, INFINIT* RGBA, pc-CODI LOGO format, and TGA with alpha channel. Scribe also imports and exports TIFF, JPEG, PCX, TGA, BMP, GIF, CLP, ASCII, IMG, SGI, PICT and EPS formats.
- Dynamic functions including motion effects. Characters, words, rows and fields can color flash and there is an actual digital time clock, as well as an event timer with countup/countdown capabilities
- Character rolls, crawls and reveal modes. Speed is selectable and can be auto timed with pauses. Messages can be manually advanced or put into sequences a long with page transitions. Transition effects include: cut, face, push, wipe, reveal, hide, cover, peel, zoom, matrix, wape, spiral, split, weave and jitter.
- Create full screen mattes and color ramps. Horizontal colored bands, with grading, can create sophisticated background designs. Graphic primitives including lines, ellipses, rectangles and arrows can also be used for foreground or background creation. Build layout templates with pre-selected styles and parameters
- To keep track of elements used in a project, a file can be created to save all font, color, template and user attributes.
- Also features a full screen display mode where text and graphics are displayed raster to raster. Although a software engine, Scribe is tightly integrated with video hardware to maximize display hardware performance. Scribe is optimized for the real time capabilities of PC-CODI's frame buffer.
- Scribe can access and control two different PC-CODI cards installed in one computer. PC-CODI supports both NTSC and PAL and with one NTSC and one PAL card installed can output both standards simultaneously.

PC-CODI and PC-Scribe Bundle 2995.00

LEADER

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5860C WAVEFORM MONITOR

A two-input waveform monitor, the 5860C features 1H, 1V, 2H, 2V, 1 s/div and 2V mag time bases as well as vertical amplifier response choices of flat, IRE (low pass), chroma and DIF-STEP. The latter facilitates easy checks of luminance linearity using the staircase signal. A PIX MON output jack feeds observed (A or B) signals to a picture monitor, and the unit accepts an external sync reference. Built-in calibrator and on-off control of the DC restorer is also provided.

5850C VECTORSCOPE

The ideal companion for the 5860C Waveform Monitor, the 5850C adds simultaneous side-by-side waveform and vector monitoring. Featured is an electronically-generated vector scale that precludes the need for fussy centering adjustments and eases phase adjustments from relatively long viewing distances. Provision is made for selecting the phase reference from either A or B inputs or a separate external timing reference.

5100 4-Channel Component / Composite WAVEFORM

The 5100 handles three channels of component signals, plus a fourth channel for composite signals, in mixed component / composite facilities. Features are overlaid and parade waveform displays, component vector displays, and automatic bow-tie or "shark fin" displays for timing checks. Menu-driven options select format (525/60, 625/50 and 1125/60 HDTV), full line-select, vector calibration, preset front-panel setups and more. On-screen readout of scan rates, line select, preset numbers, trigger source, cursor time and volts.

5100D Digital Waveform/Vectorscope

The 5100D can work in component digital as well as component analog facilities (and mixed operations). It provides comprehensive waveform, vector, timing and picture monitoring capabilities. Menu driven control functions extend familiar waveform observations into highly specialized areas and include local calibration control, the ability to show or blank SAV/EAV signals in both the waveform and picture, the ability to monitor digital signals in GBR or YCbCr form, line select (with an adjustable window), memory storage of test setups with the ability to provide on-screen labels, flexible cursor measurements, automatic 525/60 and 625/50 operation and much much more.

5870 Waveform/Vectorscope w/SCH and Line Select

A two-channel Waveform/Vector monitor, the microprocessor-run 5870 permits overlaid waveform and vector displays, as well as overlaid A and B inputs for precision amplitude and timing/phase matching. Use of decoded R-Y allows relatively high-resolution DG and DP measurements. The 5870 adds a precision SCH measurement with on-screen numerical readout of error, with an analog display of SCH error over field and line times. Full-raster line select is also featured with on-screen readout of selected lines, a strobe on the PIX MON output signal to highlight the selected line, and presets for up to nine lines for routine checks.

5872A Combination Waveform/Vectorscope

Models 5872A offers all the operating advantages of the 5870, except for the following: SCH is deleted from the 5872A (line select retained), making it ideal for satellite work.

5864A Waveform Monitor

A two-input waveform monitor that offers full monitoring facilities for cameras, VCRs and video transmission links. The 5864A offers front panel selection of A or B inputs, the choice of 2H or 2V display with sweep magnification, and flat frequency response or the insertion of an IRE filter. In addition, a switchable gain boost of X4 magnifies setup to 30 IRE units, and a dashed graticule line at 30 units on screen facilitates easy setting of master pedestal. Intensity and focus are fixed and automatic for optimum display. Supplied with an instruction manual and DC power cable.

5854 Vectorscope

A dual channel compact vectorscope, the 5854 provides precision checkout of camera encoders and camera balance, as well as the means for precise genlock adjustments for two or more video sources. Front panel controls choose between A and B inputs for display and between A and B for decoder reference. Gain is fixed or variable, with front panel controls for gain and phase adjustments. A gain boost of 5X facilitates precise camera balance adjustments in the field. Supplied with a DC power cable.

Designed for EFP and ENG (electronic field production and electronic news gathering) operations, they feature compact size, light weight and 12 V DC power operation. Thus full monitoring facilities can be carried into the field and powered from NP-1 batteries, battery belts and vehicle power. Careful thought has been given to the reduction of operating controls to facilitate the maximum in monitoring options with the operating simplicity demanded in field work.

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Softimage Inc. SOFTIMAGE/DS: SOFTIMAGE/DS brings together a comprehensive non-linear production system for creating, editing and finishing high-end videos in one integrated environment with a common interface on the Microsoft Windows NT operating system; SOFTIMAGE/DS is now shipping as a turnkey system with Intergraph Corporation's StudioZ for SOFTIMAGE/DS, and Softimage, a wholly owned subsidiary of Microsoft Corporation , has opened five authorized training centers in the United States and Europe; 818-365-1359; www.softimage.com; www.microsoft.com

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AES/EBU FIBER-OPTIC SYSTEM

Multidyne FTX-195/FRX-195: this fiber-optic stereo audio and digital AES/EBU transmission system offers specifications that exceed RS-250C short-haul and broadcast requirements; the optical budget exceeds 30dB with 1,550nm laser-optics; the 20-bit stereo digital audio delivers an S/N ratio greater than 90dB; the system supports digital audio transmission for the AES/EBU, IEC 958, S/PDIF and EIAJCP-340 formats; the FTX-195 system has two optional auxiliary data channels for RS-232C, RS-422 or CMOS; the system can also support two 10Hz to 5kHz auxiliary audio channels; portable and rack-mount configurations are available with 850nm and 1,300nm wavelength LEDs for multimode and 1,300nm and 1,550nm wavelength lasers for single-mode; multimode is used for distances up to 4km; single-mode is used for distances up to 100km; 800-4TV-TEST; 516-671-7278; fax 516-671-3362

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SWITCHERS

Lighthouse Digital Systems OZ: this DSP-based switcher does not use conventional crosspoint designs for switching analog audio, AES audio, SMPTE time code, MADI and machine-control signals in the same frame; the 1,024x1,024 frame comes in several sizes from 4RU to 24RU in 4RU increments, allowing the use of the same I/O modules and switching processor in all frames, which may be cascaded to reach 40RU in one stack; each I/O module houses 32 channels of input or output or a combined input/output of 16 channels in the case of machine control; AES and analog inputs can be routed to analog or AES outputs; on analog channels, a 20-bit conversion provides up to +24dBu with a dynamic range greater than 100dB and THD+N less than -90dB; SMPTE time code is buffered for constant output level compliant with SMPTE standard; machine control will handle rates up to approximately 38.4 kbaud with 2.5% jitter; 310-378-3494; fax 310-378-4194; litehs@oro.net

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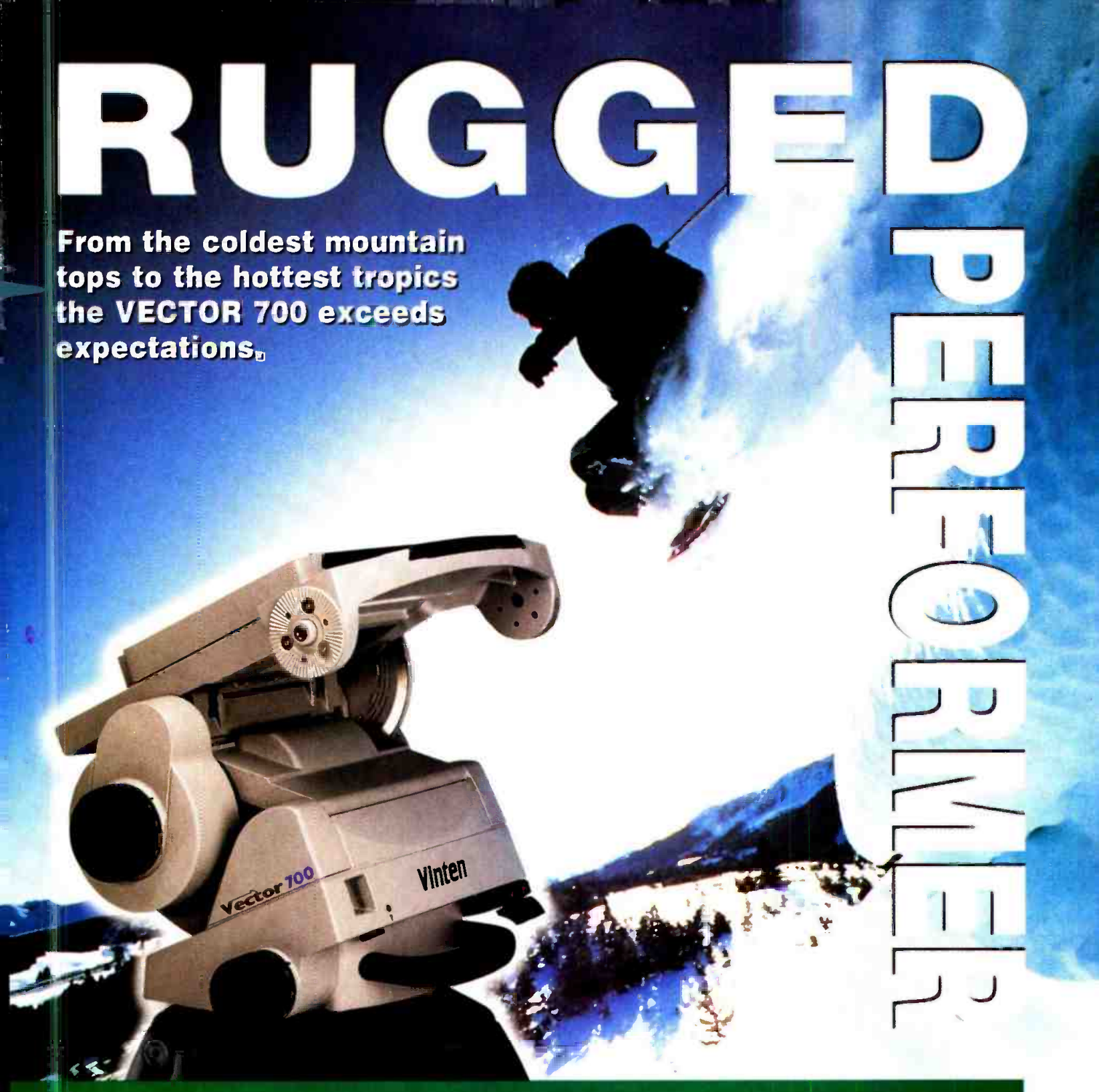

Vector 700

Engineered to handle a payload of up to 154 lbs., the new **VECTOR** 700 pan & tilt head features a Thin Film (TF) Drag System which utilizes a 'non-contacting' calibrated system to ensure consistent performance over an extended temperature range from -40°C to +60°C.

The **VECTOR 700** offers a tailored drag characteristic which combines a high level of control at the start of movement, a seamless transition into whip pan, and instant recovery to the original drag setting at the finish of movement. Incorporating its unique patented counterbalance system, the **VECTOR 700** needs no time consuming cam changes to provide up to 120° of perfectly balanced tilt range for the digital Studio and OB camera and long lens or teleprompter combinations.

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Business Wire

Business

Walk into any pro-audio shop and you'll see such names as Telex, Electro-Voice, Altec Lansing, Klark Teknik, Vega, Dynacord, RTS, ProStar, University Sound and Midas. These well-known companies are part of the merger of Telex and EV International. The new firm will operate under the banner of Telex Communications, Inc.

According to John L. Haled, chairman of the board, president and chief executive officer of the newly combined entity, the combined products are visible in a wide variety of sports, entertainment and public venues. The combined companies will enjoy an extensive worldwide distribution network, multinational manufacturing expertise and the research and development resources of both companies.

The new company expects to have more than $355 million in sales and will employ approximately 3,300 people worldwide to manufacture complete lines of audio, wireless and multimedia communications to commercial, professional and industrial customers in the business.

Thomson Tubes Electroniquescompleted its first year of service with the Finnish broadcast company, Yleisradio. During this service, Yleisradio installed the TH 760 IOTs in nine new 40kW transmitters. The TH 760 is a water-cooled IOT, featuring a compact electron gun for stability. The IOT design does not require an ion pump.

MegaDrive Systems, Inc. will begin operating under the name DataDirect Networks, Inc. This announcement accompanies the recent public statement of a strategic repositioning to address the network data access needs of high-performance, image-intensive computing environments. The name more accurately reflects the company's broad technology mix, high-speed networking focus and integrated solutions orientation.

Hitachi Denshi America announced that KFSN-TV, an ABC owned-and-operated TV station in Fresno, CA, selected four SK-2600PW portable 16:9/4:3 switchable digital studio cameras for its in-studio production.

Comark Digital Services (CDS) has been awarded a contract by TV Globo to broadcast World Cup Soccer games in France to Brazil in digital HDTV. The World Cup is being delivered in the ATSC digital TV standard.

Snell and Wilcox has been chosen by the British Broadcasting Corporation (BBC) to provide its digital solutions to help form the core of the BBC's broadcast technology. The BBC has recently installed 55 ARC150 widescreen display processors, 30 MDD500 multistandard digital decoders (two-channel version), 21 MDD1100 multistandard digital decoders with integral synchronizers, two MDE1000 multistandard digital encoders, a Magic DaVE DVE and switcher and a large number of modules from the Kudos IQ range.

JVC announced that public access cable channel, Greenbelt Access Television (GATE) of Maryland, has selected its Digital-S with 4:2:2 sampling as its house videotape format. The new station is equipped with JVC's Digital-S BR-D750 VTR and the Digital-S BR-D51 player with S-VHS playback.

Hamlet Video International Ltd. has supplied Digi Scopes to many of the UK's leading TV stations. Six Digi Scopes have been purchased for use at Central TV's Central Court, a recently installed modern news facility with a disk-based media server. Channel 4 has also purchased Hamlet Digi Scopes, one for use in its graphics department and the other for VT.

Discreet Logic has completed its purchase of San Jose, CA-based Lightscape Technologies, Inc., a developer of advanced visualization and lighting software tools for professionals in the design and entertainment industries. Lightscape's technology complements Discreet Logic's production systems comprised of real-time 3-D broadcast graphics and virtual studio systems for the creation of synthetic scenes and characters for films, virtual sets for broadcast television and interactive content for games and the web. Additionally, the acquisition adds Windows NT development expertise and an installed base of entertainment, games and design professionals using Lightscape software.

Avid Technology Inc. announced that FOX Television Stations Inc. will incorporate the new AvidNews newsroom system in each of its 22 owned stations. With the integration of Avid's newsroom computer system, FOX plans to have 200 seats installed by this June. Of the 22 stations, 16 will upgrade from BASYS or Avid NetStation systems, five stations will replace existing newsroom equipment and one station will be part of a new installation.

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nounced that Panasonic Video Communications Company has joined its Cable Modem Partnership program. Combining Harmonic's cable TV head-end equipment with consumer electronics vendors' cable modems, the program offers operators complete standards-based end-to-end systems for providing high-speed Internet services to subscribers. As part of the partnership, Harmonic and Panasonic will work together to develop and jointly market their complementary digital video solutions.

General Instruments (GI), formerly NextLevel Systems Inc. and **Sony Electronics** announced their strategic alliance to jointly develop digital TV technologies. The companies are discussing future generations of digital cable TV devices and high-definition TV products, as well as incorporating new features like Sony's Home Network architecture into GI's advanced digital set-top boxes.

Scientific-Atlanta announced its contract with Cable Television Laboratories Inc. (CableLabs) to assist the OpenCable project in key areas regarding the system integration of new OpenCable devices and services. This work will help ensure that the individual interfaces specified by the OpenCable project will support an integrated network and set of services.

Scientific-Atlanta will focus on the end-to-end system integration of new digital services on the cable industry's networks. Under the contract, it will produce and document a network architecture reference model. It will also identify scenarios for customer use, billing and third-party applications that involve important OpenCable events and data flows.

Dielectric announced that NBC has signed an agreement to purchase DTV and NTSC TV station equipment. Under the terms of the agreement, Dielectric will be NBC's supplier for its current and future O&O TV stations nationwide. The agreement covers all passive RF components including, but not limited to, antennas, transmission lines, filters, combiners, switches and dehydrators.

Wegener Corporation has received an additional order from FOX for its UNITY4000 MPEG-2 digital video satellite receivers. The UNITY4000 is a part of the UNITY digital product family and is used by FOX Sports Network, FX Networks and fxM: Movies from FOX. The new order is in addition to an order placed by FOX in May 1997 for UNITY4000 receivers and for Wegener's COMPEL network control system.

NextLevel Systems Inc. and RELTEC Corporation announced a joint proposal to market and execute turnkey solutions for voice/video/data networks for the communications marketplace. RELTEC will supply services and associated equipment to support the end-user network architecture. NextLevel will supply active and passive equipment to support the customer's network architecture and service goals.

Digital Vision announced an agreement with Scientific-Atlanta to supply HDTV encoding and decoding products specifically aimed at the upcoming DTV/HDTV markets in the United States. Scientific-Atlanta will market these compression products under the PowerVu brand name.

People

Terry Longfellow has been appointed creative director at Turner Production Effects, Atlanta.

Steve Martin is national sales manager at JVC Professional, Elmwood Park, NJ. Martin is now responsible for directing the company's sales force and overseeing dealer sales, government sales and imaging products sales at the Elmwood Park headquarters and at corporate locations in Pine Brook, NJ, Aurora, IL, and Cypress, CA.

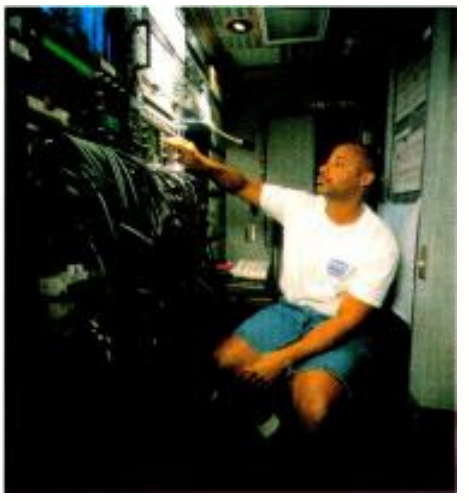
Tom Jordan, vice president at Leitch, Cesapeake, VA, has been named secretary/treasurer of the SMPTE Board of Governors.

Solid State Logic, Oxford, England, announced that **Michael Mueller** has been named vice president of broadcast and post-production for SSL North America, East Coast. Mueller will be based in SSL's New York office.

Tomohiko Saito has been named president of Ikegami USA, Maywood, NJ.

David A. Tubbs, of Evans & Sutherland, Salt Lake City, has been appointed to the Academy of Television Arts and Sciences (ATAS), and named to ATAS's Cybercast Committee.

For the record



The National Mobile Television DX4 truck with expanding trailer was manufactured up to the rack-ready stage by Gerling & Associates, Sunbury, OH. The unit's electronic equipment installation was handled by Bennett Systems, Sunbury, OH. (Photo from *BE* January 1998, p. 78.)

Don Barto, sound editor for Big Shot Productions, sitting in front of the SSL Scenaria digital audio workstation. ("Production Clips," *BE* January 1998.)

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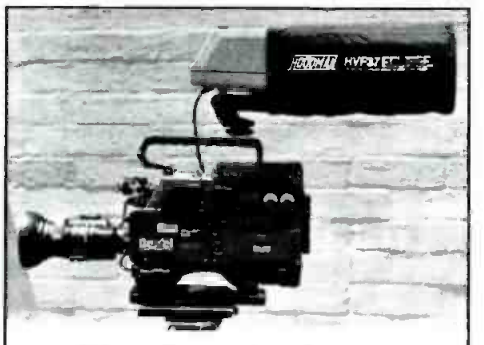

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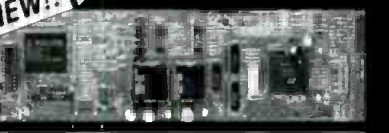

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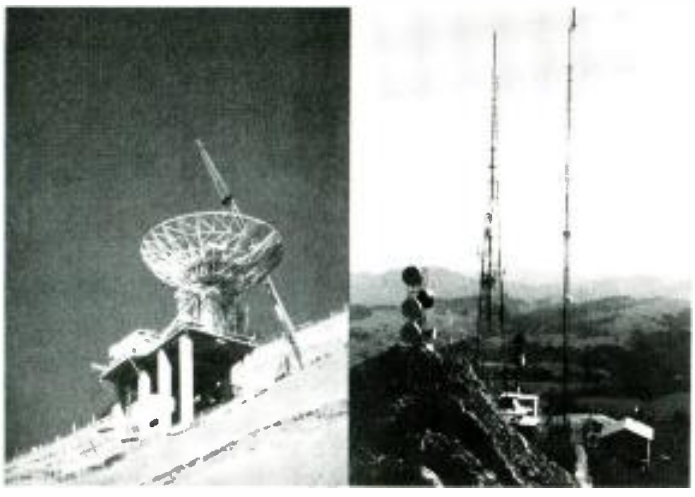

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Help Wanted

CHIEF ENGINEER (State Title: Assistant Director Radio/TV Station) POSITION #66230 WUSF-TV 16 is seeking a Chief Engineer in Tampa, Florida. CPB qualified and a member of PBS and PRG, the station receives annual Florida Community Service Grants from the Florida Legislature, funds from the University of South Florida, and viewer and underwriter support. Responsibilities include planning, organizing and directing engineering functions for the station and the new broadcast center being planned. Supervising television engineering personnel; assuring technical quality and reliability of WUSF-TV service to viewers; policy formulation and initiation for WUSF-TV Engineering; and evaluating and selecting new technologies best suited to WUSF-TV needs. Minimum Qualifications: Master's degree in appropriate specialization and two years experience at Chief Engineer level or above; or bachelor's degree in appropriate specialization and four years experience at Chief Engineer level or above. Professional work experience at Chief Engineer level or above may substitute on a year-for-year basis for required degree. Preferred Qualifications: Bachelor's degree in Electrical Engineering or Physics and four years experience at Chief Engineer level or above. Experience in writing bid specifications and grant proposals. State University System Pay Range: $27,860.00 - $49,300.00 To Apply: Send resume and cover letter to Hetty Glusman, WUSF Public Broadcasting, WRB 219, 4202 Fowler Avenue, Tampa, Florida 33620. Application Deadline: May 11, 1998. The University of South Florida is an Equal Opportunity/Equal Access/Affirmative Action Institution. For ADA accommodations call Hetty Glusman, (813) 974-9123. The search/selection process will be conducted in compliance with provisions of the "Government in the Sunshine" laws of Florida. Screening Committee meetings are open to the public and all search documents are available for public inspection.

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WDEF-TV NEEDS SENIOR MAINTENANCE ENGINEER Minimum of 2 years experience in TV broadcast maintenance, installation, set-up, testing, repair of equipment such as: video switchers, video & audio routers and Das, video monitors. Must have knowledge of beta video tape format, studio & news field cameras, microwave & satellite equipment, high power VHF transmitters, personal computers & networks, strong knowledge of TV studio plant layout & operation. FCC general class radiotelephone license and SBE certification desirable. Send resume to: Rick McClain, Chief Engineer, WDEF-TV, 3300 Broad Street, Chattanooga, TN 37408. EOE, minority applicants encouraged to apply, pre-employment drug test required. M/F

MAINTENANCE ENGINEER: Top 50 market television station seeking a qualified maintenance person. This person must have a strong background in Beta, Macs and PC computers, Digital electronics and be a good trouble shooter. Must be a self starter and highly motivated. Send resume to the following address: WSMV-TV, Att. Mike Nichols, 5700 Knob Rd., Nashville, TN 37209. EOE

BROADCAST ENGINEERS

TCI The National Digital Television Center, located in Denver, Colorado, originates 88 channels of video and compresses, authorizes and distributes over 500 channels for DBS, Cable and Digital Cables systems. The NDTC is operated by TCI. The NDTC continues to grow and opportunities are opening for broadcast engineers, uplink engineers, encoder specialists and related fields. TCI is an equal opportunity employer. Desire to learn and a track record successfully dealing with technological challenges in related fields can substitute for direct experience. Drug and background checks are required. For consideration, send your resume and requirements to:

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TV MAINTENANCE TECHNICIAN Requires self starter having experience with Beta, VPR-3, PC's and other studio equipment maintenance. Experience with microwave, satellite, VHF & UHF transmitters, and FCC General Class License preferred. Contact Marty Peshka, Assistant Chief Engineer-Maintenance, WTNH, 8 Elm Street, New Haven, CT 06510, or call: (203) 784-8841. EOE

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EOM

Please, watch the windows

BY PAUL MCGOLDRICK

Maybe the past few years have just made me suspicious or I am beginning to believe in conspiracies after all, but I just hate it when the computer guys act nice or stay too quiet. Parents know that quiet worry feeling when you finish by shouting up the stairs to young Johnny, "Whatever you're doing, stop it!" So, will that work in Seattle and Santa Clara? I don't think so.

I thought it would be sneaky of me to at least get a view of next year's plans and see what Microsoft and Intel are planning to tell us to do in broadcasting. But, they have managed to snag me there, as well. The version 0.30 draft of the PC99 System Design Guide was published at the beginning of February (you can download it at **http://developer.intel.com/design/** or **www.microsoft.com/hwdev/desguid/**). Off I scoot to the section, "Video and Broadcast Components" where the message is, '*The proposed changes for this topic are not yet available for review.*' Got me again.

I made a call to someone in one of the above companies. He got back to me with the information — the changes should be available before the end of this month. This is a significant month in broadcasting. Does it mean that NAB is being used as a vetting event? Do they want to see the state of some new products on offer for NT or Macintosh? Could well be.

The levels of broadcasting and video involvement in PC98 are all on the receiver side of things. The specifications call for a cable/off-air tuner which, with other inputs for S-Video and composite signals, feeds a "crossbar filter," PC-speak for switcher and separate audio and video digitizers (capture filters in PC-speak). The digital signals can be handled uncompressed or compressed for storage or forwarding or the signals can be rendered for viewing and/or listening.

The reasoning behind the whole process, of course, is the hope by the computer developers that the PC will become the core device in the complete audio-video world of the consumer. It is not a new thought, and some of us were involved in implementing such systems five years ago. Back then, the working team — remarkable for their thinking, incidentally — was insistent that a new bus be implemented and their favorite was the new RAM bus. That may at last be the direction that the PC'ers are reluctantly finding they are having to go.

Motherboard bandwidths

The ability to handle signals in most PC implementations is abysmal. We have seen demonstrations of CPUs operating at 1GHz and that is extremely impressive, but you can't get signals across a motherboard at anything like that speed. That is why we have seen over-the-top bus implementations proposed for digital signals.

It has seemingly rung on deaf ears in the PC industry that if the bandwidth of your signal lines is limited to 50MHz it is still 50MHz whether the processor is working at 486 speeds or Pentium speeds or 1GHz. These are serious frequencies and although I am comfortable with RF (I like to say that I am frequency-challenged to 40GHz), I would not care to design a PCB that is carrying signal lines at 1GHz with numerous power lines, multilayers and a plethora of clock signals with direct relationships between them. Ugh.

But, that is exactly what is needed if you want to use the processing power as anything but a fast calculator. Designing for real-world signals can certainly be done, but even the largest board houses have trouble with signal line impedances and crosstalk at only 100MHz. And, power line problems are becoming intense. With variable voltage control on CPUs, using the lowest-possible voltage at any moment to reduce the squared-component in power dissipation, supply currents are rapidly approaching 20A, an amplitude that will be achieved within the next two years.

Re-inventing VBI insertion

On another subject, a number of broadcasters, including Cox Cable and Oregon Public Broadcasting, agreed to accept a kit of parts to try out an alternative income stream. The kit allows data to be placed in vertical blanking as an alternative for Internet downloads. The math says that four inserted lines in an NTSC signal could provide — if everything else is perfect — 32kHz of bandwidth. However, that bandwidth would be shared between many other people trying to download information at the same time. Doesn't sound too attractive to me.

And, didn't the broadcasters invent VBI insertion some time ago for test signals, for teletext? I don't get it. The cable guys have a much better chance of winning the Internet market with two-way systems if they are willing to make the investments. Microsoft has bought into that as well so it has spread itself around the alternates. And, I have no doubt at all that someone out there is working on a way to use their new DTV channel allocation with a single 480P signal and the rest of the capacity devoted to data; but you would still need your telephone line and modem to call up the information you want. ■

Paul McGoldrick is a free-lance writer and consultant based on the West Coast.

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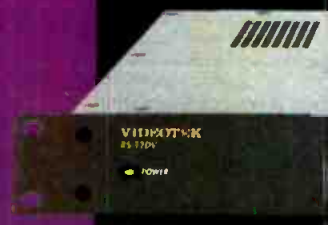

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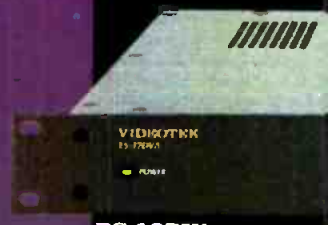

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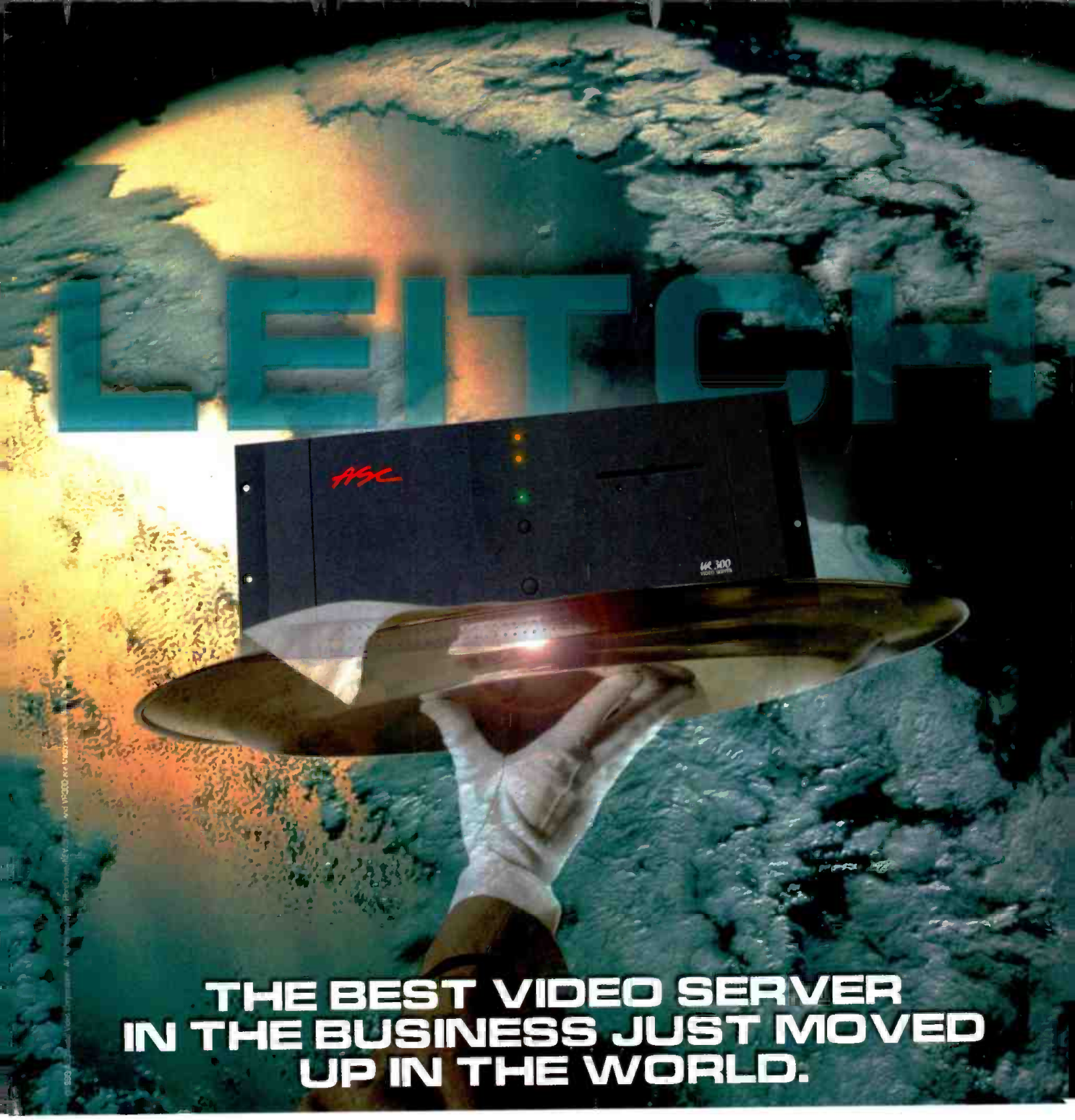

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