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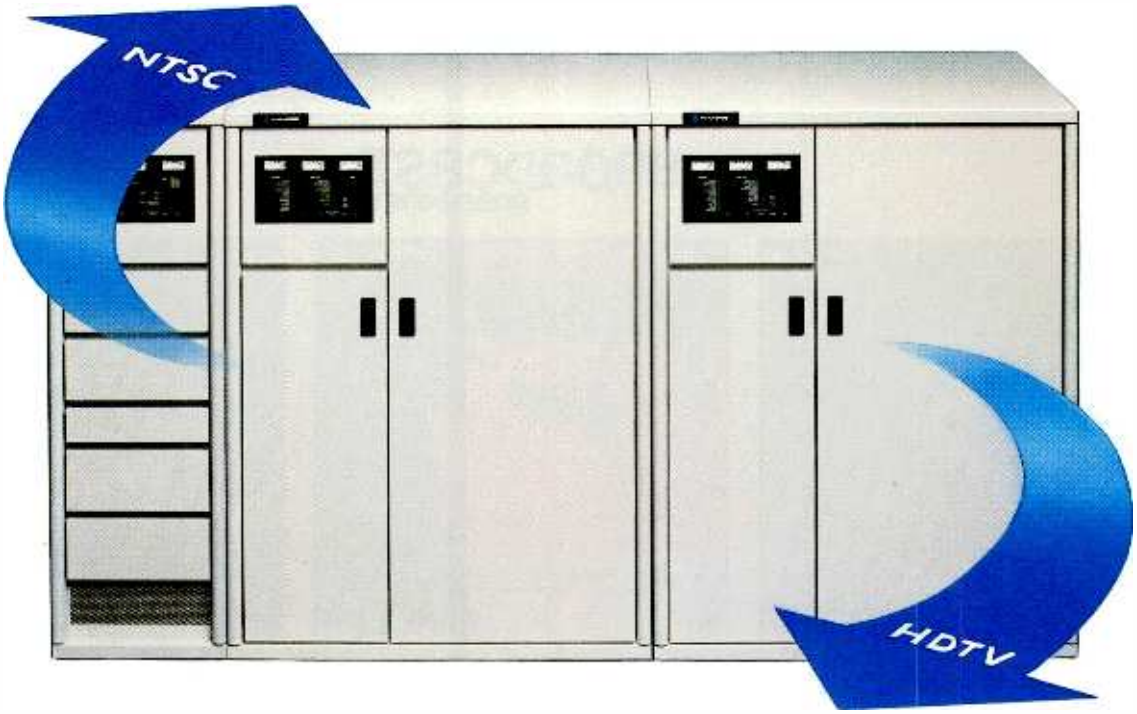

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FACILITY AUTOMATION SPECIAL REPORT:

Automation technology has grown tremendously in recent years. This month's feature coverage examines some of the new technology available to broadcasters and cable systems. This new technology will result in improved reliability and quality to our audiences, and increased profit margins for our companies.

THIS MONTH...

OTHER FEATURE:

ON THE COVER:

For broadcasters looking for new sources of revenue, multicasting holds great potential. Thanks to the effective marriage of computers and sophisticated, reliable mechanics, it is now possible to supply multiple programs and commercials from a single source through the convenience of a videotape library system. (Cover design and photography by Odetics.)

DEPARTMENTS:

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News

By Dawn Hightower,
senior associate editor

FCC should reject non-duplication rule changes

According the National Association of Broadcasters (NAB), the Federal Communications Commission (FCC) should reject a cable industry proposal to modify the TV network non-duplication rules. NAB considers the proposal a thinly veiled effort to undermine a local broadcaster's ability to negotiate for carriage with a local cable operator.

The non-duplication rules generally permit a local TV affiliate to limit the distribution rights of the network programming it carries. Specifically, local TV stations can prevent local cable systems from importing a distant affiliate's network programming into their local market. NAB opposes a proposal by the National Cable Television Association (NCTA) that would prevent TV stations from enforcing these non-duplication rules, if a local TV station exercises its retransmission consent option but later cannot reach a carriage agreement with local cable operators.

NAB told the FCC that the NCTA wants to create a negotiating environment in which local TV stations would be coerced into seeking carriage for no compensation. Under the NCTA proposal, a local cable operator could refuse to negotiate with a local TV station and bypass the local affiliate by simply carrying the distant affiliate of the same network.

NAB believes the NCTA scheme would restore to cable the type of monopoly base leverage that Congress sought to curb when it passed the 1992 cable law.

NAB also argued that changes in the non-duplication rules would undermine the localism mandate under which TV stations are licensed and would infringe on the TV network's right to control distribution of their programming.

ATRC demonstrates HDTV system to U.S. labor leaders

In an unprecedented move underscoring organized labor's commitment to a U.S.-based high-definition TV (HDTV) industry, America's labor leaders have viewed the digital HDTV system proposed as the U.S. standard by the Advanced Television Research Consortium (ATRC).

At its annual mid-winter meeting, the AFL-CIO Executive Council — whose members include the heads of 34 unions as well as the AFL-CIO's president and secretary-treasurer — was invited to a special demonstration of advanced digital HDTV (AD-HDTV). It was co-hosted by William H. Bywater, president of the International Union of Electronic Workers (IUE), and International Brotherhood of Electrical Workers' (IBEW) president John J. Barry. This is the first time that an outside organization has been invited to demonstrate and brief the union leaders on a new technology.

The IUE and IBEW, two major unions involved in TV receiver manufacturing in this country, have endorsed AD-HDTV because ATRC members Thomson Consumer Electronics Inc. (RCA, GE and ProScan brands) and Philips Consumer Electronics Company (Magnavox, Philips, Sylvania and Philco) have pledged to make HDTV receivers and picture tubes at their manufacturing plants in the United States.

Progress toward terrestrial digital HDTV

The engineering department of the British Broadcasting Corporation (BBC) says the use of a high spectral-efficiency modulation technique, together with advances in digital compression, have made it possible in principle to transmit HDTV programs in a single 8MHz channel.

BBC Engineering and the French Thomson-CSF/Laboratories Electroniques de Rennes (TCSF/LER) organization have collaborated in a successful experimental digital transmission using high spectral-efficiency modulation, as part of a project to develop the technology that will bring digital HDTV to the general public via terrestrial transmission networks.

A digital TV signal was broadcast in a standard 8MHz TV channel from a low-power transmitter located at the BBC's Crystal Palace mast in London. The signals were successfully received at the BBC's engineering research department, and at other test sites in south London and the adjoining county of Surrey.

The particular modulation technique used and the transmitting and receiving equipment were developed to convey about 60Mbit/s in a single 8MHz UHF TV channel.

The system transmits two separate 30Mbit/s signals, one of which is broadcast with horizontal polarization, the other

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BROADCAST ENGINEERING is edited for corporate management, engineers/technicians and other station management personnel at commercial and educational radio and TV stations, teleproduction studios, recording studios, CATV and CCTV facilities and government agencies. Qualified persons include consulting engineers and dealer/distributors of broadcast equipment.

BROADCAST ENGINEERING (ISSN 0007-1994) is published monthly (plus three special issues) and mailed free to qualified persons within the United States and Canada in occupations described above. Second-class postage paid at Shawnee Mission, KS, and additional mailing offices. POSTMASTER: Send address changes to **Broadcast Engineering**, P.O. Box 12960, Overland Park, KS 66282-2960.

SUBSCRIPTIONS: Non-qualified persons may subscribe at the following rates: United States and Canada: one year, $50.00. Qualified and non-qualified persons in all other countries: one year, $60.00 (surface mail); $115.00 (air mail). Subscription information: P.O. Box 12937, Overland Park, KS 66282-2937.

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Editorial

Closed captioning: A new opportunity

New federal regulations are now on the books that affect almost every provider of entertainment programming. This includes program producers, broadcasters, cable systems and even TV receiver manufacturers. The regulation is based on the Americans with Disabilities Act, which became law on July 26, 1992. Now, almost a year later, broadcasters are going to have to cope with some additional technical requirements. That's the stick. The carrot is that stations may be able to gain additional market share by serving a long-unmet need.

The Americans with Disabilities Act is a broad piece of legislation that requires changes be made in the public and private sectors to meet the needs of people with disabilities. This population represents one of the largest minority groups in the country. Nearly 43,000,000 Americans have some form of disability that is covered by the new regulations. The largest segment of this group is the deaf and hard of hearing, representing 24,000,000 people.

Title II of the act states: "A public entity shall furnish appropriate auxiliary aids and services where necessary to afford an individual with a disability an equal opportunity to participate in and enjoy the benefits of a service program or activity conducted by a public entity."

According to the Justice Department, auxiliary aids and services are defined as "...closed-caption decoders, open and closed caption, videotext displays or other effective methods of making aurally delivered materials available to individuals with hearing impairments."

OK, so much for the legal jargon. What does all this mean to broadcasters and cable systems? It means an opportunity to provide a new service to a previously untapped audience.

Everything from national programming to movies, local news, sporting events and governmental meetings will be captioned. The market is exploding, and there are ample opportunities for those stations and cable systems willing to make a relatively small investment in the technology required to originate closed-captioned programming.

In July 1993, the Decoder Circuitry Act and the regulations devoted to providing captioning take effect. *Broadcast Engineering* magazine will continue to provide the needed information so that stations can begin implementing this technology.

System and station managers and engineers should not view these new regulations as another federal requirement, but as an opportunity to serve a new audience and enjoy a new business opportunity. Become a leader in your community. Provide closed captioning for your viewers now.

Brad Dick

Brad Dick, editor

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FCC Update

NAB seeks flexibility in HDTV channel usage

By Harry C. Martin

In comments filed with the FCC, the National Association of Broadcasters (NAB) has urged that during the transition to HDTV, broadcasters be permitted to employ the unused portion of their future HDTV signals to provide high-speed data broadcasting and other innovative services to consumers and businesses. According to NAB, broadcasters could deliver data at least 10 times faster than existing computer information services that are constrained by slow transmission speeds of 2,400-9,600bps.

Permitting such services would help the TV industry raise significant revenues, tapping an estimated $400 million data broadcasting market. This revenue would help pay for the transition to HDTV and encourage a rapid deployment of HDTV nationwide. TV stations today are taking advantage of unused portions of their existing signals to deliver teletexed services, scrolling billboards, credit card verification and interactive games.

July 1 is the deadline by which all aural broadcast STL, ICR and booster stations must be using FCC-authorized equipment.

Fine assessed for cable signal leakage

The commission has fined a cable system $23,750 for a rule violation concerning system signal leakage. The rules prohibit systems operating in the 54-216MHz band from radiating in excess of 20 microvolts per meter at a distance of 10 feet from the cable.

The system was emitting radiation in excess of this standard on two separate days in February 1992. The fine was levied even though the system had taken corrective action once the problem was revealed. The commission said the fine was justified by the threat to public safety caused by the leakage, which could disrupt operations on aeronautical and other public safety frequencies.

Under the commission's standards, $12,500 is the base amount for excessive signal leakage. The fine was increased to $23,750 because the leakage was severe and occurred on two separate days, making the violation flagrant.

Filing window procedure for ITFS

The FCC is seeking comments on a proposal to institute a window filing procedure for applications for Instructional Television Fixed Service (ITFS) facilities.

Under the window procedure, a limited time period would be specified for filing applications for new facilities or for major changes in existing ITFS stations. The commission would no longer publish cut-off lists of accepted applications and invite competing proposals. Instead, the agency would issue a public notice announcing a filing window that would open at least 60 days hence. The window would remain open for a specified number of days, and no applications would be accepted before or after the window period.

Applications filed during the window that are not mutually exclusive with any other window applications would be placed on a proposed grant list. Mutually exclusive applications would be placed on public notice. In both cases, the commission would allow 30 days for the submission of petitions to deny. Then, the single uncontested applications would be granted while mutually exclusive proposals would be processed according to the current comparative criteria.

Pending adoption of the rules, the FCC will not accept applications for new ITFS facilities or major changes to existing facilities. However, applications on file and already cut off will be processed.

Cable Act home wiring provision implemented

In February, the FCC adopted rules prohibiting cable TV operators from removing cable home wiring upon termination of service without giving subscribers the opportunity to purchase the wiring. This is so subscribers can use the wiring to accommodate alternative multichannel video delivery systems.

These rules apply only to voluntary termination of service and do not apply when service has been terminated because of lack of payment or for theft of service.

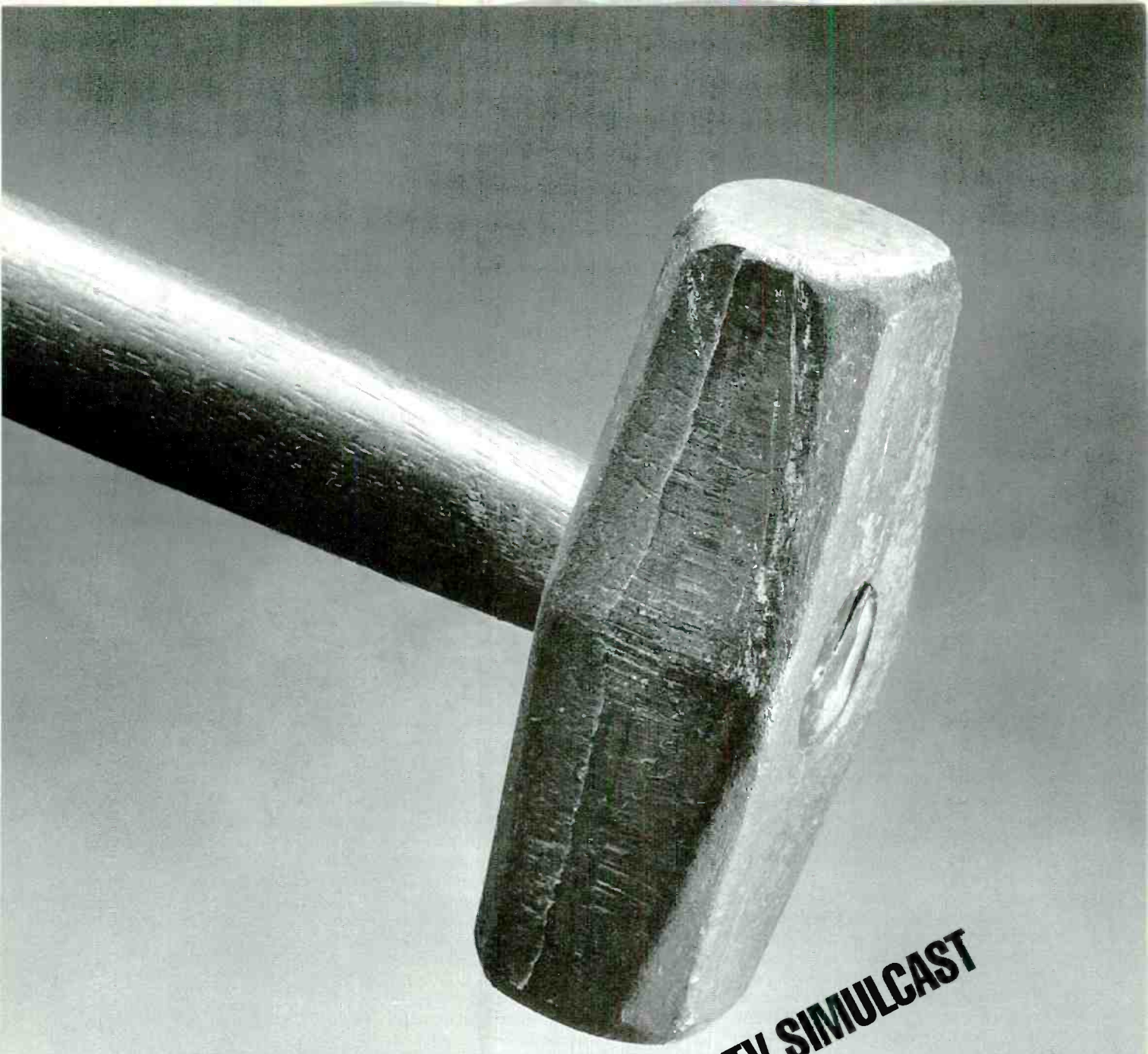
The commission prescribed that the cable operator is required to inform the subscriber that the wiring may be purchased at a per foot price equal to the replacement cost of the wiring.

On July 26, 1992, federal regulations based on the "Americans with Disabilities Act" was passed. This year, broadcasters will have to cope with additional technical requirements. In July, the decoder circuitry and the regulations devoted to providing captioning will take effect.

The FCC also addressed concerns about signal leakage from cable home wiring. Signal leakage from cable systems may cause interference to aeronautical and public safety radio services. The cable operator who installed the cable home wiring will not be held responsible for signal leakage once cable service is suspended. However, the responsibilities of cable operators to prevent signal leakage from home wiring remain in effect as long as service is provided.

■

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



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Part 4

Strictly TV

Strictly HDTV

More on HDTV

By Curtis Chan

The special panel of the FCC's HDTV advisory committee has rejected the NarrowMUSE analog transmission system of NHK, Japan Broadcasting Corporation. The 1,125/60 standard already is being used for many high-definition (HD) productions. Now its proponents can concentrate on establishing a unified production standard.

Of the other four digital HD transmission proposals, none has emerged from testing as a superior choice that could be recommended to the FCC as the basis for a terrestrial advanced TV standard. Additional testing is likely to be performed on the four digital systems, after the proponents have made the proposed improvements.

Richard Wiley, chairman of the advisory committee, stated that field testing in Charlotte, NC, on the winning system would be deferred until the improvement tests have been completed. This will push the time line five to nine months further down the road.

It's possible that a joint alliance between the remaining proponents could develop. At the onset of the advisory committee's efforts 5½ years ago, it was recommended that all system proponents consider pooling their resources. Over the years, as many of the entrants dropped out of the race, productive relationships developed among the remaining parties, including AT&T and Zenith, GI and MIT, and the Sarnoff Labs, NBC, Thomson and Philips. Furthermore, it was recommended that the parties consider an alliance in which they could attempt to pool their knowledge and resources in support of a single system. Any resulting technical proposal would not represent a new system but a combination of the four systems already tested.

One step ahead

Many of the proponents have discussed the possibility of joining forces. It was recommended that any proposed agreement should be submitted to the advisory committee for its review, comment and possible modification. If an all-proponent plan is to come about, a strong possibility exists that the technical subgroup would reassemble to work with the proponents to finalize an acceptable unified system concept within a 30-45 day time frame. If this scenario were to happen, another delay would be expected while the prototype system is built and subsequently in-house and field-tested.

Chan is the principal of Chan & Associates, a marketing consulting service for audio, broadcast and post-production, Fullerton, CA.

Selection criteria

The advisory committee has set up 10 selection criteria that fall into three categories: spectrum use (service area and accommodation percentage), economics (cost to broadcasters, alternative media and consumers) and technology (audio-video quality, transmission robustness, scope of services and features, extensibility and interoperability considerations).

Spectrum use criteria

For NTSC allotment purposes, the United States is divided into three zones. Zone I is the northeastern part of the country. Zone III is an area with unusual propagation conditions and includes Florida, southern Georgia and a band skirting the Gulf of Mexico. Zone II is the balance of the country.

In any spectrum allotment plan, co-channel spacing determines the number of allotments that can be accommodated in any area. Therefore, the minimum first adjacent-channel spacings for all zones are 59.5 miles for VHF stations and 54.5 miles for UHF stations. The minimum co-channel separation distances for the NTSC service are summarized in Table 1.

Taboos

In addition to the restrictions on NTSC allotment spacings, restrictions are placed on allotments in the UHF portion of TV reception that might occur because of receivers' tuner characteristics.

To permit ATV broadcasting by every authorized TV broadcaster, a second channel must be provided to each broadcaster from within the presently allocated spectrum. Each system must be able to operate at closer co-channel spacings than its NTSC counterpart. This restriction also applies to the ATV/NTSC and ATV/ATV combinations. Because the greatest portion of spectrum must come from the UHF band, the selected ATV system must be relatively immune to taboo restrictions while still being able to operate in a closely spaced adjacent-channel situation.

Contrary to popular belief that the NTSC service area is defined by the Grade B contour, substantial interference from co-channel and adjacent-channel stations is encountered within the Grade B contour of many NTSC stations. That interference often is noticeable for VHF stations in Zone I. The ATV service is regarded as interference-limited rather than noise-limited.

A further consideration relates to the needed effective radiated power (ERP) for the ATV stations. The advisory committee assumed that the ERP for each ATV facility would need to produce the same viewing distance to the noise-limited ATV coverage contour as the distance to the companion NTSC station's Grade B contour. This leads to some interesting points.

If it is assumed that the ATV station's antenna height is the same as that of the companion NTSC station, the resulting needed ERP in cases where VHF stations are operating with low antennas is greater than current equipment can provide. In digital-based systems, the basic requirement to maintain linearity during transient peaks places a responsibility on the ATV station to employ a transmitter. It should be capable of achieving peak power levels in excess of the average power used in service and interference studies. This indicates that some ATV stations may use lower power levels or greater antenna heights than used in previous spectrum studies. ■

ZONE	CHANNELS 2-13 (miles)	CHANNELS 14-69 (miles)
I	169.5	154.5
II	189.5	174.5
III	219.5	204.5

Table 1. *The minimum co-channel separation distance for the NTSC service.*

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re: Radio

Orwell rides again

By John Battison, P.E.

After an extended hospital stay for a recurring back problem, my fingers feel a little stiff at the keyboard. This hiatus, however, prompted me to look back over the years. I was reminded that all AM engineers need to recall the occurrences of June 1990. At that time, much attention was being directed to RF emission bandwidth and spurious radiation, especially into adjacent channels. Eventually, the FCC passed a rule mandating new bandwidth restrictions. The National Radio Systems Committee (NRSC) produced the NRSC-1 specification, and life became easier for the station engineer for the next four years.

Direct your attention to FCC rule No. 73.44(d), *AM Transmission System Emission Limitations*. In this rule, measurements are to be made to show compliance with paragraphs (a) and (b). *However* (emphasis is mine), "licensees of stations complying with the ANSI/EIA-549-1988 NRSC-1 AM Pre-emphasis/De-emphasis and Broadcast Transmission Bandwidth Specifications (NRSC-1) prior to June 30, 1990, or from the original date of operation, will be considered to comply with paragraphs (a) and (b) of this section, absent any reason for the commission to believe otherwise." The section goes on to say that such stations are waived from having to make periodic measurements (described in No. 73.1590(a)(6)) until June 30, 1994.

Most of us remember the mad rush to purchase NRSC-1 filters and processing equipment to meet the rule and thereby obtain freedom from having to make any revealing emission tests. But now the demand has died down, and probably most engineers and stations have forgotten about the second phase of the process. That's why I'm writing about No. 73.1590. Readers may recall George Orwell's *1984* and its regime of Big Brother and double talk. Rule No. 73.1590 is not double talk, but it *is* a fact of life to be met and obeyed in the year 1994.

June 30, 1994, is a little more than a year away. How many stations have made equipment and/or emission tests since installing the NRSC-1 filters in a panic-stricken rush back in June 1990? Also, how many stations have NRSC-1 filters properly adjusted so that RF output from the transmitter really does comply with NRSC-1?

It is wise to budget now for the spectrum analyzer and other equipment that will be required next year.

FM stations do not have to make any emission measurements unless the transmitter is changed, or SCA or stereo operation is added. On the other hand, AM stations are required to make the test specified in No. 73.44 (a) and (b) at intervals not exceeding 14 months. Because of NRSC-1, we have had a pleasant respite from making these tests (and worrying about the adequacy and compliance of their results) for a period of four years. But next year, Big Brother will once again be looking over our shoulders with keener eyes and more precise requirements. Instead of relying on pure observance "in the absence of reasons to the contrary," the commission will require *proof* that stations comply.

Testing requirements

For many, a spectrum analyzer will be the best tool to use for this job. Rule No. 73.44(a) reads, "emissions shall be measured using a properly operated and suitable swept-frequency RF spectrum analyzer using a peak hold duration of 10 minutes, no video filtering, and a 300Hz resolution bandwidth, except that a wider resolution bandwidth may be employed above 11.5kHz to detect transient emissions."

The rule continues, "alternatively, other specialized receivers or monitors with appropriate characteristics may be used to determine compliance with the provisions of this section, provided that any disputes over measurement accuracy are resolved in favor of measurements obtained by using a calibrated spectrum analyzer adjusted as set forth above."

In other words, you can continue to use a communications receiver and a field intensity meter to satisfy yourself that your station is in compliance and thus document your report for the files. But — and here is the fly in the ointment — if the commission, or your competition, uses a spectrum analyzer and shows that you are out, then *you are out*. The spectrum analyzer has the last word.

Spectrum analyzers are not cheap. The least expensive ones run approximately $3,000, and may not do all that is required in this application. A recording device of some kind, such as a camera or graphic recorder, also will be needed. A well-heeled contract engineer could probably make a decent profit by investing in such an outfit. After quickly recovering costs, the consultant could get plenty of repeat business if the work is done properly and accurately. Another option, but less likely, is for several stations to get together and purchase the required hardware.

Regardless of equipment requirements and availability, it is now time for the forward-thinking station or contract engineer to consider how to cope with the impending requirement. Presumably, there will be 14 months in which to document the first emission test. The commission should allow the *assumed* compliance that follows from the four years of NRSC-1 usage to provide the breathing space in the following 14 months to prove it.

Nevertheless, it is not too early to take a look at your RF emissions today. You may get a shock when you see what is really going out. It also is wise to budget now for the spectrum analyzer and/or other equipment that will be required next year. If stereo conversion is in your near-future plans, a spectrum analyzer is almost a must. ■

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

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Part 2

Management for Engineers

Managing stress

Defining stress

By Judith E.A. Perkinson

Several years ago, I attended a stress management workshop. At the time, I was going through a divorce, had just changed jobs, my boss was terrible, finances were tight and I had two small children to care for. During the workshop, I filled out a series of stress source checklists. Not surprisingly, my stress levels were off the top of the chart. According to the workshop leader, I should have been dead.

When I completed the stress indicators checklist, I found I was not demonstrating any dramatic signs of stress. The workshop leader was astounded, and explained that I must be one of those people with a high capacity for dissipating stress. Because he could not explain exactly how I managed to accomplish that feat, I left the workshop feeling lucky and a little frightened. Needless to say, I had lost some of my faith in traditional stress management workshops. Somehow, there had to be more to understanding stress than a series of checklists. I wanted an explanation as to how I was able to manage the stress in my life, when all indications showed that my stress levels were extremely high.

The traditional approach to stress management can leave a person confused and ill-informed. Stress management is not a series of checklists coupled with exercise and a well-balanced diet. Each person needs to develop a lifelong stress management system. This can be accomplished by educating yourself on the consequences of stress; identifying personal and job stressors, evaluating their effects and ways to cope with them; establishing a plan to reduce, eliminate or manage those stressors you have some control over; and developing a plan for coping with stress.

Last month we discussed how stress affects us. This month we will examine what stress is and where it comes from.

What is stress?

Stress is a mental, emotional, physical and behavioral response to anxiety-producing events, whether real or imagined. Stress is unavoidable. It is a natural reaction to positive or negative changes in your life. Stress can develop from any type of change, good or bad. It can result in physical, psychological and behavioral problems. Your mind and body can react to this anxiety in such ways as increased heart rate, blood pressure, metabolism and breathing.

The physiological response to stress is the same, whether you are trying to fix an expensive piece of equipment, accepting an award or being chewed out by your boss.

Stress management is not a series of checklists coupled with exercise and a diet. Each person should develop a lifelong stress management system.

Sources of stress

The source and amount of stress in your life changes constantly. It is a fact of life that you will have to adapt to changes at home, in the workplace and in your personal life. It is important to understand the types of events that produce stress so that you can gauge the amount of stress you must handle at any given period in your life.

• *Life events.* Checklists come in handy here. Potential sources of stress can be grouped into five general areas:

1. *Health* (illness, injury, recovery).
2. *Home and family* (marriage, divorce, birth of a child, death of a family member, change in residence, remodeling, infidelity, holidays).
3. *Personal and social* (vacation, lawsuit, travel, return to/from school, arrest, victim of assault or robbery).
4. *Work* (change of employment, promotion, demotion, retire, get fired or laid off, increase or decrease in workload, trouble with boss or co-workers).
5. *Financial* (mortgage, foreclosure, major purchase, increase or decrease in wages, financial loss or gain).

• *Daily sources.* Quality of life can influence levels of stress. You can recognize daily sources of stress by determining which events make your life comfortable or uncomfortable. A neighbor's barking dog, road repairs on the way to work, a messy house or someone in the office who smokes can all produce stress. Sometimes, you may become so used to these stressors that you don't think of them as such. Things that reduce your quality of life can be sources of stress.

Types of stress

Not all stress has a negative effect. Three types of stress include normal, good and bad.

1. *Normal* stress keeps you on your toes, makes you aware and helps you keep a sense of concentration.
2. *Good* stress motivates you and gives you a positive sense of excitement and enthusiasm.
3. *Bad* stress has a detrimental effect on your physical and/or psychological well-being.

Often, the difference between normal, good and bad stress is the way it is handled. Furthermore, it is related to events that are within or out of your control.

Many sources of stress are beyond your control. For example, holidays, getting sick, accidents, bad weather, and paying taxes. Most people learn to handle these situations when they occur.

Although you cannot always control the sources of stress, you can control how it affects you. Your attitude toward life at home, work and yourself influences how you control stress. Some people are constantly building mountains out of mole hills, while others seem to roll with the punches. Reaction to anxiety-causing events often is a matter of choice.

Next month, we will examine how your mind can help you develop a life-long working stress management approach. ■

Perkinson is a senior member of the Calumet Group Inc., Hammond, IN.

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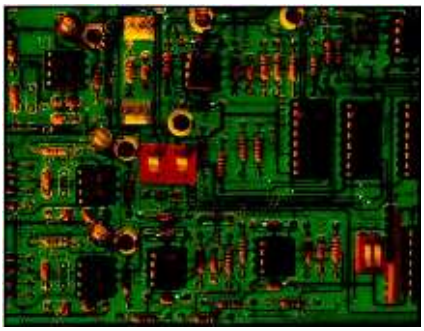
Part 2

Circuits

PLD basics

Circuit design

By John T. McGaughey



Part 1 of this series examined the concept of a programmable logic device (PLD) and how these ICs can be an important tool in circuit design. Even the typical small PLD actually contained two programmable arrays — one defining the function, a second providing additional control. Because the number of programmable links contained in even small devices can exceed 1,472, it is not surprising that these components failed to gain popularity until computer-aided techniques simplified their programming. Let's explore how software can ease the process of circuit design using PLDs.

Developing PLD applications

A PC running a logic compiler program is connected to an IC programmer unit connected by a serial or parallel port. Two types of logic compilers are available. To support the development of their own PLD business, some manufacturers supply compilers that are relatively specific to that company's own device programs. (Sometimes these are available at no cost. One notable example is the PALASM2 by Advanced Micro Devices Corporation.) Greater flexibility is possible with manufacturer-independent compilers, which support a wide array of PLDs from various manufacturers. These are fairly expensive, although some models are offered with reduced part support at a much lower cost.

With a PC and the software, an IC programmer is still required. High-quality units can be found in the $300-$500 range that support many of the most popular PLDs. The ICs can be purchased in low volume from mail order companies for $2 to $5. Because they are electrically erasable, experimentation is risk-free. Mistakes are simply erased.

Defining the function

Circuit development begins by creating a logic description file with a text editor. The file describes the logical function required in a format acceptable to the compiler.

The compiler translates the description to a JEDEC file format (Joint Electron Device Engineering Council). The process is analogous to software development, where source code is translated to machine code. In the process, a documentation file is produced to show exactly how the device was configured. Some compilers include a simulator for testing of the design to verify correct performance.

McGaughey is an instructor at the University of Georgia Center for Continuing Education, Athens, GA.

```
(Header section)

NAME      ALARM;      (header)
DEVICE    F273;
FORMAT    J;

(Pin designations)

PIN 1 =   !TOWER_LIGHT_FAIL;
PIN 2 =   WEATHER_ALERT;
PIN 3 =   !EBS;
PIN 4 =   NETWORK-MESSAGE;
PIN 5 =   ALARM;

(Logic description)

ALARM =   TOWER_LIGHT_FAIL
          # WEATHER_ALERT
          # EBS
          # NETWORK_MESSAGE;
```

Table 1. *A logic description file.*

A logic description

Three sections make up a logic description file. The *header* section names the work, specifies a PLD and performs housekeeping tasks.

In the second, the *pin declaration* section, names are assigned based on signals connected to device pins. This permits descriptions to use meaningful names instead of pin numbers. Within the pin name, the signal is declared as active high or low, but the procedure also permits logic descriptions without specific information of signal status. (Active high or low refers to a 1 or 0 status as the condition of interest.) Also, pin input or output directions are deduced by the compiler by how they are used, so no direction is specified.

The third section of the file is the *logic description* section. This contains the logic equations made up of signal names and logic operators to specify the functions needed.

In Table 1, a short description file outlines a system to sound an alert if specified alarm conditions occur. The header names the description (alarm), selects a PLD (Type No. F273) and specifies a JEDEC (J) format output file. Five pin-declarations state four input conditions and an output to a warning light. Two inputs are active low; the remaining two are high. The equation for the alarm will make the alarm pin high if any of the four inputs are active. The pound symbol (#) represents a *logical OR* for this compiler; an exclamation point (!) denotes *active low*. Each complete statement ends in a semicolon (;) as required by the programming syntax. This code would be compiled to produce a JEDEC file suitable for the IC programmer.

Circuit development begins by creating a logic description file with a text editor.

If requirements change, such as an addition input or an alteration of the input active level, simple changes in the description solve the dilemma. Because this application uses only five pins of a possible 22 in this device, other unrelated logic could be implemented in the same PLD.

Equations are not restricted to simple operations. They can be free form, which permits parentheses along with intermediate variables. Equations also can be created without specific assignments to given pins, similar to variables in mathematics. An equation name can be used in other equations for a building block approach. These conventions permit a final equation to appear quite simple, even though the actual function may be extremely involved.

Next month, we'll continue the series by describing a PLD-based alarm system constructed for the radio station WUGA-FM at the University of Georgia. ■

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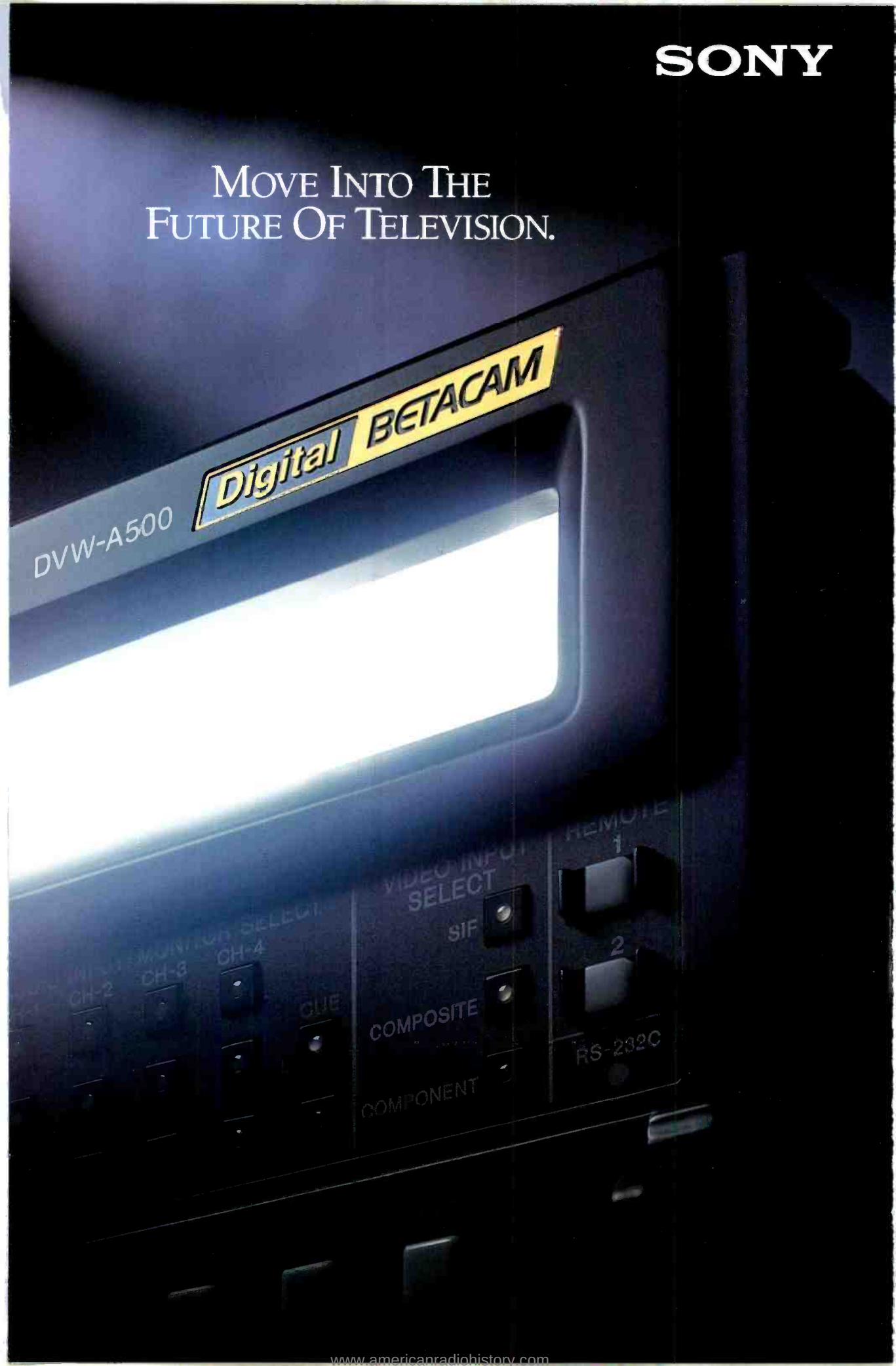

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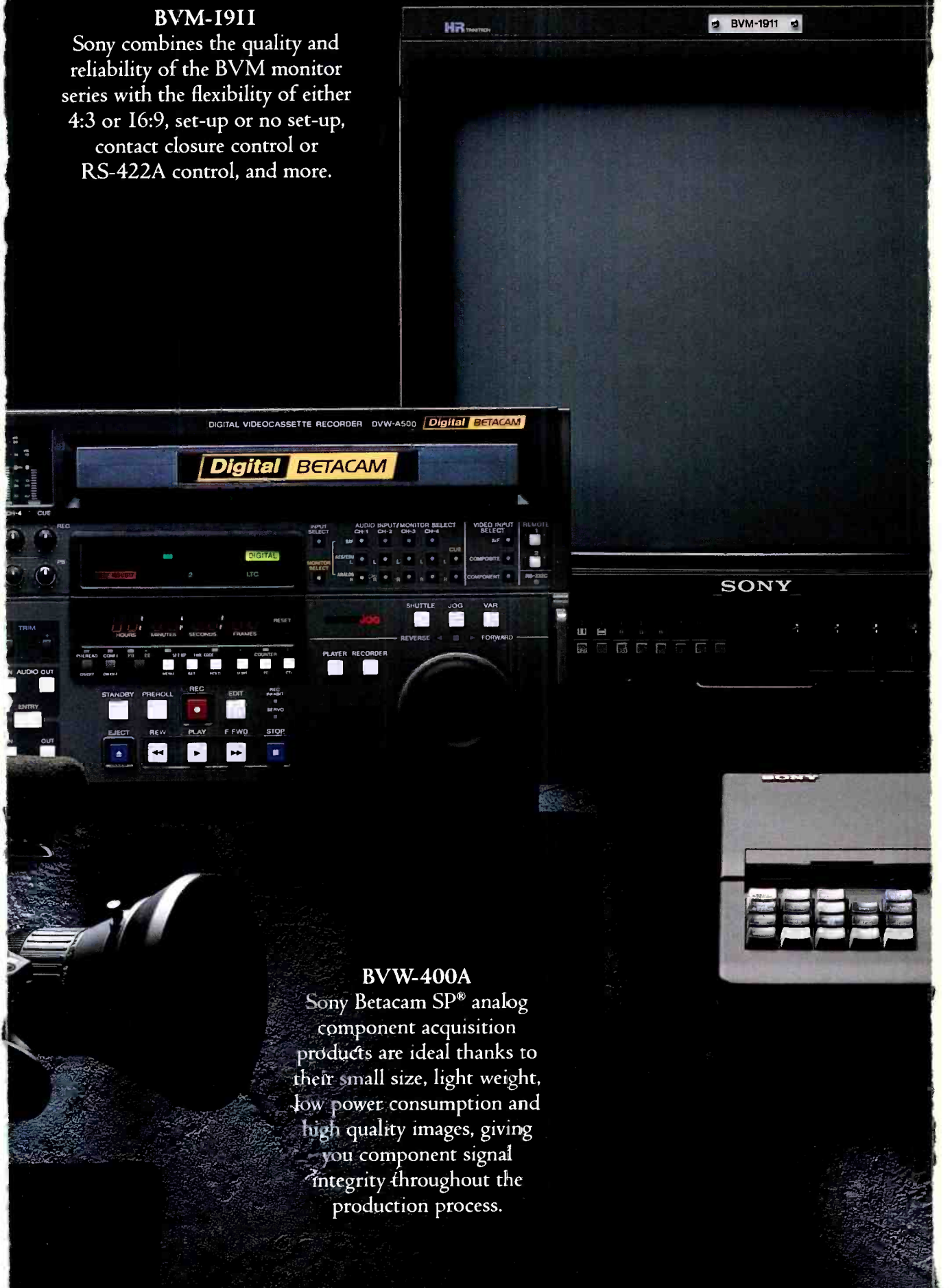

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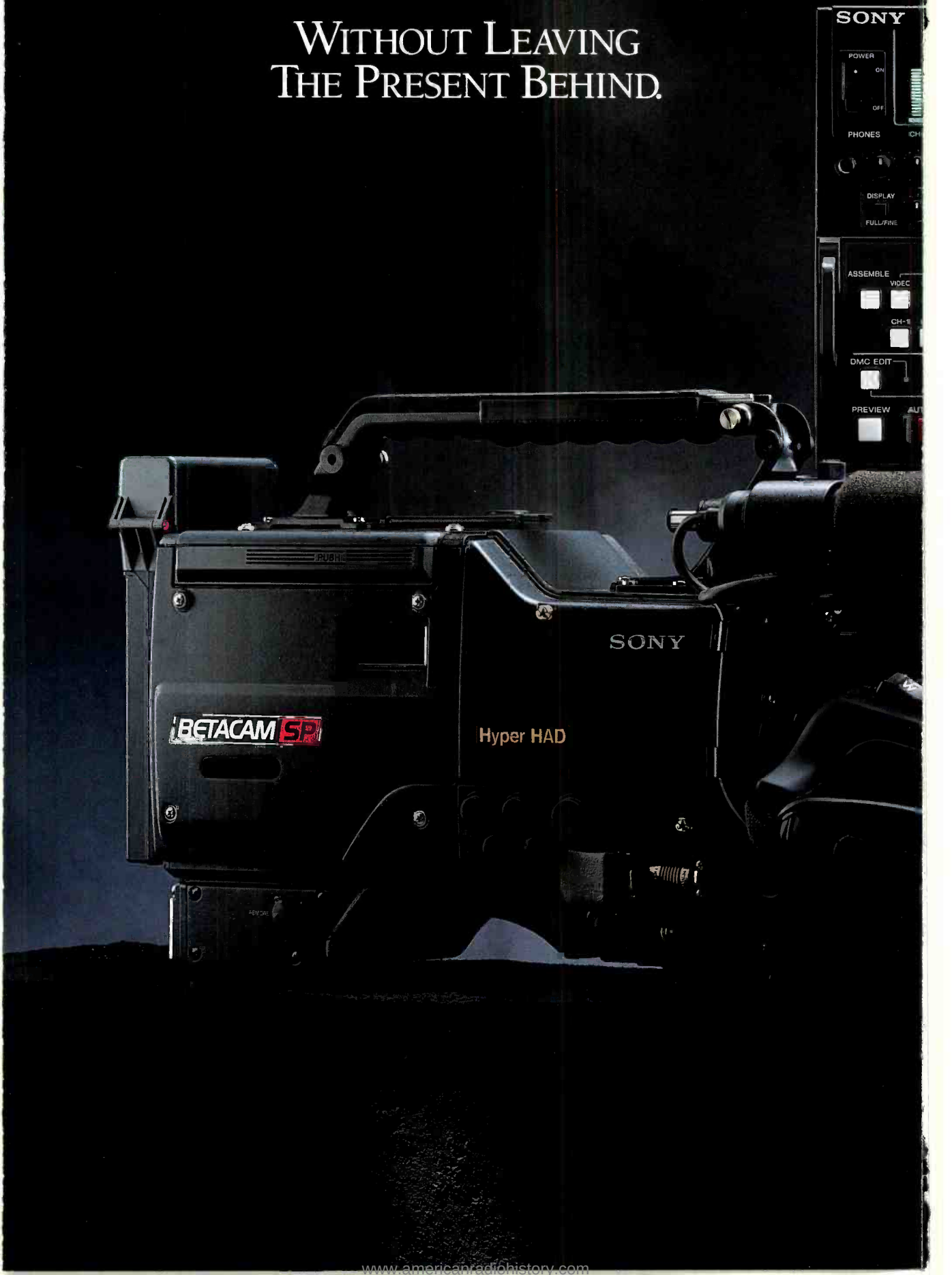

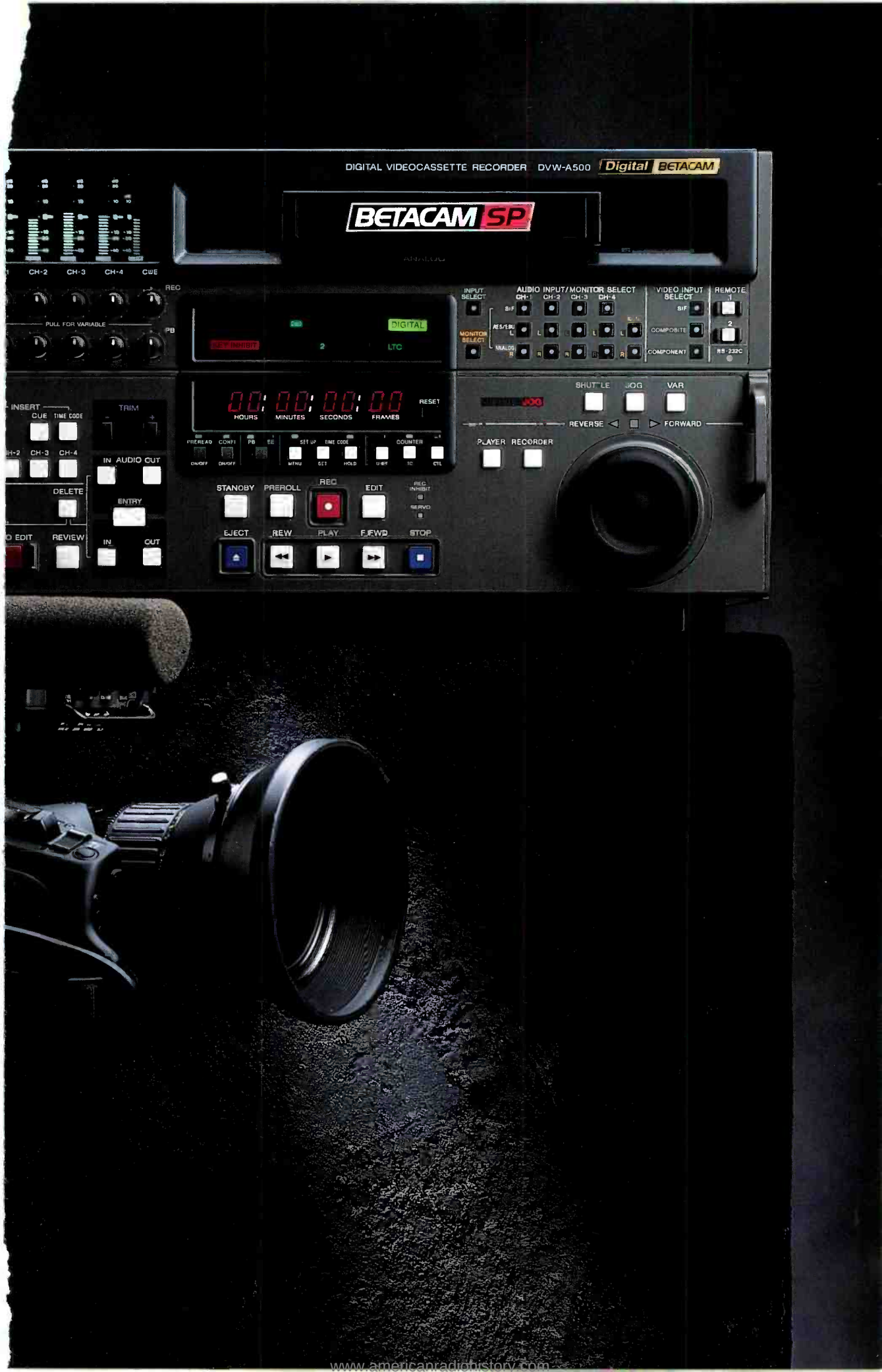

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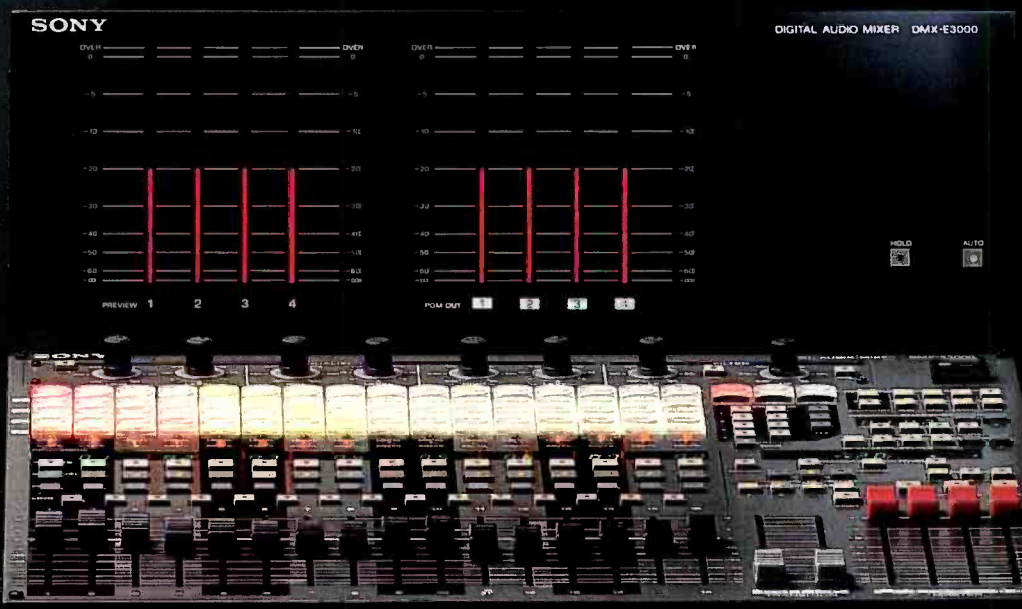

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Continued from page 4

with vertical polarization. Each 30Mbit/s signal compresses an orthogonal frequency division modulation (OFDM) ensemble of approximately 500 closely spaced carriers, all of which are digitally modulated using 64 QAM.

NAB wants FCC to reform FM licensing policies

The National Association of Broadcasters (NAB) is pressing its case for FM license reform with FCC regulators, using a commission proposal to change the reporting requirements for radio and TV licenses as the venue.

NAB supports a proposal to modify the broadcast license renewal form to determine whether a broadcast station is on the air. Regulators, however, were urged to use the information as part of a larger effort aimed at reducing the number of surplus radio stations.

NAB said the growth in the number of U.S. radio stations and the increased amount of interference among FM stations has worked against the interest of the broadcast industry and the listening public. NAB also noted other FCC reforms tackling interference problems on the AM band, and said similar efforts are needed for the FM band. NAB has offered one solution, which is the prompt deletion of silent FM stations that have been off the air for more than six months.

Greater use of directionals will cause interference

The National Association of Broadcasters (NAB) has told the Federal Communications Commission (FCC) that greater use of FM directional antennas will lead to interference.

In its filing, NAB underscored the importance of overhauling the commission's FM allocation rules and policies, a request first made in February 1992.

NAB asked the commission to overturn an FCC decision, which encourages greater use of FM directional antennas. Many broadcasters assert directional antennas provide unreliable protection against interference. NAB fears that eliminating the 8km short-spacing rule, which restricts the use of directional antennas, will actually lead to more interference for stations slotted nearby on the FM dial and encourage more crowding on the FM band.

Call for papers

The Association of Central Canada Broadcast Engineers (CCBE), Technologists and Technicians Convention will be held Sept. 28-30 at the Skyway Trade and Conference Centre in Toronto, Canada.

This is the association's 42nd annual trade show and convention. Gary Hooper of Telemedia Communications is the papers chairman. He can be reached at 40 Holly Lane, Toronto, M4S 3C3.

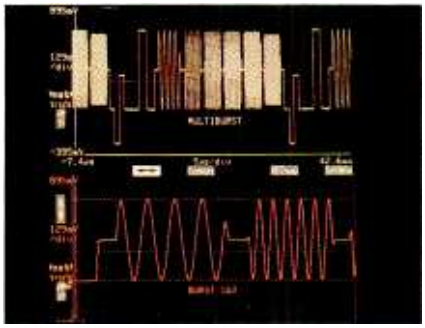
Central New York's upcoming SBE annual convention

The 21st annual regional convention of the Society of Broadcast Engineers (SBE) Central New York Chapter 22, Syracuse, NY, will be held Friday, Sept. 10 from 9 a.m. to 5 p.m. The convention will be held at the Sheraton Inn Convention Center in Liverpool. Admission is free.

For more information on the convention, contact John Soergel, convention chairman, at 315-437-5805. ■

Part 2

Troubleshooting



Care and feeding of coaxial transmission lines

Mechanical properties

By Dean W. Sargent

Now that you can select the correct size transmission line for the power you are going to run, let's discuss what mechanical properties you want in your line. There are several types of flanges to choose from. The flange should be attached to the outer in the best manner. Some will be silver soldered, and some will be welded.

Silver-soldered flanges require much heat to the flange and outer tube. This will cover a large area and result in the copper becoming soft over a large area. If care is not taken in the soldering process, the flange will become distorted from the excessive heat. This can result in poor RF contact at the connection and possibly cause a leak from not compressing the O ring properly. The outer is likely to have dents around the flange where the wrench socket hits the tube while tightening the flange bolts. *Never* use a socket for this purpose; use a box end wrench.

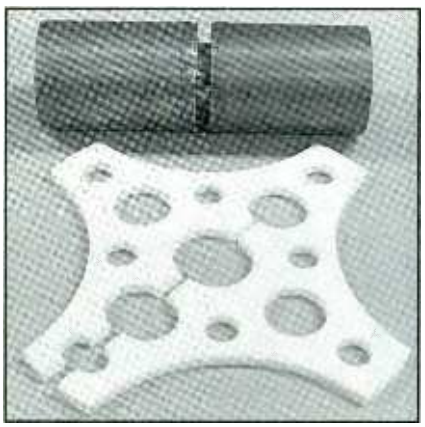


Figure 1. *Old-style insulator and undercut.*

Leaks that show up later are another problem that arises frequently with silver soldering. This is usually the consequence of flux embedded in the solder, which breaks down with time. This results in a leak from the normal flexing of the line with movement caused by wind and/or expansion and contraction because of temperature changes. Distortion of the outer (and inner) conductor can result if too much tension is applied at a flange because of improper tension of hangers, or worse, a jammed hanger. This can occur because of the softening of the copper tube in the soldering process.

Sargent is president of D.W. Sargent Broadcast Service Inc., Cherry Hill, NJ.

Flanges welded in place using *Heliarc welding* do not suffer these problems. This process requires no flux, and the heat is confined to only the area to be joined, resulting in a much stronger joint. This is true in constructing elbows and tees.

When using larger size line (8 3/16-inch and 9 3/16-inch), different manufacturers use different bolt hole patterns on their bolt-type flanges. In 4-inch transmission line, several different sizes of flanges (and tube) are used.

All inner conductors are not the same

The next item to consider is how the inner conductor is supported inside the outer conductor. Some manufacturers use "pin" insulators. These are Teflon pins passed through the inner conductor at various places to support the line. The presence of the Teflon *is* a discontinuity. If the spacing between insulators is an even number of quarter wavelengths at your frequency, the VSWR of each will add up. Pin insulators also tend to break easily when inserting or removing the inner conductor from the outer conductor. Care must be used when removing or inserting the inner in the outer.

Some manufacturers use a form of disc insulator that fits in a groove (called undercut) in the inner conductor and supports it in four places within the outer. The undercut is made a certain depth and width to compensate for the presence of the Teflon insulator, which also is made with the correct amount of material. This results in a compensated line section so that the discontinuity is extremely small. Figure 1 shows this undercut and the insulator that fits into it. This undercut or groove is machined into a piece of copper bar and the tube welded to it. The undercut has to be deep, because the Teflon insulator is thin and the depth is necessary to compensate for the mass of Teflon. This requires a good weld that does not protrude above the tube because a discontinuity will result. Some manufacturers roll this undercut into the tube itself, which results in an extremely thin tube at the location of the groove.

Figure 2 shows a new technique for this undercut/insulator. The undercut is longer but not as deep. This undercut is put in the tube by a process analogous to what happens with heat shrink tubing when it is heated. The copper tube is shrunk down onto a die on the inside of the tube. The thickness of the tube is not affected, and no welding or grinding is necessary. The insulator is in two pieces. One piece is wide to fit the undercut and has a thin groove to accommodate the Teflon disc insulator that supports the inner inside the outer conductor. This results in a stronger line with extremely good electrical characteristics.

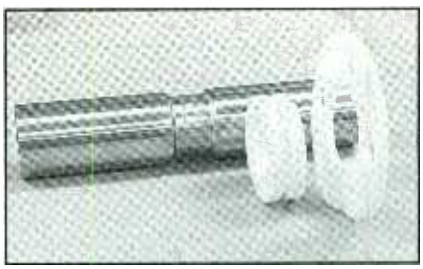


Figure 2. *New-style insulator and undercut.*

Elbows have inner conductors too

Several manufacturers offer elbows with no insulators. Although this eliminates the necessity for compensation, it does have a drawback. It is difficult to seat the inner connector into the elbow inner. Some manufacturers have a threaded hole inside the inner that a rod can be threaded into and the inner connector is inserted over this rod, a sleeve inserted over the rod and a nut tightened down on the sleeve. This pulls the bullet into the elbow inner conductor. It only works when you can have both bullets installed in the elbow. These elbows are invariable ones with short, equal length legs.

A better approach is to use longer length legs or one short and one longer leg that will allow the inner to be supported with disc insulators, suitably compensated, which also will captivate the inner so that the bullet can be inserted without any auxiliary equipment. This will ensure that the bullet is properly seated. ■

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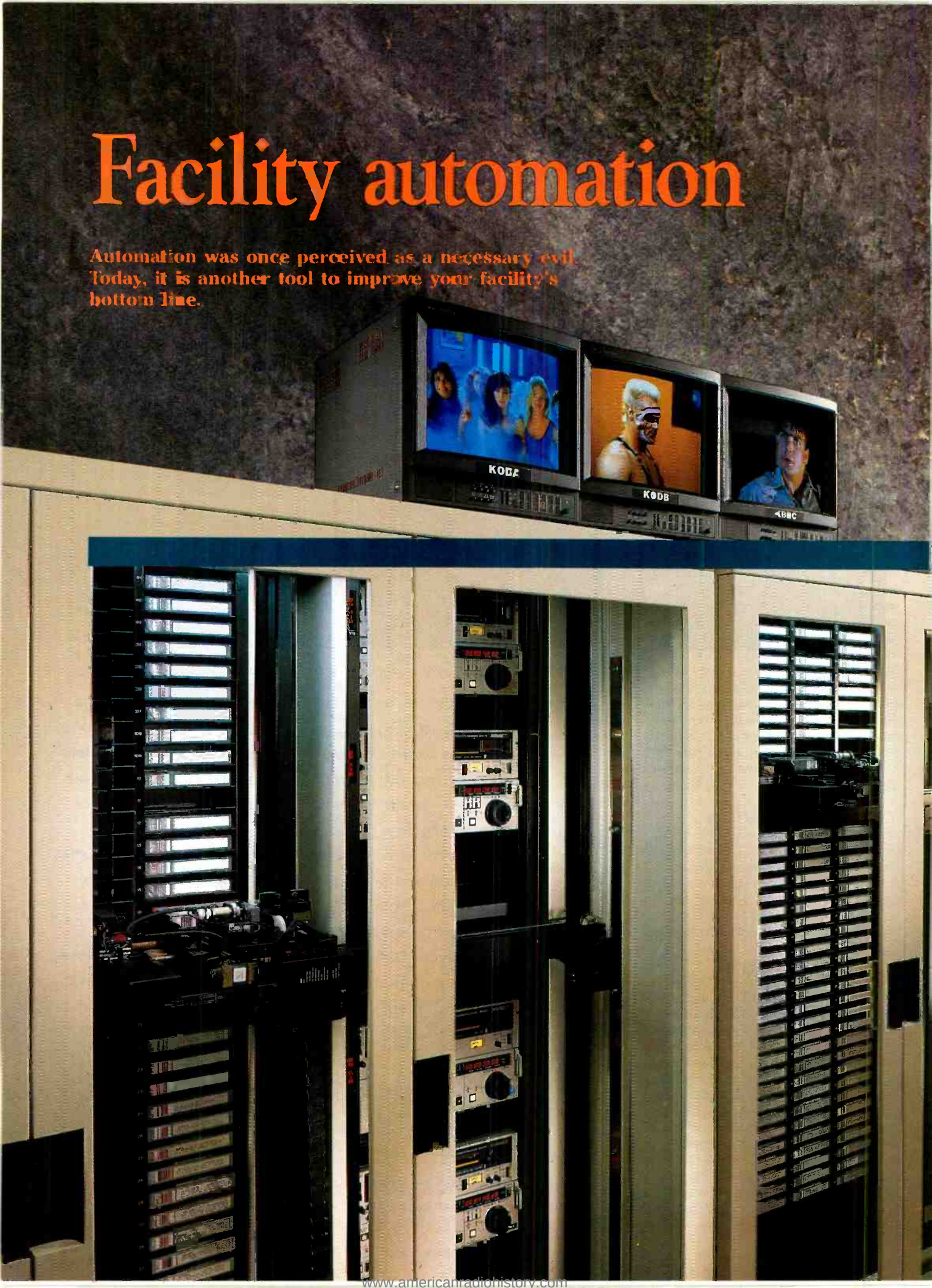
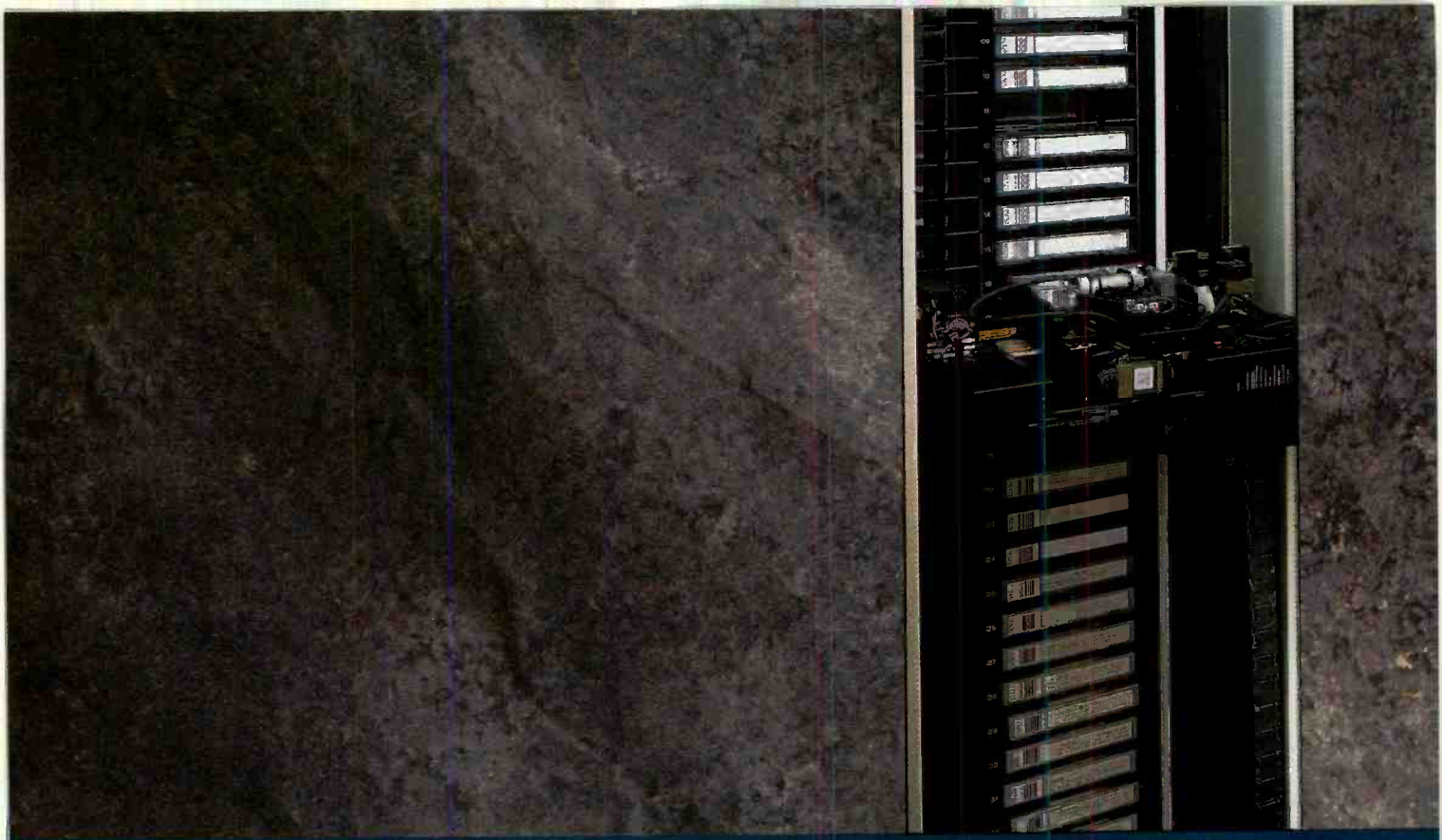
Facility automation

Automation was once perceived as a necessary evil. Today, it is another tool to improve your facility's bottom line.





Automation systems have been called everything from an answer to a prayer to some inappropriate terms that we can't print. My early days in radio involved working with some of the original automation systems. The systems often were filled with banks of relays, "peg board" programming matrixes and sequential programming stepping relays. These early systems were prone to mistakes, many of which were humorous — as long as you weren't the station engineer.

One night I was listening to one of my favorite stations in Wichita, KS. The station's late-night programming relied on an old automation system. It was well after midnight, the network news had just ended and an Army public service announcement was aired.

The PSA finished, and then played over and over and over again. I think the cart played 27 times before someone discovered the problem and kicked the system to the next step.

Automation, especially for television, used to be looked upon as a technological evil. It was perceived as a harbinger of staff reductions, the onslaught of operatorless and engineerless radio and TV stations. Automation was seen as the end-of-the world as far as engineering jobs were concerned.

Today, automation is seen in a more realistic light. Although automation technology was never the devil it was often portrayed by some, neither were early systems the salvation offered by their evangelical salesmen.

Automation, like other technological developments, is merely a tool for improving quality and productivity. These two factors will translate into higher profits that benefit every facility employee.

Engineers and managers recognize the importance of efficient operation. Companies cannot afford to waste human or equipment resources. Many tasks in a broadcast or cable operation are repetitive and relatively non-challenging. Such tasks are often perfect applications for automation. Where tasks are relatively simple and recurring, automation is usually better-suited for the job than a person. Human power is more appropriate for those applications that require original thinking and problem-solving work.

It's no surprise that as automation technology began to offer solutions to operational problems, broadcasters and cable systems began to embrace it. And that's as it should be.

This month's feature coverage looks at how modern radio and TV automation technology is solving problems. Forward-thinking technical managers will look toward automation as a tool to help their facility's bottom line. After all, it's only through the profitable operation of our companies that we as employees can grow and prosper.

Brad Dick

Brad Dick, editor

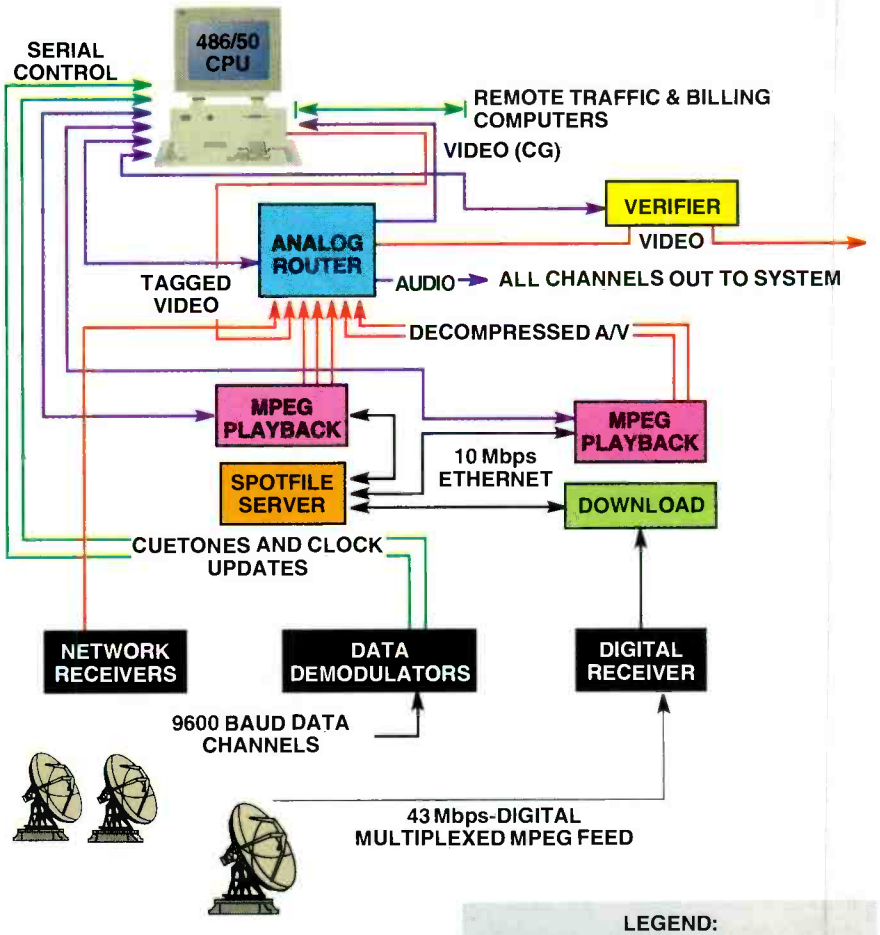


Figure 1. Digital satellite delivery of commercials can tie even the most remote cable systems together as an interconnect, or transport national and promotional spots for near immediate turnaround.

most revolutionary technology to hit the cable business since the satellite. Although compression was originally introduced to the cable industry primarily as a means to multiplex multiple signals onto one satellite transponder, digital compression and storage for playback has immediate applications for cable. One of the first areas to be directly impacted by this technology will be ad insertion.

Digital compression provides a vehicle for expanding local advertising while solving many of the reliability problems and limitations of tape-based insertion. Advances in computer technology allow the compressed digital video insertion system architecture to be almost entirely PC-based. Using standard 386/486 platforms, ethernet networks with hard drives, mean time between failure (MTBF) can approach 100,000 hours for individual components within the system.

Such digital systems also are not restricted to the old random-access rules. If a commercial resides in the system, it can be copied for playback in any order and to as many channels as necessary. Fixed position of all breaks is possible, and total on-line commercial inventory is only limited by storage capacity.

The modularity of the PC platform makes inventory expansion simply a matter of adding hard drives or other storage media. Additionally, adjustable data rates allow operators to control the playback quality without changing hardware. The relationship between playback quality (data rate) and overall spot storage capability can be customized to suit individual operations in a way previously not possible.

MPEG vs. JPEG encoding

Although the emerging international standard for compressed digital video is MPEG(II), JPEG is being considered by some manufacturers and operators for ad insertion. The JPEG move is fueled by the expense of MPEG real time compression. The number of calculations required to process analog video into full MPEG Interframe Bidirectional Predictive (IBP) frame compression is too great for even a 486/50 processor to handle without the help of a specialized video board to slow things down to one frame at a time digital capture. Even so, the process can take several hours to digitize and compress one

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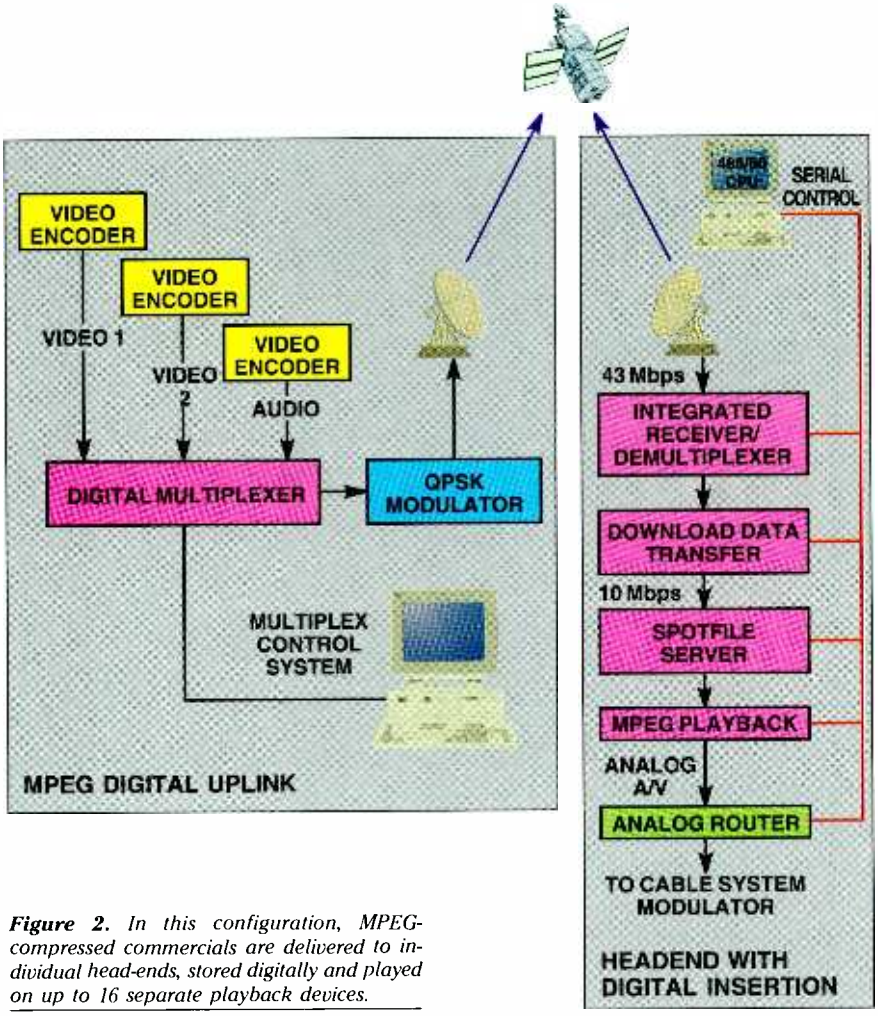

Figure 2. *In this configuration, MPEG-compressed commercials are delivered to individual head-ends, stored digitally and played on up to 16 separate playback devices.*

30-second analog commercial.

Real time MPEG encoding is accomplished by first converting analog video to CCIR 601 (digital video) and inputting it to a proprietary-designed VME-based IBP compression system. (See Figure 1.) These real time encoders sell for $100,000 or more and are used primarily in uplink applications. The current VME approach is too expensive, and PCs are too slow for the copy change requirements of local cable systems.

This dilemma led designers to consider the JPEG approach, which deals only with the individual frames. Compression algorithms are greatly simplified, and real time encoders can run on Sun workstations or PCs.

Unfortunately, this strength also is JPEG's weakness. Breakthroughs in chip technology are expected to change this encoding advantage in the near future and may knock JPEG out of consideration for local ad insertion or other serious motion applications.

The advantages of MPEG(II) are considerable. Using IBP frame encoding will provide much greater video quality in playback while using lower data rates than JPEG. Conservative estimates put this advantage at 2:1, and some experts believe that it can be as much as 4:1. This advantage can translate into reduced transmission times for downloading spots and increased on-line commercial storage for insertion. Additionally, MPEG(II) will remain compatible with standard CCIR 601 digital sampling and provide a backward bridge to NTSC and PAL video formats.

Digital signal standardization in the cable industry eventually will reach directly to the subscribers' set-top, making incompatible signals impossible to carry without additional head-end transcoding. Such standardization will facilitate interoperability throughout the cable industry, and will extend beyond ad insertion to PPV and video-on-demand applications.

Digital commercial insertion system architecture

Let's examine the system architecture for a digitally based commercial insertion system. These systems will rely on compressed digital signals stored in a central file server and reproduced by separate playback chassis. This approach takes full advantage of the digital system's ability to archive large numbers of commercial "spot files" (digitally compressed commercial spots) and copy them to smaller, high-speed storage devices prior to playback. A typical system is shown in Figure 2.

The playback ports consist of a smaller dedicated hard drive and the MPEG decompression engine. This drive need only be large enough to buffer at least one commercial break in advance of the network cue tone. With cable operations running 16 or more channels of insertion, these buffers must be staged far enough in advance of anticipated break times to avoid last-minute collisions on the network. The control software resident in the 486-based insertion controller must be able to handle staging operations, schedule updates, verification stamping and cue tone activated switching. Real time control is essential to local insertion. Also, keeping the PC's CPU clock from drifting ensures accurate verification and commercial spot staging. An open architecture, PC-based system must have its clock monitored and updated to maintain scheduling accuracy and verification integrity. This is accomplished through a continuous, dedicated modem or demodulator connected to a central site that can automatically provide broadcast clock updates to the unattended head-end systems.

Providing local cable advertising places unique demands on the operators and equipment.

The file server provides the primary commercial archiving for the digital video playback system. Two types of storage media are being used in servers: large hard drives and 4mm DAT or 8mm digital tape cartridges. Tape-based storage provides greater storage at lower cost. However, access speed is sacrificed, and there may be potential reliability problems. Hard drives, on the other hand, are more expensive but highly reliable. As drive storage prices continue to drop, the large 1Gbyte and greater SCSI drives become an attractive alternative for use in commercial insertion.

Total commercial on-line inventory also is a function of the data rates used in compression. MPEG IBP frame commercials compressed at a 5.3Mbps rate will result in improved playback quality for most local cable operations. This data rate provides 29 minutes of video playback from one 1.2Gbyte drive. Drives can be ganged in the server for large storage capacity and then connected to the playback chassis via PC networking technology.

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JVC's new KY-27 2/3" 3-CCD video camera sets the standard by which all other cameras of its type are measured. When first introduced, the KY-27's amazing LoLux feature was a revolution in the professional video industry.

Video professionals who chose the KY-27 for its low-light capabilities have come to appreciate the camera's total performance features, such as its excellent sensitivity, resolution and image quality.

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"We find that the KY-27 is incredibly sensitive, has excellent resolution, and superb signal to noise characteristics."

John Kautzer, Chief Engineer,
Southern Illinois University at Edwardsville
Television Studio

LoLux Technology

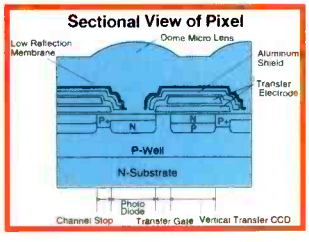
In applications as low as 2 lux, users can now capture images never before possible. Once LoLux is switched on, the CCD's are maximized for low-light sensitivity equivalent to an electronic gain of 24dB with an additional 6dB, which is provided by JVC's unique CCD pixel readout system, for a total of 30dB. All without the noise and picture degradation normally associated with this degree of gain.

KY-27 shown with the BR-S422U recorder and optional lens.

THE TOTAL PERFORMANCE OF

Latest CCD Technology

JVC's latest 2/3" CCD technology incorporates an array of advanced features that set new standards for performance and sophistication. Sensitivity is dramatically improved by the new dome-type micro-lens, which utilizes JVC's light tracking simulation technology for highly efficient light conversion. The result is the nearly total elimination of vertical smear, flare and ghost images.



Lightweight Ergonomic Design

The KY-27 has been designed to offer near-perfect weight balance, with all its controls ideally located for total ease of operation. And the extensive use of solid-state circuitry provides excellent reliability and durability.

Variable Scan

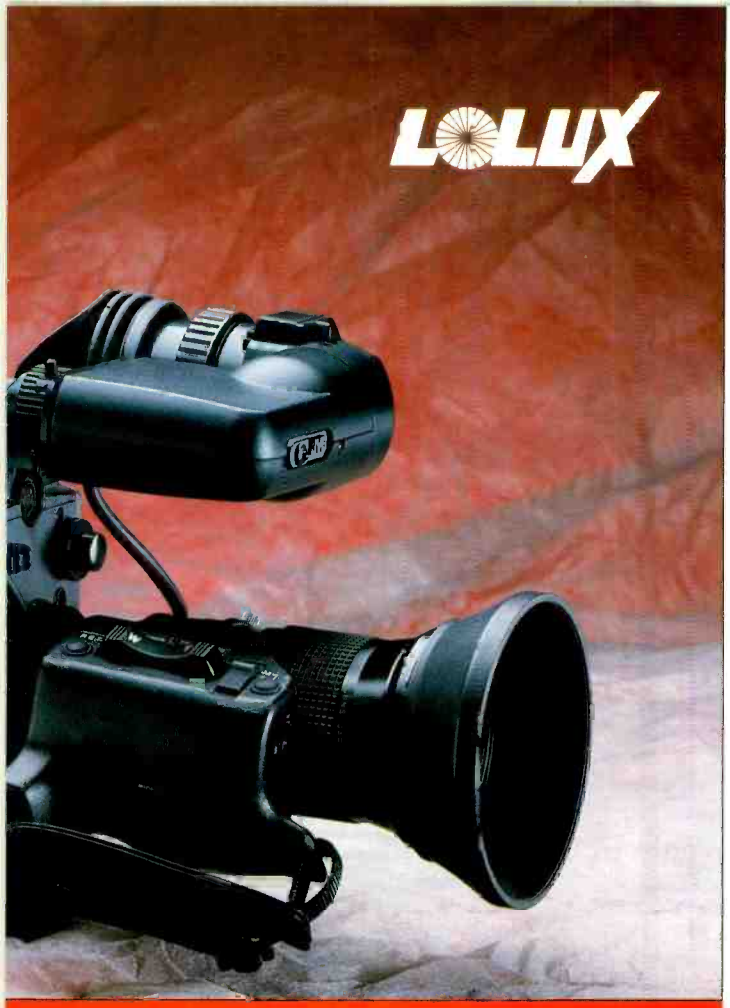
The KY-27's Variable Scan function provides flicker-free shooting of CRTs, and features an electronic shutter with fine increments ranging from 1/60 second to 1/2000 second.

"The KY-27 gives our ENG crews much more flexibility because of its low-light performance, and the "full auto" mode allows us to concentrate on the shot instead of the camera."

Fred Yawnick,
US Electro Dynamics, WA

Full Auto Shooting

In the Full Auto Shooting mode, the KY-27 operator has only to zoom, focus and press the trigger. All other functions are controlled automatically for total "point and shoot" ease of operation. This is a real plus when you have to quickly capture a shot and you don't have time to check your switch settings.



JVC's LoLux KY-27

Enhanced Automatic Level Control (ALC)

The new Enhanced ALC mode not only varies the gain, but also engages a variable shutter, allowing continuous automatic shooting in all light levels, from very dark to bright outdoors, without the need to suddenly switch the gain setting or insert an ND filter.

"The features we find appealing are the low-light capability, its true-to-life color rendition and its general ease of operations."

Dan Block, ASCA Films

Full Time Auto White

This function analyzes the color temperature of the light source and then self-adjusts the setting. This allows you to follow a subject moving through different light sources, such as incandescent to fluorescent to outdoors, without stopping to take a new white balance for each lighting change.

A host of other features demanded by today's video professionals rounds out the KY-27's total performance capabilities.

- Star Filter
- Advanced Memory System (AMS)
- Low Power Consumption
- Remote CCU Options
- Auto Knee Circuitry
- SMPTE-Type Color Bars
- Component, Composite, Y/C, and RGB Outputs
- 2H Contour (detail) Correction
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- No Lag, Burn or Deflection Distortion
- Color Matrix Circuit for Accurate Color Reproduction
- Genlock Circuit Built into Camera Head

"We've had KY-27 cameras since December of '92. They've lived up to our expectations and we highly recommend them for both studio and location operations."

G. Ricciardelli, Vice President Engineering, WICZ-TV, an NBC Affiliate

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Perfectly at Home in a Studio

The KY-27 offers a full range of accessories which make the camera ideal for studio configurations. In addition to a 4" viewfinder, cables, and a full line-up of lenses from all the major manufacturers, two camera control units, the RM-P200 and the RM-P300 are also available.

RM-P200 A basic camera control unit, the RM-P200 is very economical and operates up to 325 feet.

RM-P300 A deluxe control unit, the RM-P300 offers extensive controls with digital rotary encoders and an LCD menu display. And, it can operate up to 1,000 feet from the camera.

Camcorder with Panasonic's AU-410 MII recorder

Direct Docking with a Variety of VTRs.

The KY-27 is designed to dock directly with the BR-S422U, BR-S411UB and BR-S420CU S-VHS recorders. Optional adapters allow docking with MII, Hi8, Professional Betacam and Broadcast Betacam recorders.

Camcorder with Sony's PVV-1 Betacam Pro* recorder

Camcorder with Sony's BVV-5 Betacam* recorder

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Camcorder with Sony's EVV-9000 Hi8 recorder

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A standard ethernet interconnect will provide up to 10Mbps of throughput for staging commercials. At the 5.3Mbps data rate, spot files can be copied to the playback buffer drives in approximately one-half of real time. Such PC-based platforms allow the network architecture to be expanded to increase playback capability and/or staging speed as needed.

Although a cart system for every cable network would provide ideal flexibility, it would be cost-prohibitive.

Attempting to interconnect multiple head-ends or expand channel capacity beyond 16 places additional processing loads on the system controller. Such large designs require a multitasking operating system, such as Unix, and distributed processing in the form of smart machine control cards. This approach can effectively manage any outward expansion needed by an MSO or large cable system.

Future switching systems

In the near term, commercial insertion will still take place at baseband audio/video. This requires analog switching between the MPEG decompression playback cards and the satellite networks. Simple dedicated channel switching can be used, but a router provides more flexibility. Because digital video ports can be effectively shared across networks, a router means less ports in the system and a savings in decompression cards and high-speed SCSI drives and controllers. Customizing commercials at the head-end also is possible through the addition of a character generator. This affords operators and interconnects the ability to overlay generic promotional spots and commercials with system-specific tags after they have already been loaded into a digital storage system. Because the cable head-end is not driven by house sync, any router will require individual sync circuits on the output channels. A digital commercial insertion system is shown in Figure 3.

Gaining the maximum advantage requires that all signal switching eventually take place in the digital domain. However, initially all inserters will be essentially a hybrid digital/analog system. Commercials will be routed internally by digital staging, then decompressed to analog and switched into programming. The analog router also facilitates hybrid tape/digital video systems configurations that some operators are planning. This will ease the migration path from tape to digital video playback. In the longer term, signal switching may well take place digitally with MPEG-compressed commercials switched directly into MPEG programming streams and decoded at the subscriber's set-top terminal.

Verification systems

Until recently, commercial verification was standard with most insertion systems, often relying on a proprietary marking scheme that encoded IDs on one of the two audio channels. The ID tones are usually FSK bursts that include the essential spot and advertiser information. Some systems also provide SMPTE time code to locate and verify commercials during playback.

A new technology standard is emerging for use in commercial verification. Although designed for cable multichannel applications, it still retains the VBI active video encoding technique of its broadcast counterpart. The commercial identifier is read independently of the inserter's switching system and reports back to the controller.

Unlike over-the-air broadcasts, there are no guarantees that a commercial that reaches a channel modulator actually reaches the entire cable system. However, because the IDs are embedded in the active video, the verification decoder unit can be located remotely anywhere on the cable system to verify that the spots were run correctly. The decoder can even be positioned down the amplifier cascade or over remote microwave sites.

Fiber optics and head-end consolidation

One key to effectively integrating commercial insertion into large systems is the use of fiber. Tying contiguous franchise areas and even entire markets together with fiber-optic loops is already having a positive effect upon the logistics of local insertion. Head-ends, which were formerly remotely located, are now collapsed into single, larger centralized head-ends feeding many more subscribers. This means that the insertion system can easily service a larger area or the entire market in a hard interconnect.

Consolidating insertion equipment at a single location also makes it easier for operators to improve quality and maintenance while making it possible to more quickly update commercials.

Such logistical improvements do have one drawback: A single insertion system cannot provide the kind of system-specific targeting that has built the local cable advertising business. The real advantage of fiber is that it allows cable systems to be zoned into more relevant market areas that may provide even more specific insertion capability than the previous individual head-end architecture. These zones become hubs that can be fed from one large, centralized insertion system with separate output channels for each network and each zone.

StarNet control room in West Chester, PA, monitors and retransmits all ad-supported cable network cue tones and deploys an MPEG digital uplink to send commercials to affiliates for storage and playback.

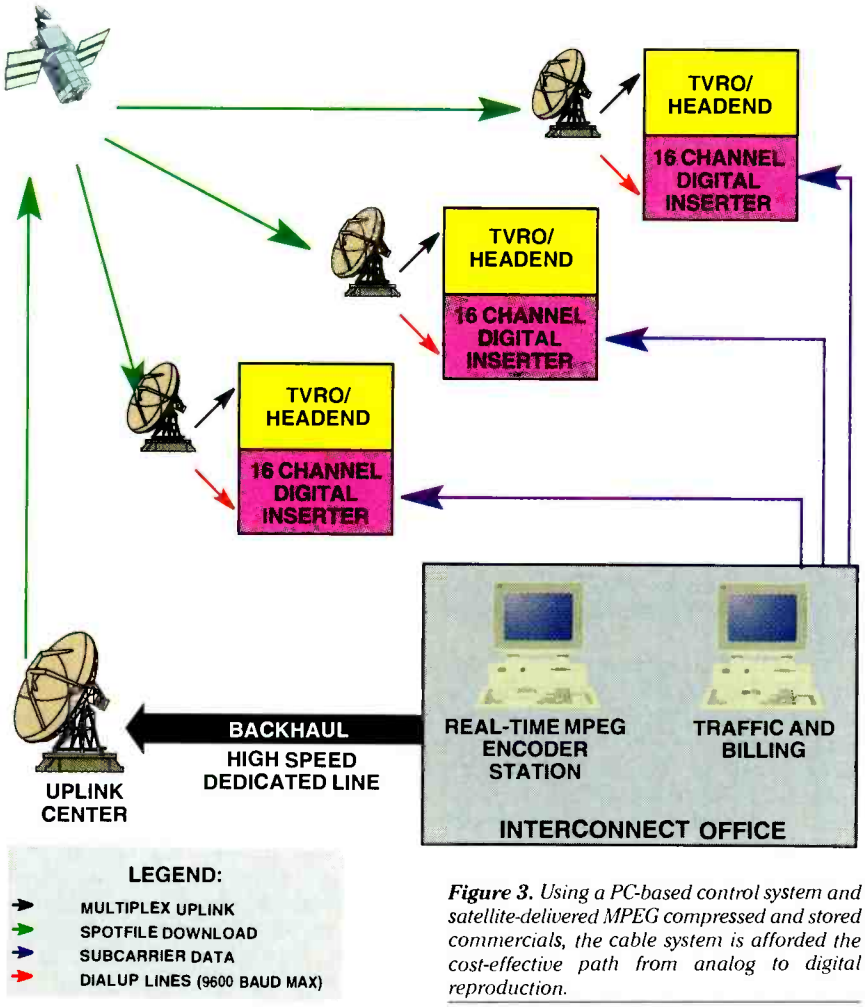

Figure 3. *Using a PC-based control system and satellite-delivered MPEG compressed and stored commercials, the cable system is afforded the cost-effective path from analog to digital reproduction.*

With the advance of digital video systems, hubs also can effectively operate from different locations (previously complete head-ends) taking advantage of a single fiber channel to connect them onto a network for receiving digital commercial downloads. This application is similar to the on-demand PPV systems planned to target nodes with as few as 200 subscribers. Fiber's ability to provide improved logistics and increased targeting also apply to multiple cable operators within the same market.

Satellite transmission for commercial distribution

Although all cable systems receive programming via satellite, only one major TV market in the country is currently using that synergy to deliver commercials to their affiliate head-ends. This market's interconnect has been a pioneer, but it is still videotape-based. Commercial master tapes are downloaded/recorded daily to unattended edit record VTRs for later playback. The interconnect has been able to eliminate tape bicycling and decrease turnaround time, making it more competitive with local broadcast stations. However, the tape-based inventory and random-access restrictions still persist, along with the continuing maintenance problems inherent in VTR operations. Digital satellite transmissions can be used in conjunction with digital commercial insertion systems to open up this delivery method to many more markets.

New uplink compression technology has been moving away from proprietary compression schemes to a standardized MPEG approach. The leading manufacturers of digital uplink systems have either dropped their proprietary compression schemes or moved toward the MPEG (II) standard. By splitting a transponder into two 21.5Mbps halves, two broadcast-quality (8.3Mbps) MPEG feeds can be multiplexed on to each half transponder.

If this new technology is used in a storage for playback application instead of live network retransmission, high volume commercial distribution can result. Although the data rates that will be used for local insertion playback will usually be lower (5.3Mbps), the resulting spot files are still large — 18Mb to 20Mb each. This means that the standard dial-up lines normally used in cable to download schedules and retrieve verification logs too slow to move commercial copy to the head-end. A 9,600 baud modem could take as long as four hours to transfer one 30-second spot. Although other high-speed data transmission methods and fiber can tie remote cable head-ends back to a central traffic or production office, satellite delivery is the only method that can download the large amounts of data at the high-speeds required to all head-ends simultaneously.

MPEG digital uplink technology is new. At the end of March, only two companies in the world were deploying this delivery system. One of the two, StarNet, will use the technology to deliver commercials and promotional spots to affiliated cable head-ends for storage and playback into local insertion schedules. The delivery is extremely fast (43Mbps) with spots passing through the uplink at a rate of one every four seconds.

The head-end digital insertion playback units are MPEG-based and addressable, retrieving only those commercials from the uplink feed that are slated for playback at that particular head-end. Such technology allows operators to streamline their operations and eventually tap into revenue streams from regional and national spot buys previously unavailable to them because of logistical problems.

More and better options

As digital and compression technology matures, cable systems will offer subscribers and advertisers more and better services. The advertiser will be able to target more accurately, thereby getting the most cost-effective coverage. The subscriber will benefit from having the availability of local and national commercials, which help control the pressure to raise subscription rates.

As these technologies move into the cable arena, engineers must become familiar with them and learn how to effectively implement them into their systems. The spin-offs from such advances will be rapid and widespread. No one should think that such improvements are the final stage. After all, we've only begun to enjoy the benefits resulting from the invention of that first semiconductor device, the point-contact transistor, developed by John Bareen, Walter Brattain and William Schockley back in 1947.

➡ *For more information on automating cable systems, circle Reader Service Number 300.* ■

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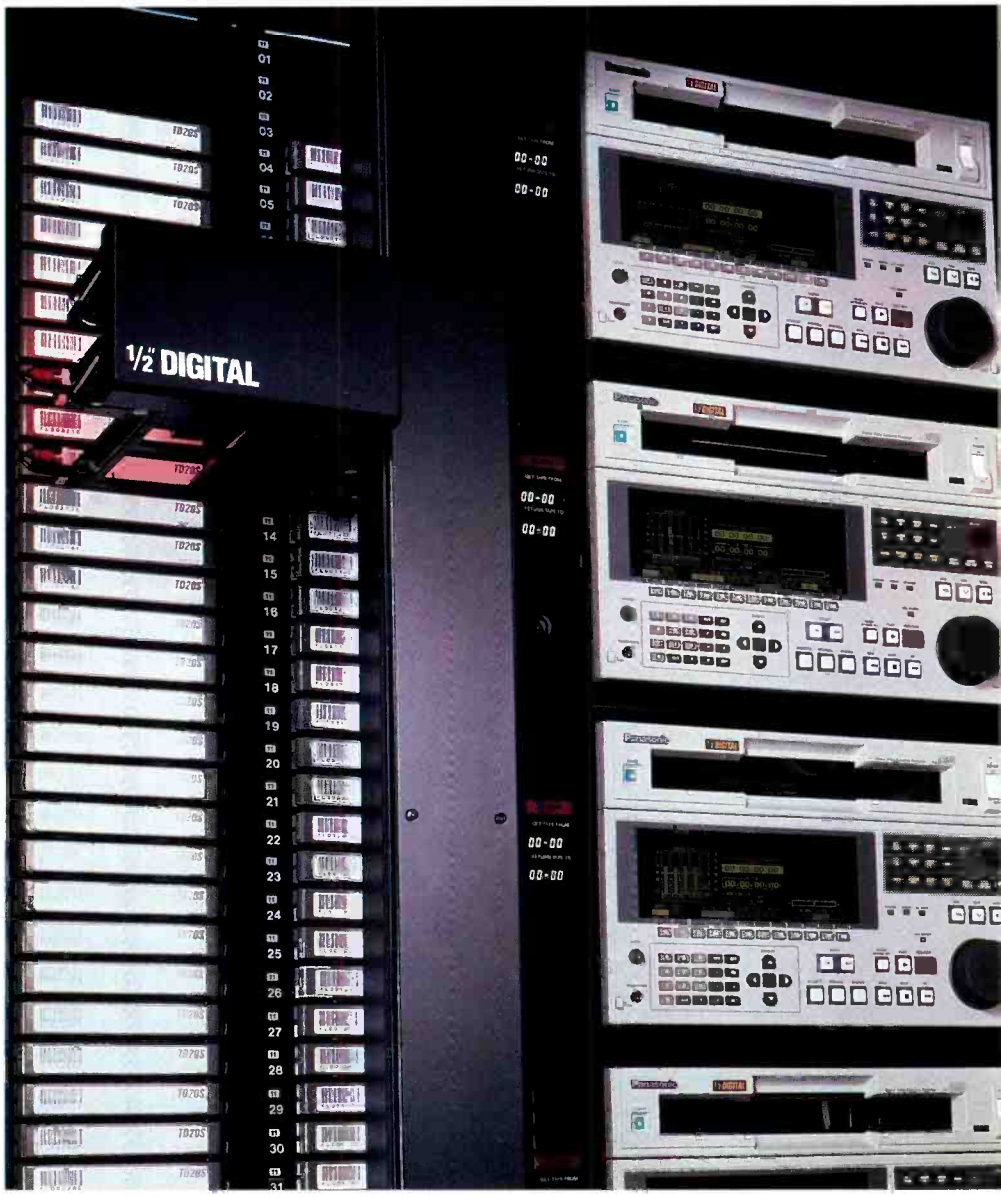

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Multicasting for TV broadcasters

Managing multiple program streams requires a new breed of hardware.

By Ray Baldock

The Bottom Line

Forecasters predict that few of tomorrow's broadcast facilities will provide the singular program service that they do today. So-called "multicasting" may become the standard paradigm for the industry. Moving to this new approach will take some substantial adjustments, but with them can come significant benefits. Multicasting may, in fact, become broadcasters' key to survival in tomorrow's media-rich environment. Some motivations and transition paths toward multicasting are presented in this forward-looking article.

$

Signal compression systems, perhaps the most significant technology highlighted at this year's NAB, will provide a wealth of new opportunities for the distribution of programming through the next decade and beyond. In addition to enabling terrestrial broadcasters to squeeze future HDTV signals into a smaller transmission bandwidth, several companies see signal compression technology as their entree into a new business called *multicasting*. Multicasters include those facilities originating two or more program feeds from a single location.

The enthusiasm for compression among non-terrestrial broadcasters (cable, DBS and telcos) is unquestionable, and it is the driving force behind several major players' ongoing attempts at redefining how entertainment is distributed. Multicast operations in a non-terrestrial broadcast environment can benefit from the lower cost of distribution provided by signal compression, plus the economies of scale afforded by centralizing and automating technical facilities.

Business environments for multicasting

Well-established national cable networks have already tripled the number of program choices available in the typical viewer's home over pre-cable days. Signal compression serves these networks' needs well and can greatly reduce their distribution costs. Consumers also benefit from greater accessibility to their entertainment preferences. Increased channel availability means more frequent start times for pay-per-view movies and/or greater diversity in the number of movies offered simultaneously.

Compression technology also is enabling many cable networks to incorporate regional advertising. Meanwhile, most broadcast networks are already selling some of their time for regional commercial feeds, and they, too, may soon be looking to compression as a means of lowering their costs.

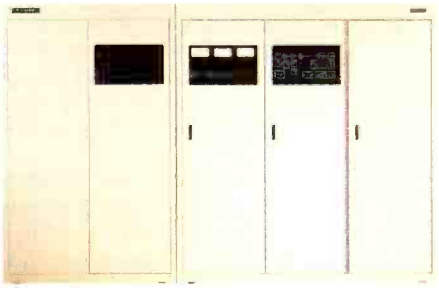
Multicasting is not new to local stations either. Several group owners (most with stations located in adjacent markets to each other) have consolidated their administration, technical facilities and engineering support into a single location to lower their operational costs. Other stations that feed a translator, or those feeding their signal for carriage on an out-of-market cable system, have provided a subregional feed of their programming with some of the breaks targeted specifically to that audience.

National cable networks have already tripled the number of program choices available in the typical viewer's home.

Many of these split-feed stations garner additional revenue by tailoring their subregional feed with commercials sold and aired exclusively in the remote area. Others provide a time-shifted version of

Baldock is director of product development for Odetics Broadcast, Anaheim, CA.

Stop Talking Dirty.



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* DX 100 to 1000 kW-plus transmitters also available.

their programming in a second feed to improve their share. In the case of a superstation, which is distributed nationally via satellite to cable head-ends, local spots are often replaced by national ones.

Often, an advertiser who is test-marketing a new product in the local market only will contractually require the station to cover the product's spot if the station is carried nationally. In other cases, the station can benefit financially by replacing local spots with national advertisers who seek and will pay for the larger audience. Likewise, many syndicated programs are sold with market exclusivity and must also be replaced with alternate material when the station is viewed outside its home market.

On a larger scale, the entry of big league multicasters means that stations face further erosion of their market share. Without a strong local identity or popular network series, small-market independent stations face the greatest challenge for survival. According to several industry executives, these "indies" could be the first to fail in the face of additional competition from new multicasters. Broadcasters need to redefine their market niche and, in some cases, they should consider new strategies to maintain their profitability.

With the recent developments in multichannel automation, it seems likely that some broadcasters will benefit by using the multicasting concept as a means to centralize technical facilities.

Sourcing systems for multicasting

Cart machines play an important role in multicasting if the incremental cost of operating additional channels is to be minimized. Sourcing several channels from a single cart system places some new requirements on the control software, because several channels may be competing for common resources (such as VTRs or robotics). Further complications arise when multicut tapes are used and the same tape may be required on two different channels at a similar but not identical time.

Application software for all of today's library management cart systems was originally designed for single-station, single-list operation. Although attempts have been made by some cart system manufacturers to provide for short breakaways from the main channel so that a few spots can be replaced in a secondary feed, these systems are often severely restricted by the limited resources available within the cart system itself.

Direct-to-air spot replay for several channels, sourced from a single cart machine, is only possible when the duration of the material does not exceed the recycle time of the robotics on any channel. Events that occur simultaneously on two or more channels will often cause contention for the robotics, making the cycle time unpredictable. In cases where the channels are totally different (*asynchronous*), the designer must plan for operation where breaks are often unscheduled and where both channels might be running short-segment spots simultaneously. In this case, cycle time can be greatly limited by the system's robotics.

Therefore, for consistently reliable direct-to-air multichannel operation, the allowable cycle time on each playlist has to be tightly specified. Placing such restrictions on the sales or traffic department is unrealistic and usually unacceptable as a solution, however.

A more practical approach that removes these constraints on how commercials are sold or scheduled involves the precompilation of spots for each break onto a separate break tape. This effectively

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Automated broadcasting in Britain

By Harry A. Cole

Britain is a relatively small country with a population of approximately 56 million. Its terrestrially based radio and TV programs are broadcast from 50 main transmitting stations and nearly 1,000 lower-powered relay stations. Most of these transmitter sites operate unattended and provide coverage for more than 99% of the population.

At virtually any location, the British broadcast audience has its choice of four TV stations (all UHF) and at least five radio stations (FM/VHF and AM/MW or LW). (TV relay stations are installed to ensure adequate coverage for any location with a population exceeding 200.) Two of the TV channels come from the British Broadcasting Corporation (BBC), while the others are regionally based commercial services. Radio stations are similarly provided by the BBC and independent commercial operators. The BBC and commercial channels alike feature national and local material.

Most commercial radio and TV oper-

Cole is a freelance science writer based in Whitby, North Yorks, England.

Regional Operations Centre (ROC) at Emley Moor in North Yorkshire controls commercial TV transmissions for the midlands and north of England.

ators have their programming distributed and transmitted by National Transcommunications Limited (NTL), which has recently designed and implemented an innovative, integrated system of remote control and automation. More than 100 main TV stations and more than 300 relay and radio stations in Britain are currently on-line with this new control technology.

Central control

The new integrated service is based at four *Regional Operating Centres* (ROCs), each of which is responsible for controlling and monitoring a number of transmitter sites. Each ROC uses a DEC MicroVax computer and workstation(s) on a local area network (LAN) leased from a wide area network (WAN).

This configuration enables any ROC to have access to any other ROC's data, allowing 24-hour monitoring and control of the entire network from a single location, if required. From their workstations, operators are able to observe the status of the system and enter commands to control transmitter equipment or make configuration changes.

The system is user-friendly, with a windows-like graphic user interface (GUI). Operators have a range of major operating tools available to them, including a network status display summarizing the overall network alarm status in a single window.

At the station end

The ROCs connect to a variety of terminal hardware at the stations under their control. The main transmitter sites use service controller systems. These offer a distributed approach to monitoring and control of the on-site equipment at the transmission facility, using robust *Bitbus* technology. This system architecture provides a high degree of flexibility for future expansion.

Most British transmitter sites operate unattended and provide coverage to more than 99% of the population.

At the smaller relay stations (outstations), dial-up facilities using compact microprocessor units may be employed instead. These can be configured to suit the requirements of each particular site. The primary functions required for such stations are logging and alarm reporting.

Decentralization

For station operators who require remote control and automation on only a small number of transmitter sites, and who wish to provide their own monitoring and control functions, the ROC's capabilities can be duplicated or replaced by the operator's own control site. In this case, a PC-based monitoring and control system using a Windows 3.1 GUI provides the same functions to the station operator as the ROC does in the larger system. The same dial-up terminal equipment previously described can be used at the stations, which allows the operators to migrate to larger control systems when desired, without replacing hardware at the outstations.

The remote hardware for radio station control includes a dedicated unit that monitors audio failures within the transmission system, locates faults and provides on-site corrective actions.

These remote-control systems have improved reliability and have reduced the cost of commercial broadcast station operations throughout Britain.

eliminates the contention for original tapes, minimizes the number of VTRs required for air, and removes the cycle-time restrictions. Cart machines have proved to be efficient compiling systems. They provide the ability to edit the tape together if a conflict for spots on the same tape or an access time problem precludes continuous assembly.

A comprehensive automation package should provide for control of devices outside the cart machine.

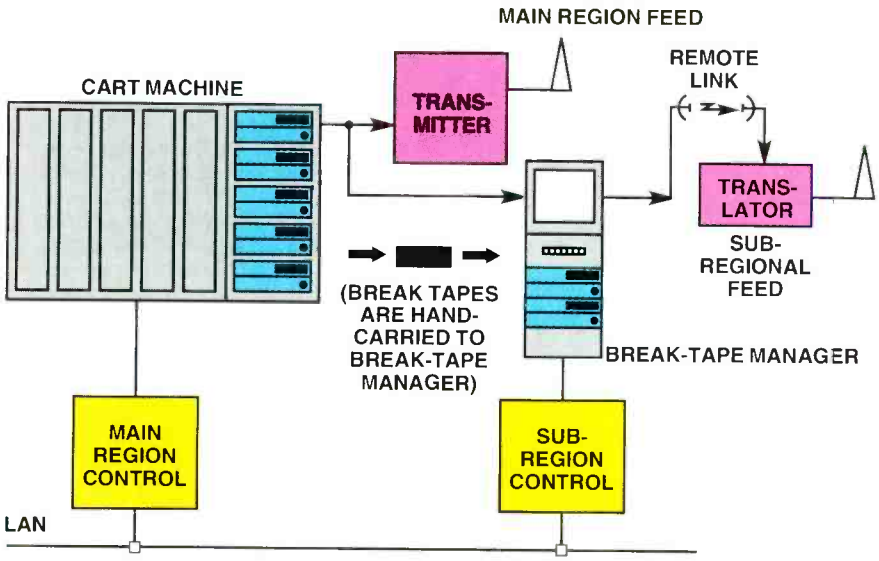

Figure 1. One approach to multicasting, where two stations share the bulk of their programming, with occasional segments split between stations.

Where the highest quality is required, digital VTRs may be employed to minimize the generation loss during dubbing. With the availability of serial digital interfaces on most DVTRs, cart machine manufacturers can be expected to add digital switchers to their cart systems to provide the best possible performance in the digital environment.

For relatively low additional cost, several cart system manufacturers already offer split-feed capability using compiled reels for spot insertion on one or more output channels. (See Figure 1.) The approach adopted in these *break-tape* systems is simple and efficient for managing occasional spot insertion in a subregional feed. The break-tape assembly process

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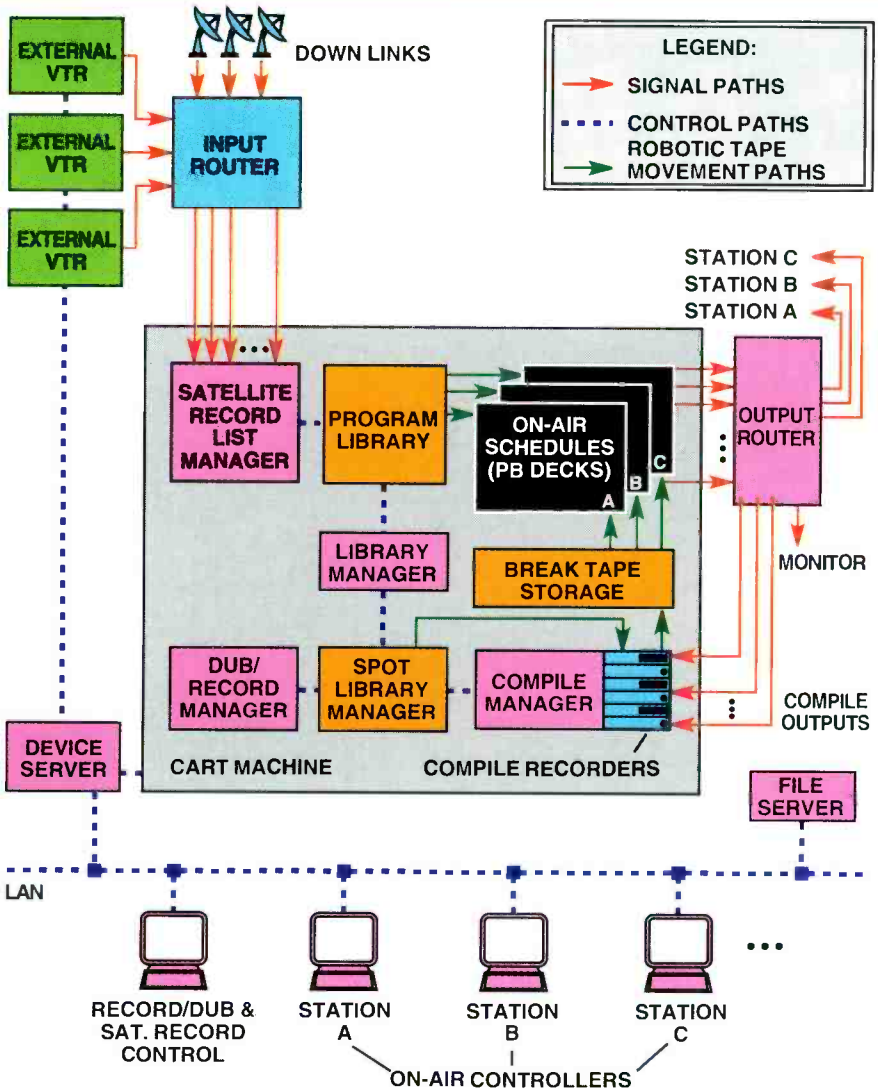

Figure 2. An advanced multicast operation that allows multiple stations to be served with independent, asynchronous schedules from a single storage/playback system.

is semi-automatic and requires only minimal operator supervision to select the record tapes and to initiate the compilation process. Only the unique segments of individual channels must be compiled onto the break tape, so compile time for a split feed is often extremely short. After completion, an operator moves the compiled reel(s) to the appropriate break-tape manager (BTM) for replay.

In this approach, the cart machine handles replay for the main feed while an independent BTM handles the switching of the pre-compiled breakaway material into the feed, using its own downstream switcher. During the breaks in which both channels are airing the same material at the same time, the BTM switches the cart machine to air. When the breaks are different, the BTM rolls the appropriate break tape and switches it to the subregional output. A separate BTM subsystem is required for each separate feed. Many such systems can be added to provide for a number of subregional outputs.

Although this approach generally works well, the cart machine still has a limited amount of off-air time to compile all of the break tapes. Some users would also like to eliminate any physical handling of the finished break tapes by operators. These and other concerns have generated increased interest in highly automated multicasting, and the integration of all functions within a more sophisticated cart system. Some developments along these lines were visible at NAB '93.

Automation and cart systems for multicasting

One demonstration at the show highlighted a new cart system configuration specifically designed to automate all tape functions for several stations within a single cart system. Advanced multichannel automation software for the system provided management of all feed recording, program replay and spot insertion for several independent stations on a 24-hour basis. (See Figure 2.) Pre-air tape preparation, inventory management, as-run logging and automation for up to eight lists, using up to 24 serially controlled devices, can be included in this system.

Some proponents envisage central broadcast operations centers that market technical services to licensees in their area.

Also demonstrated was a network split-feed system (see Figure 3) that could automate a single program feed with as many as five or six regional breakaways. The number of stations served, or the number of breakaways provided, is limited only by the number of installed VTRs and the aggregate time required to com-

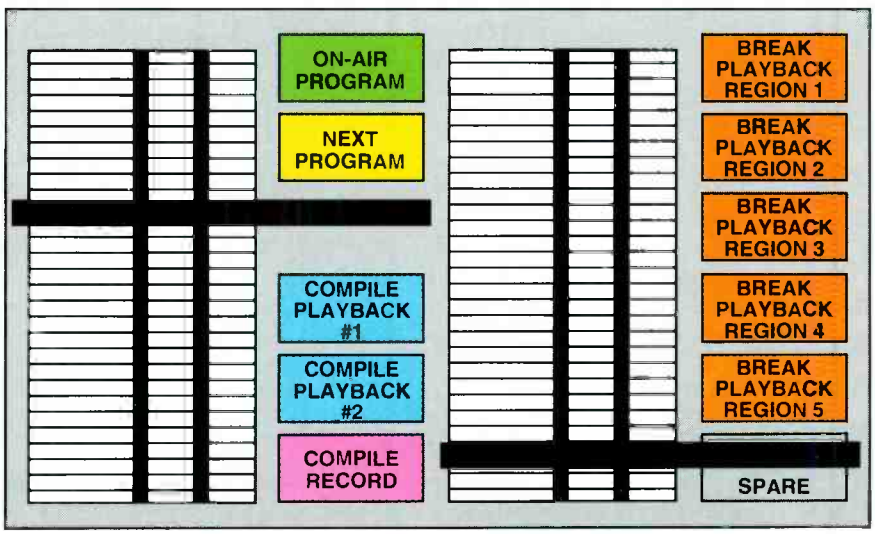

Figure 3. VTR allocation and layout of a cart machine system for multiregional spot insertion.

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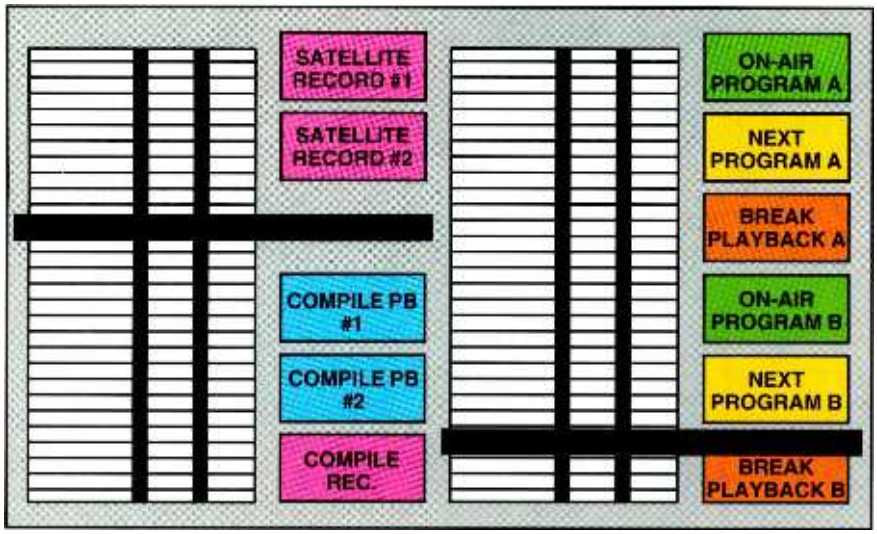


Figure 4. *VTR allocation and layout of a cart machine system for multistation shared origination.*

pile the necessary material.

Regarding such limits, tape library systems now include storage for up to 300 tapes and 11 standard VTRs. With D-3 or S-VHS decks, up to 14 machines can be accommodated. Some systems can also handle mixed cassette sizes. A multicast-capable library system can include several sets of robotics to service a larger number of tasks simultaneously and can pass cassettes back and forth between its multiple libraries.

Multicasting brings new opportunities for the broadcaster as well as new challenges to equipment manufacturers.

The automation control for such a system assigns VTRs to specific functions and moves tapes to storage locations closest to the decks on which they will be played. Three or four decks (one recorder and two or three players) are normally assigned to the compile function in such a system. Compiling is usually continuous, unless shuttle time or the cycle time on the robotics prevents a tape from cuing in time to be rolled. In this situation, the compile manager will back up the record deck and edit the spot into the compiled reel. Because of this edit capability, and because the system is not running spots direct-to-air, source tapes may contain multiple spots per cassette without the constraints usually imposed in a direct-to-air system.

A typical network affiliate's schedule of spots can be compiled in about $3^1/_2$ hours. An independent station may require almost double that time to complete. To eliminate possible contention for resources in a multilist operation, resources should be assigned to each list until otherwise reallocated by an operator. Figure 4 shows the allocation of VTRs in a system supporting a multistation operation with record capability. Compiling, satellite-feed recording and on-air replay can occur simultaneously in such a system, providing continuous operation for several feeds.

With additional VTRs, the number of stations served by the system could be increased as long as the compile process can be completed in the time allotted. It is also possible (with additional VTRs) to run several compile lists so that break tapes can be made for several channels simultaneously.

Another desirable feature is the ability to react to last-minute changes, such as the replacement of a previously compiled spot with another of the same duration. In the event that there is no time to recompile the change, one way to handle this is by pulling and replaying the original tape in place of the compiled tape's spot. Whether the tape has been compiled or is replayed directly should make little difference to the operator viewing the schedule. Each program stream's schedule should be independent, generating an as-run log that is complete for each regional feed.

A comprehensive automation package should also provide for control of VTRs and other devices outside the cart machine. Switching could be handled using either a dedicated router or the existing station router. These external devices permit integration of programming from other VTR formats or even optical disks. Access to still-stores and other serially controlled devices could also be integrated under the same automation system. GPI control of additional equipment, such as keyers for the station's logo or affiliate tone generators, should also be available.

With an adequate number of available VTRs it is also possible to download a schedule of recordings to be made. This includes new spots to be transferred to the system and programs that must be recorded from satellite for later replay. The record list can include crosspoint designation so that incoming signals can be directed to the appropriate VTR in the system.

Imminent applications

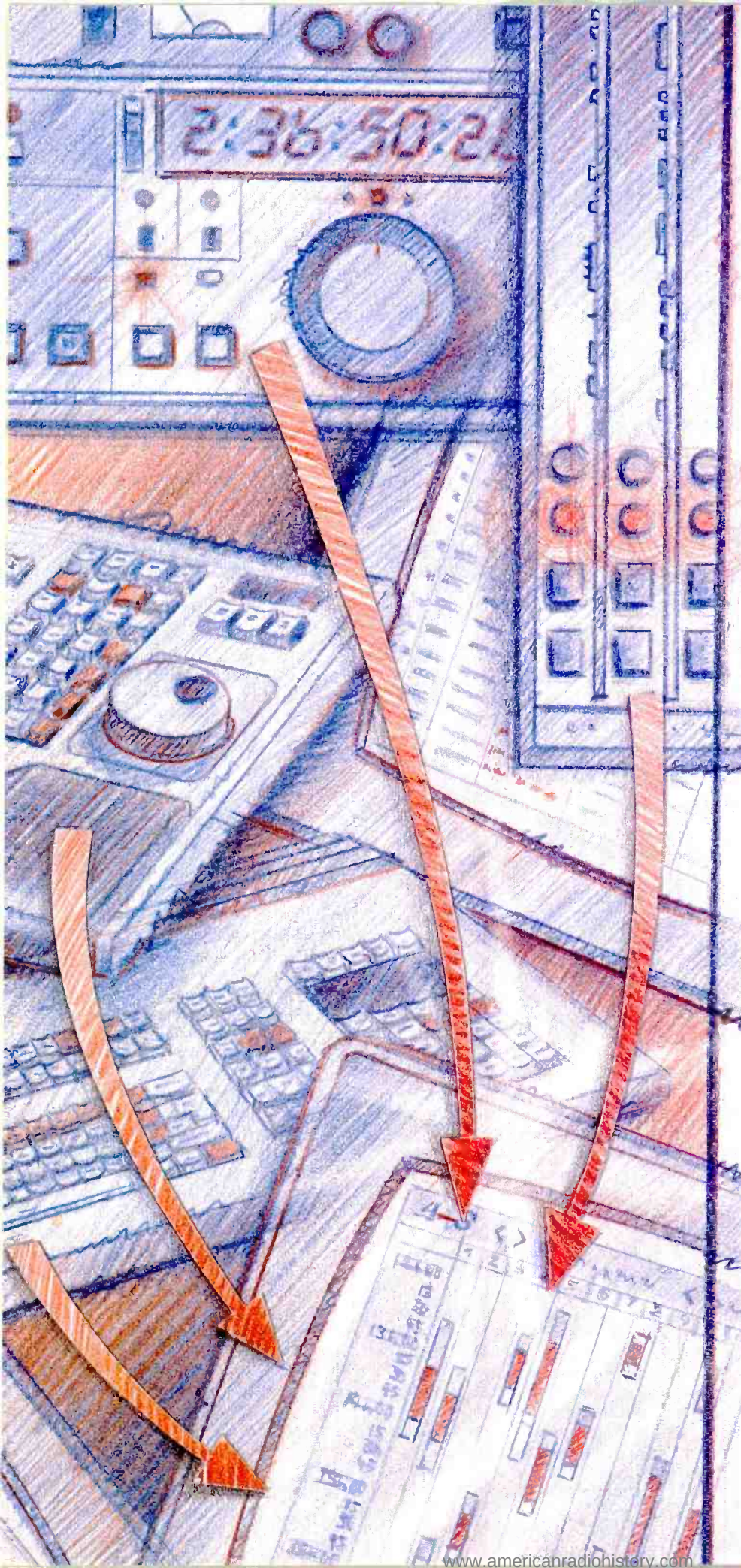
This type of system has many possible applications. Economic conditions in some markets demand new strategies to control costs. Some proponents of the technology envisage central broadcast operations centers that market technical services to many or all licensees in their area. For stations without a local news service to support, such sharing of resources may make economic sense.

With close attention paid to the quality of material being fed into the system, it may be possible to have a single operator controlling several stations. It may still be desirable, however, to provide a dedicated control terminal and operator for each feed. The client-server architecture of the automation control system should allow for such flexibility.

Likewise, it should be possible to segregate the control of specialized functions, such as compiling and feed recording to different physical locations. Such a configuration should also be easily changed, perhaps automatically by daypart, thereby allowing one operator to easily monitor another operator's channel during unstaffed breaks or overnight shifts without reconfiguring the hardware. Tiered access should also be incorporated to prevent unauthorized control by "view-only" workstations.

Multicasting will bring new opportunities for the broadcaster as well as new challenges to equipment manufacturers. The challenge of a fragmenting marketplace undoubtedly requires further, extensive examination by all parties. Several areas require significant work in refining automation for multicast application. Yet substantial advances have already been made that bring added flexibility to existing tape formats and provide new automation choices for the industry. Because HDTV and its requisite need for new hardware looms on the horizon, any systems that can extend the lifespan and broaden the applications for existing equipment inventories in the meantime are welcome indeed.

➡ *For more information on videotape library systems, circle Reader Service Number 301.* ■



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Radio automation techniques

Automation isn't "the A-word" around the radio station anymore.

By Greg Dean

The Bottom Line

Today's radio automation systems can run circles around those of yesteryear (and it's not just because hard disks spin faster than cart carousels). Consider the cost-effectiveness of PC/LAN-based systems, high audio quality and reliability, the easy import of scheduling data, storage of all audio on hard disks, simultaneous record and playback capabilities — all this and more is now standard. If that sounds appealing, read on for a primer on what today's radio automation systems can provide. $

As the competition for each advertising dollar intensifies, so does the demand for more efficient automation techniques in radio broadcasting. Fortunately, the PC marketplace has made available a vast array of powerful hardware at affordable prices. The radio broadcaster now faces a win-win situation — the ability to improve audio quality and reliability while decreasing operating expenses.

Three environments of automation are emerging:

1. *Satellite:* Local inserts into satellite-delivered programming.
2. *Local automation:* Automated delivery of locally produced programming.
3. *Live-assist:* Live delivery of locally produced programming using automated sources.

Automation with satellite delivery

The satellite automation environment allows the broadcaster time to focus on local events, because most other aspects of programming can be managed by the satellite service. The highly structured satellite format gives the broadcaster the opportunity to plan for the content of each local break. Cutaways will normally be filled with a cluster of commercials, but they also can be used for local features, such as sports, weather or remote broadcasts from an advertiser's place of business. The local on-air talent can be limited to one or two regular voices used for recording the commercials. Sales staff can be used for the remote broadcasts.

A satellite automation system must be able to provide a high ratio of *walk-away-to-maintenance* time. It also must meet the timing challenges inherent in the satellite format through the use of automatically selected filler material and electronic time base adjustment.

Until the advent of digital audio storage and computer automation, satellite formats were limited in their creative endeavors by the shortcomings of analog satellite links and automation equipment. Today, the satellite providers are moving to digital audio systems, while the state-of-the-art in delivery automation equipment has also become all-digital. The real time random-accessibility to any piece of audio stored in a digital automation system provides significant advantages here. A satellite format is no longer restricted to six contact closures with which to "localize" a format.

Analog automation equipment required the local operator to manually change playback media (typically carts) with each announcer shift change at the network. Walk-away time was limited to the length of an announcer shift. Digital automation systems allow the electronic log to program the changes without operator intervention. The potential exists for the satellite service to send a change-voice command. It is now practical to have local liners and time-announce cuts using the voice of the current network announcer.

The digital system's random-accessibility and the structure of today's satellite formats make it reasonable for each satellite voice to record a range of time-check announcements using only the hours and minutes near the times of the format's local cutaways. It isn't necessary to record a cut for every minute of every hour. The automation equipment will choose the proper voice and cut matching the time at which it is being played. If, at a particular time, a cut hasn't been recorded, the

Dean is chairman of Computer Concepts, Lenexa, KS.

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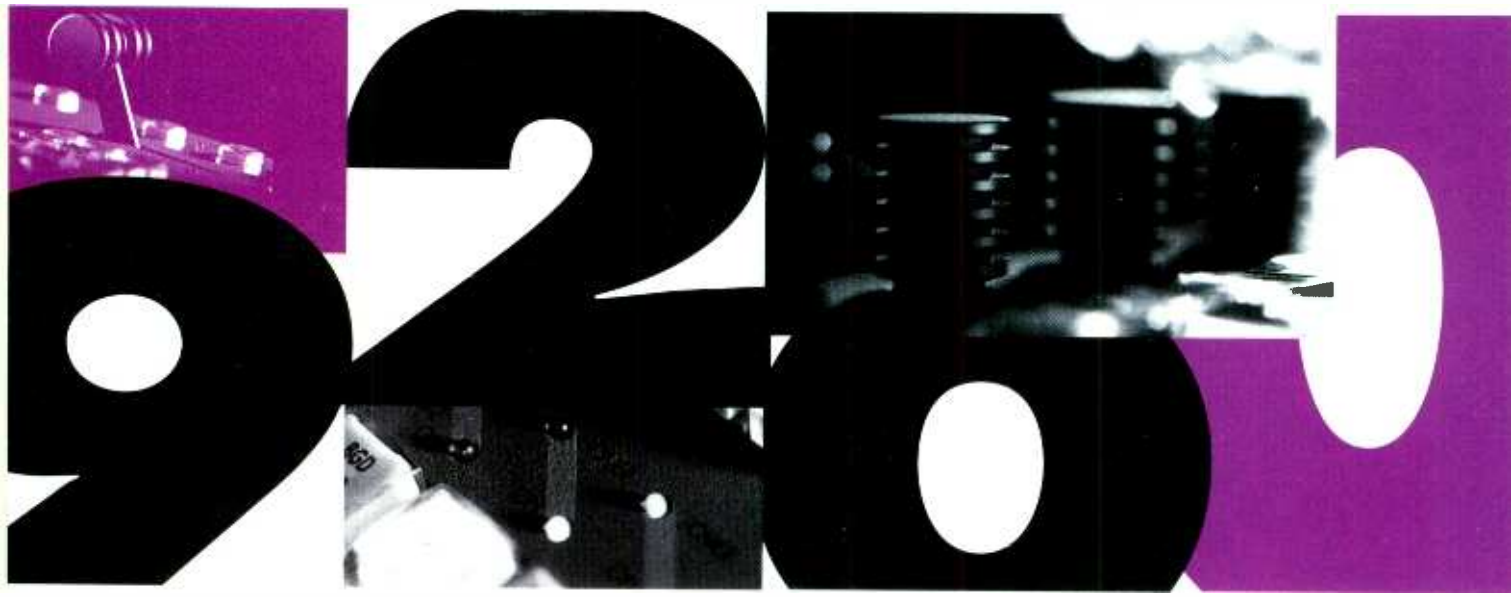

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automation computer simply substitutes a generic (non-time-related) cut recorded by the announcer.

Satellite automation always includes a switcher capable of turning off the network during local breaks. This switcher can be made remotely controllable (via dial-up phone line) in order to allow unattended, phoned-in reports to be aired (or recorded for later airing), such as weather, bulletins or remote broadcast inserts.

Most digital automation systems are now capable of multitasking, such that at least one record and one playback function can be handled simultaneously. This allows closed-circuit broadcasts from the satellite service to be recorded by the automation system while it plays back audio during a local break. The recordings can be reviewed and edited or deleted by an operator when convenient.

Local automation

A local automation system is used in an environment where the broadcaster desires total control of program content. Typically, such a station has a number of announcers on staff, but wants to relieve them from having to sit at a microphone for the actual duration of the shift. The principle also applies to music-based operations and prerecorded non-music formats.

The major challenge for automated music formats has been maintenance of the on-line selection of music. CD libraries and juke box-like mechanisms have provided a substantial improvement over open-reel tape systems, but cuing times and sequencing problems still remain. Once again, the total random-accessibility and instant response time of an all-digital automation system — where all music material is contained on the automation computer's hard disk(s) — can help.

Announcers record their voice-over cuts while listening to the beginning or ending of each musical selection to be played during their air shifts. Voice tracks for a 4-hour shift can be recorded in less than 30 minutes. The automation computer ensures the proper match of front/back-announce cuts to the music selections. Sequencing of the voice, music and commercial elements is driven by files containing block format, music log and station log data. With all of the music stored on computer hard disk, no conflict in the sequencing of songs occurs, as there would be when attempting to play two cuts from the same CD back-to-back.

Stations using non-music, prerecorded formats simply record the short- and long-form audio elements into the automation system. This function can be either manually assisted or operate as an automated background recording near the time of broadcast. Most digital systems allow the simultaneous playback of an element while it is still being recorded, providing a versatile time-shifting capability. The on-air sequencing is again controlled by the same combination of block format, program element and station log data files.

Live-assist

Digital automation systems provide a number of interesting opportunities for live-produced formats. This environment is called live-assist because the automation system simply waits for commands from the live operator.

The station log and music logs typically are merged into one display from which the operator can sequence the elements. With a single keystroke, the operator tells the automation system to load a complete cluster of commercials into a queue and wait for the operator to give a subsequent instruction to begin playing them. With a few more keystrokes, the operator can reassort the sequence.

Digital automation systems also can be applied to the announcer desiring instantaneous access to various sound effects or other preproduced bits. Some systems offer a keypad of a few dozen push-buttons, which can be assigned to particular audio

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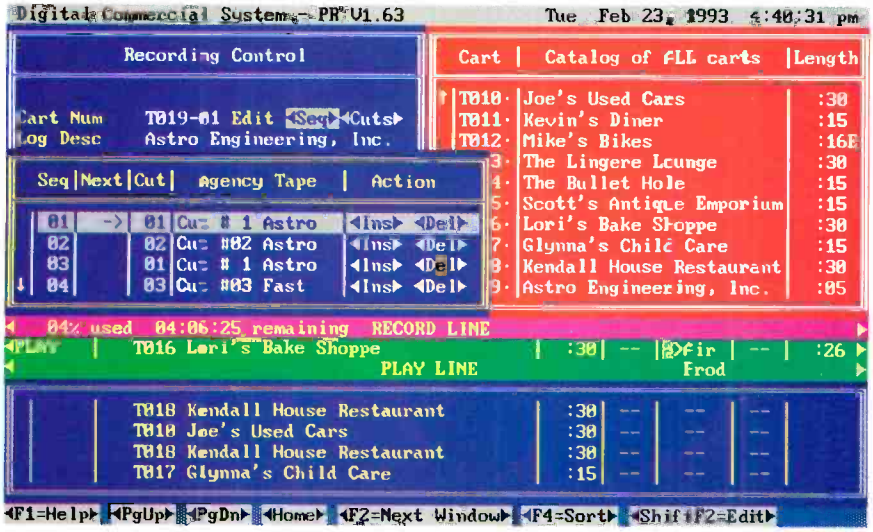


Display screen of a typical PC-based automation system.

cuts and used to start them. Others use "virtual" button icons on a touchscreen for similar purposes. The assignment of audio to the various buttons can be loaded from personalized configuration files and changed on-the-fly during the shift.

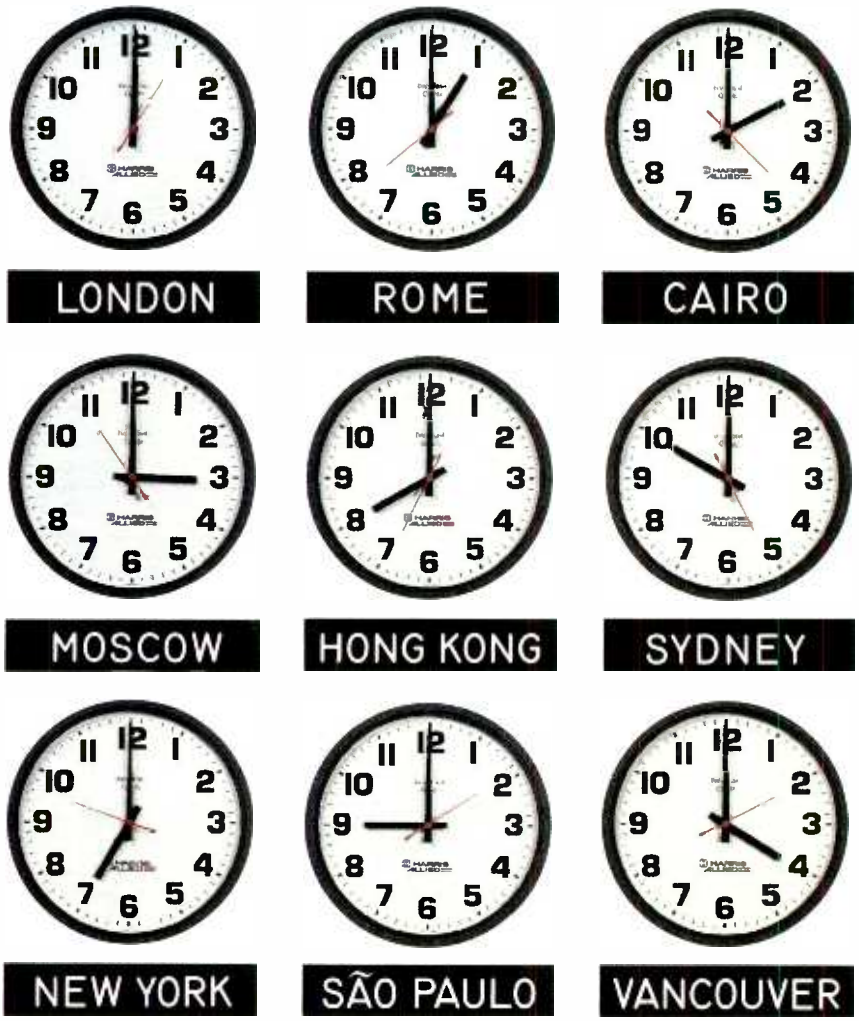
These buttons also can be programmed to control any function for which the automation system has been configured. For example, some buttons could be assigned to the start, pause, resume and halt functions of recording from the telephone, eliminating the announcer's need to handle any tape for this purpose.

Finally, accuracy for advertisers is enhanced, because the station log directs the digital automation system in the selection of audio. The automation system can challenge the operator if the audio being selected is out of date. Digital audio storage on a computer also allows reliable verification of the current audio inventory against the log schedule for the next day's broadcast.

Benefits common to all environments

The digital automation system can provide a detailed audit of each event it has performed. A well-designed audit system saves these details to a computer file that can be manipulated with a vendor-provided report generator. The operator can create a fully detailed report of all activity for a given time period, or he can filter the data so that only the events related to a certain closure or the playback of certain audio is reported. By storing the audit data in a PC file, the archiving of performance data is simplified. Typically, a month's worth of audit data can be stored on a single 1.2Mbyte diskette.

Highly reliable delivery of audio is proving to be a major benefit of fully digital automation systems. These systems eliminate the traditional analog audio artifacts caused by wow-and-flutter, inconsistencies in tape-to-head contact and azimuth error.



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A buyer's guide to radio automation

By Greg Dean

When approaching PC-based automation for the first time, it helps to know what questions to ask. The following are a few common concerns about such systems, with some general answers supplied:

1. *Why would I want hard disk automation for a format as simple as a satellite-delivered music service?*

A well-designed satellite automation system allows a large amount of walk-away time. It can handle the timing challenges of the satellite format by accurately filling the breaks without leaving empty space.

2. *All PC-based automation systems look alike. Are there significant hardware differences among them?*

Definitely. Although the PC is a common element, each manufacturer adds proprietary hardware to handle the digital audio and switching. These differ in quality and capability.

3. *What about software?*

Again, significant differences exist between suppliers. Each system has a unique user interface, and some are much easier to run than others. Some systems have extra features that may not be important in many applications but could be critical to yours. Finally, some manufacturers test and debug their software more thoroughly than others. The prospective purchaser is well-advised to check with other users before buying.

4. *How feasible is a combination of satellite and live assist?*

With the proper hardware and software, this shouldn't be a problem. In a system that is well-designed for this purpose, switching between these modes could be as simple as toggling a single key. On the other hand, some systems make it extremely difficult to make a smooth change.

5. *Does this kind of automation make sense in a live-assist environment?*

Yes. Digital automation systems can provide a number of opportunities in the live format. For instance, the station log and music list can be merged onto a single screen from which the operator can arrange a program stream. Clusters of commercials can be loaded, rearranged or played with a few keystrokes. Out-of-date messages can be tagged and not allowed to play without an alarm to the operator. Again, a well-designed system will allow switching of the system to fully automated operation with minimal key stroking.

6. *What kinds of problems can trip a system?*

The most frequently reported problems involve multiple simultaneous operations. For example, many systems can crossfade in stereo from one spot to another during playback, but can have a problem doing this while recording new material into the system at the same time.

7. *What happens if a computer crashes?*

This is a major concern for broadcasters. A well-designed system can provide redundancy by duplicating the audio on more than one computer, often via a network. This allows quick switch-over if a device should fail.

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Comparing systems

The following are some questions to ask when shopping for systems. Some can be answered by the manufacturer, while others are best addressed by experienced users.

1. *What sort of experience does the manufacturer have?*

When making a decision as to which product to purchase, be sure to find out how long the company has been producing the product, how much the company actually knows about the broadcast industry, how many units have been sold and the product's general track record. Ask manufacturers for a complete list of existing customers.

2. *How good is the manufacturer's customer service?*

Knowing this is critical. Does the manufacturer offer a toll-free (800) number? Is it staffed on a 24-hour basis?

3. *How comprehensive is the system, and is it relatively easy to learn?*

The more the system is capable of doing, the more there will be to learn. This does not necessarily mean that it has to be difficult. The user prompts should be easy to understand and should list all choices whenever possible. This will minimize incorrect responses and the possibility of users getting "stuck" in the system.

4. *What sort of hardware does the system use? Is it PC-based or is it proprietary equipment?*

A PC-based unit is preferable. Most failed components are available locally, allowing for a minimum of downtime.

5. *How much hard drive capacity does the unit have? Is it expandable? Is data compression available?*

Be sure the system you choose is flexible. It should offer large-capacity storage with the option to expand. Many systems allow additional drives to be added without significant interruption of the existing system's operation. Verify that audio quality is not compromised to obtain additional disk space. Some data-compression algorithms can provide additional storage without significantly compromising audio.

6. *How does the system respond to a computer crash?*

Is a computer network operation supported? What kind of backup procedures are offered? Which operations are affected by a lock-up? What happens to the on-air signal? How quickly can the system recover after a crash? What kind of situations cause crashes most frequently?

7. *Are all cuts truly instant/random-access?*

For systems that put all audio on hard disk, access time can be virtually instantaneous. Systems using machine control for external storage devices (CD juke boxes, DAT, carts) may require longer access times, and could run into conflicts in the sequencing of back-to-back elements from the same device/media.

8. *Are last-minute changes possible? How easy are they?*

Well-designed systems allow last-minute changes to be made quickly and easily, minutes or even seconds before airing.

9. *How easy is it to access multiple satellites?*

This varies among systems. More sophisticated systems can do this efficiently, while others don't include the hardware and/or software to handle it.

10. *Can the automation system be interfaced to our traffic and billing system?*

Probably. Most automation systems interface with some or all of the standard traffic and billing systems. Specify your existing system when inquiring.

11. *Has the manufacturer shown the ability to keep software current?*

A few calls to existing users will quickly answer this question.

They also eliminate the need for tape-head cleaning and cart rewinding, and banish forever the embarrassment of a miscued cart. Systems in use today are reported to have run continuously for more than two years without physical maintenance. In addition, audio recorded on those systems more than two years ago sounds the same today as it did then.

The concept of a central bank for a station's audio also simplifies day-to-day operations. Pressure-sensitive labels no longer need to be typed, with all spot labeling stored in a consistent manner within the automation system. This also prevents the need to search through a number of studios for a particular cart — all the audio resides within the system.

On the other hand, because of such concentration of audio resources inside the system, reliability and redundancy is a major concern. Well-designed digital automation systems provide for redundancy by duplicating audio data on more than one computer (or hard drive) through the use of LAN technology. If one computer goes down, it can be replaced instantly with another (for example, either a shop spare or one from the production studio). After the failed device is repaired, it can be returned to service, whereupon any new audio data that was loaded during the outage is updated automatically. Some larger installations (10 to 16 workstations) have invested in a *hot standby* computer that does nothing but collect audio inventory to be used in the event of a failure of some other station on the LAN. In this case, the additional 6% to 10% expense is warranted.

In order to ease operators' transition from tape carts to digital automation systems, an automation system's user interface should accommodate the familiar tape environment as much as possible. Calling the audio files "carts" and providing a multicut cart capability can help in this respect. (The multicut cart is a simple, well-understood model for creation of a rotation mix, although its random-access incarnation here also allows individual cuts to be easily added or deleted, and the sequence of cuts easily changed.)

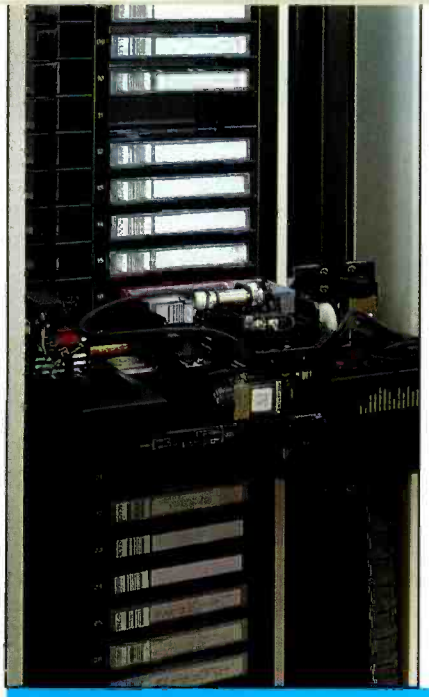
A PC-based radio automation system in use. (Courtesy of WIBW-FM, Topeka, KS.)

Conclusion

The radio industry has a unique need for reliable, instant, random-access to short segments of audio. The tape cart and analog automation systems have served the radio broadcaster well for 30 years. Such longevity gives testimony to the difficulty in designing a suitable replacement with sufficiently improved performance. Digital automation and hard disk audio-recording systems fill this role by providing a quantum leap in the technology of mass storage and delivery systems.

There is no question that this technology can improve the bottom line of the radio broadcaster. Consulting with broadcasters who have already converted to fully digital automation systems will probably convince you to join them.

➡ *For more information on radio automation equipment, circle Reader Service Number 302.* ■



Video production switchers

Enjoy a new era of creative video production by equipping your facility with the latest switcher technology.

By Curtis Chan

The Bottom Line

Graphics, 3-D effects, still-stores, titlers and editing controllers play major roles in most TV facilities. Yet, the production switcher, surrounded by fancy accessories, remains the focal point of every production studio. The control panel, with its rows of source selector buttons, matte generators, mix/effects modules, effects patterns and fader bars, offers a comforting familiarity for those operators who are sometimes intimidated by the technological explosion that describes today's television. Beneath that panel, powerful technology thrives, ready to launch the studio into a new era of creative video production.

Chan is the principal of Chan & Associates, a marketing consulting service for audio, broadcast and post-production, Fullerton, CA.

Editor's note: Abekas, Grass Valley Group, Sony and VGV provided assistance in the preparation of this article.

For nearly 30 years, video switcher technology has undergone a continuous evolution, spanning the eras from monochrome hard switching to full-color, glitchless scene transitions. Throughout that time, however, three basic application guidelines have driven switcher designs. These include live on-air production, production and post-production. Within the last few years, switcher designs have looked to evolving technologies in responding to user needs. Broadly speaking, however, many approaches have continued to follow traditional methodologies.

Digital component and composite technologies, complemented by parallel improvements in digital signal processing (DSP), application-specific integrated circuit (ASIC) and software coding, have helped present-day switcher technologies to branch away from the evolutionary tree. In doing so, digital switcher implementations in the mid- to high-end range have, and will continue to have, a positive impact on artistic creativity.

What's in an interface?

Probably the most difficult design part of a new, advanced production switcher is not in the merging images or in warping and twirling objects in 3-dimensional space. A good deal of thought, digital logic and computer computation may be needed to do those things, but a more difficult task is giving those capabilities to the switcher operator. Many manufacturers prefer to play it safe when it comes to switcher design. For example, several new digital composite and component switchers offer numerous innovative ways to integrate powerful digital-based features. But why have the manufacturers used more traditional lines of thought in their control panels? Why do they opt to disguise a switcher's newfound power behind an analog switcher facade?

Familiarity enables people brought up on more traditional analog-based interface concepts to experience an easier transition to the digital world. The typical digital switcher resembles a top-of-the-line analog switcher rather than a layering device. With the look and feel comes a major benefit — a significant reduction in the learning curve. The facility also enjoys faster, improved productivity through new layering, compositing, effects and routing subsystems, and quality through improved digital electronics.

Several new digital composite and component switchers offer numerous innovative ways to integrate powerful digital-based features.

Through integrated digital technology, user-interface functions can be vastly improved. One approach uses intelligent assignment of hard keys with associated paths of processing. In another method, software macros and assignable soft keys access control features. For example, many digital switchers offer full programming of peripherals, such as digital disk cache recorders, digital special effects and still-stores, directly from soft-key graphi-

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cal interfaces. Such features nearly eliminate the need for multiple control panels in an edit suite.

Digital switchers may feature multiple layering and compositing. One such system boasts eight layers of compositing, using key processes. Key signals are variously derived from the chrominance or luminance content of the video input as well as from externally generated signals.

The basic switcher operations, source preview, layer selection and selection of video, key and mask sources to the compositing layers are all available from top-level controls on the control panel. To reduce real estate and complexity, extensive bus delegation is used. For example, one switching bus for video, key and mask selection to the different layers replaces what would otherwise need 24 individual buses. Traditional controls — a level arm to control transitions, a 3-axis joystick for wipe positioning and perspective and, possibly, a trackball for screen pick operations — might be included. The uniqueness of the system is in the user interface. (See Figure 1.)

Graphical display time lines and icons allow the user to set up, preview, perform or undo edits. As a result, the user interface becomes more interactive with the user. The only apparent difference is the improved digital image quality. Because picture quality is less of a concern, the editor spends more time concentrating on the creative aspects of on-line editing. In comparable analog suites, the operator must monitor signal timing and levels. Analog systems require color-correction adjustments. In the newer digital component switchers, color correction is done in the digital component domain. Level and shift changes are needed less, and color phase correction is a snap. Additionally, most changes can be done on-line, which is an option that usually doesn't exist in an analog suite.

Networking

The user interface can be taken to another level. Consider the power and flexibility if a post house could network multiple control panels together with a single or multiple configured signal chassis. The result would be either multiple mini-switchers or one large switcher with enhanced processing power.

The typical digital switcher resembles a top-of-the-line analog switcher rather than a layering device.

To realize the benefits of the networking approach, it is necessary to understand the concept of the networked system. Suppose that the system chassis contains three mix/effects (M/Es) modules. In addition, a central routing switcher accepts multiple inputs and all of the internal sources.

Although a non-networked system has one dedicated control panel to control the system chassis, networking allows each chassis to support up to three identical control panels. This means that different operators control each M/E separately. For each of them, all of the switcher's sources and features are available independently. However, because any single panel can control the entire system by simply acquiring more resources, it is necessary to use a full control panel in each targeted room.

Is this perceived as a benefit to the editor or to the client? Actually, it is a benefit to both. It ensures that operators are familiar with the switcher control panel, regardless of the room they are in or the number of M/Es they have under their

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control. Clients do not feel that they are in a lesser-equipped room when they are producing simple titles and doing long-form editing and using only a limited amount of the system's features.

In regard to the inner workings of the network, the switcher components communicate through an ethernet-type protocol via coaxial cable. The system's intelligence resides in the control panel. The signal chassis simply interprets the commands and updates the hardware. In this way, each control panel knows what the other panel is doing, a necessity during resource sharing. In addition, to avoid the

Switcher on a chip

By Janet Matey

The rapid growth of desktop video can be tied to the application-specific integrated circuit (ASIC). Such devices have allowed a number of advanced systems to be achieved because of an overall reduction in individual components and space. To shrink the functions of a video production suite onto a few circuit boards that fit into a personal computer requires large scale integration.

A recently introduced device, called the SIESTA and designed by Matrox for its desktop equipment, special integrated effects and switching ASIC, extends the concept of space reduction. There are approximately 50,000 individual gates in a 208-pin plastic quad flat pack surface-mount chip. Through various combinations of the gates, the IC includes the capability of a classic 3-bus video switcher architecture, along with a graphics channel and independent upstream and downstream keyers. These functions are expanded with a wipe generator and two 5-layer compositors, which enable individual layers to be added, removed or reprioritized during a transition. Dual-independent key processors support chroma, luminance and alpha channel keying with a rectangular mask feature.

Although the ASIC has contributed to the development of desktop video, its name suggests limitations. However, contrary to their "specific" nature, some ASICs are now adaptable through software to support a variety of tasks. Through ASIC tools functions, such as on-line post-production, live switching and non-linear editing can be contained in a single box to serve the video industry.

Matey is marketing director for Matrox Electronic Systems, Quebec, Canada.

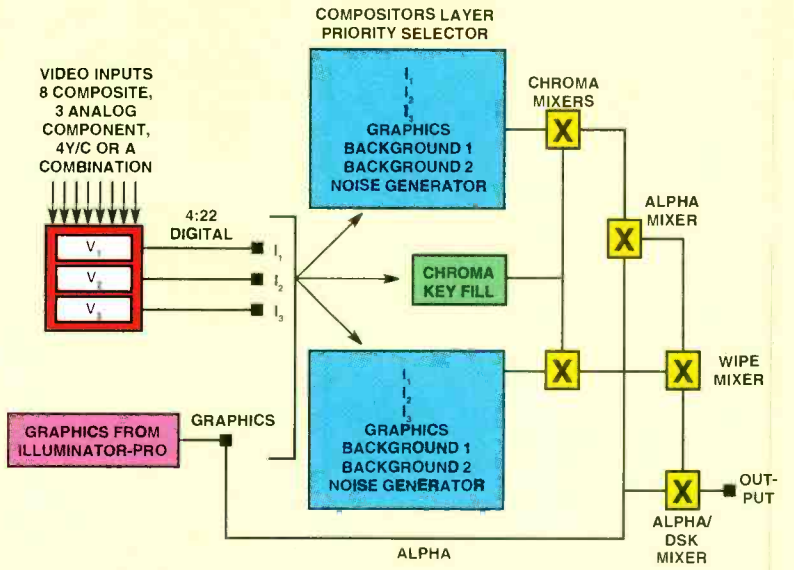

Figure 1. A block diagram of the Matrox SIESTA device.

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Scheduling and subsequent billing can track the amount of time that any control panel uses acquired resources, billing the client with a system that charges per M/E time used.

data collisions that are common on an ethernet environment, each system component is given a unique address, and the system is synchronized via an on-board counter resident in each control panel. The concept of a collisionless ethernet is important if there is a production application where effects recalls can't be interrupted by data collisions.

Resource sharing

In a networked system it is important to know if a control panel or part of the signal chassis function is available for allocation. A resource must first be available before it can be allocated. In this case, manufacturers of networked systems provide a menu-driven display that shows resource status information. Information includes the number and availability of signal chassis, M/Es and other resources. Within the architecture, prioritization takes place through a predefined hierarchy. The intelligence of the system might also extend to user-assignable setups and memory of acquired and released resources with all of its setups intact when on loan to another edit bay.

Billing and logging

Because the equipment is in the business of making money for its owner, a discrete logging system might be integrated into the unit. In this way, scheduling and subsequent billing can track the amount of time that any control panel uses acquired resources, billing the client with a system that charges per M/E time used. The time log would track the number of seconds used for each M/E and present a total at the bottom of the list. A pause key would stop the clock when a rest break is in order.

Reduced router size

Imagine that each system chassis can accommodate *n* number of primary inputs, which can be any combination of video and key sources. If each input on a setup menu is named, sources can be assigned to the control panel with hard and soft labels. Primary inputs that are not assigned by hard labels can be retrieved through the soft labels in the menu. This emulates an internal router and means that different sources can be assigned at will, rather than using permanent assignments to bus row buttons on the control panel. If additional chassis are connected, then it follows that hard-labeled sources must be available to it. Intelligent software can keep track of where the sources are and route them to the correct button on the bus row. After all, when an operator

A hybrid approach suggests other major benefits to networked switcher design.

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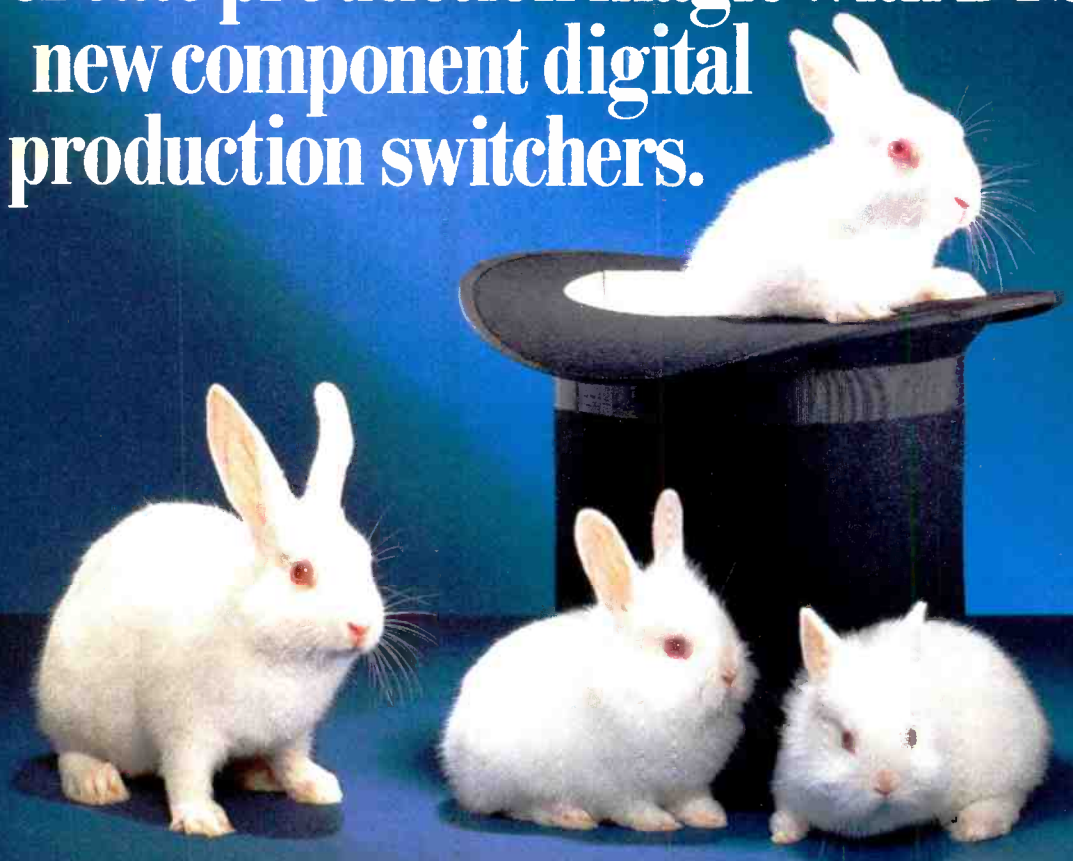

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calls up VTR3, the source is expected to appear there, regardless of the chassis being used at the time.

Keeping a traditional approach in our networked scenario, re-entering the upstream M/Es would require a primary input. Software would flag the input as a re-entry, and the system would route that source to the end of the bus row where it is expected in a traditional cascading mix effects architecture. Remaining sources feeding each chassis may be completely different and can be assigned to the last crosspoints. Because *n* number of hard-labeled sources and M/E re-entries are common to both switchers, this effectively increases the number of inputs available to each control panel.

Multiple control panels

The use of multiple control panels has other benefits as well. For example, a particular control panel assigned to a specific room can be given full power of a particular chassis at a given time. If the chassis has two M/Es and a downstream keyer, these resources can be assigned to the specific control panel in use. Depending upon the job complexity, it also may be desirable to split the M/Es and the downstream keyer and assign control of each to a particular control panel simultaneously.

Suppose edit suite A takes control of M/E A. The operator has all the power of M/E A available. The M/E A program output also serves as line out. Edit suite B takes control of M/E B. The job taking place in edit B requires the power of M/E B plus the downstream keyer. If a third edit suite was involved, the two M/Es could be assigned to separate edit suites. Simultaneously, the downstream keyer remains with the assigned third suite.

Hybrid networking

In another circumstance, the same manufacturer might offer digital composite and component versions of the same networked system. The control panels might be identical. If so, the component and composite version chassis can be directly connected to the ethernet network. Now a single control panel can access two M/Es representing the two formats. Although M/E A might be component and M/E B composite, the output can be either one.

A hybrid approach suggests other major benefits to networked switcher design. For example, many clients transfer film to D-1 for color purity. Suppose that the transferred program must then be encoded to the composite format to be edited with material from either Type C or D-2 in a composite edit bay. If the original material had blue or green screen chroma-key scenes, the quality of the chroma-key from the D-2 transfer experiences the bandwidth limitations of the format. In the hybrid approach, the operator directly keys

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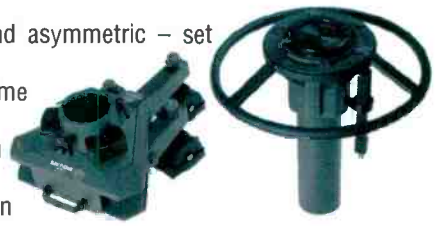

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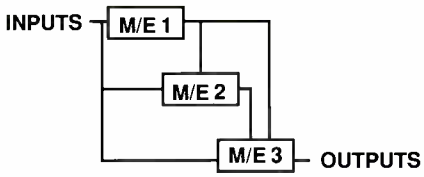

Figure 1. The concept of a mix/effects switcher.

the blue screen chroma-key scene in the D-1 format and converts the processed key and fill signal to D-2 for compositing. For the material to be composited in component, the program can stay in D-1 and the result encoded and cut into the D-2 or composite record master.

Layering switchers

Digital disk recorders and low-cost memory storage expands the performance options available from a traditional switcher. With a compositing or layering switcher, the operator can access *n* layers of a composite image simultaneously. The ability to adjust relationships between the various layers or elements of a composite before recording is an important benefit over conventional sequential compositing. With the ability to see and operate on all of the layers simultaneously, all attributes of a layer can be established relative to all other layers before rehearsing and finally recording. In a digital composite or component environment, the editor not only retains the ability to preview complex effects with the freedom to experiment as in the analog domain, but also has benefits inherent in digital processing, such as little or no generation loss and the ability to perform unlimited layers.

Mix/effects vs. layering

Conventional M/E-type switchers have three major elements:

1. M/E modules,
2. a program/preset bus; and
3. a downstream keyer.

Often, M/Es have dedicated background buses for A and B video with one or more dedicated keyers. A/B buses and M/E keyers have black, color background and the switcher video inputs as sources. M/Es re-enter the program/preset buses as sources, which have the same sources available as the M/Es. The program bus feeds the downstream keyer. (Figure 2.)

In a compositing switcher, effects are created in layers. Layers can be defined as either backgrounds or keys stacked in order of priority to create a final composite.

Because the switcher treats each layer as a full background image or key, any combination of key and background elements become available to the operator in any desired image priority. Layers can be cut, mixed or wiped into or out of the video composite individually or in combination with other layers. At the same time, traditional attributes can be applied to each layer. Each layer will have an independent, user-assignable linear or nonlinear wipe and mix transition profile, transition rate and offset time. Each layer is independently controllable, offering complete arbitrary image control.

External effects processing

The benefits of digital processing, routing and software coding introduce new effects approaches for modern-day switchers. In the compositing switcher, each layer can generate a separate video fill and matte signal reflecting the key, wipe and mix parameters applied to it. These signals are available to external processing devices through video and key aux buses. Layers also can be grouped into a submix composite prior to an effects send. Flexibility in routing and switching architecture allows modified video and matte signals or subcomposites to be returned at any level within the overall video and key composite.

No longer hindered by bulky parallel cables, serializers and deserializers allow simple BNC hookups in the edit suite.

Serial digital inputs and framestores

One factor that has helped significantly to bring digital technology into the post and broadcast arenas is the serial digital distribution standard. No longer hindered by bulky parallel cables, serializers and deserializers allow simple BNC hookups in the edit suite. Most serializers and deserializers also incorporate equalization and buffering for long signal lines.

Lower-cost memory has had a direct impact on the incorporation of more than one framestore into switchers. In a compositing switcher, a separate framestore may be assigned to each input source, permitting any source to be live or frozen in building a composite image. Individual elements may be loaded into the frame buffers from any number of source machines, including source VTRs or disk recorders.

New switchers also assign framestores

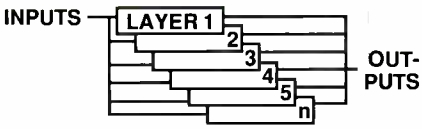

Figure 2. The concept of a compositing switcher.

to external key inputs for static keys or mattes. By sharing the framestores with the ability to perform key masking, a static garbage mask from a caption camera or paint system can be frozen. The mask generator is free to be used for other purposes. Wipe patterns also can be used for live key masks or frozen in a mask store for static masking, releasing the switcher wipe generator to perform dynamic masking or transition effects.

Aside from the fact that multiple passes through the system can be achieved without the need to record the output between passes, the framestore architecture also lends itself to off-line creation of effects. This is in direct comparison to the costly traditional approach of using multiple source VTRs.

The uniqueness of the system is in the user interface.

Parallels and projections

The advent of digital switcher technologies paralleled with the growth of digital VTRs and peripherals will change present operating methodologies and increase creative freedom. New upcoming standards for signal and control interfaces, along with more powerful computing power, will greatly enhance production throughput while minimizing interface concerns. As a result, broadcasters and production houses are given more incentives to consider equipping their facilities with the latest advances in switcher design and other digital-based systems.

➡ *For more information on video production switchers, circle Reader Service Number 303.* ■

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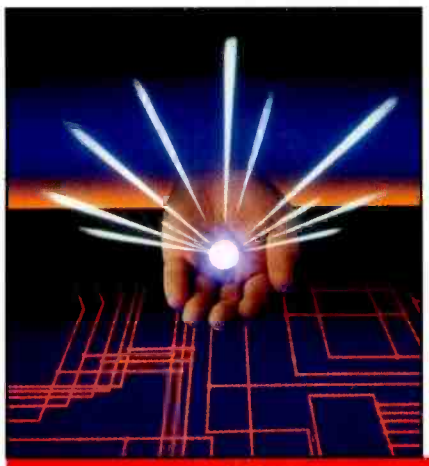

A technical glossary

It's never too late to increase your knowledge of today's computer jargon. You may not know as much as you think.

By John Moretti

The Bottom Line

Because computers have become integrated into almost every aspect of our lives, it is crucial to understand the technical terms associated with them. Whether you are a computer novice or a technical whiz, the following user-friendly glossary is guaranteed to give you insight into the often overwhelming world of computer techno-jargon.

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Let's face it. As digital is established as the new standard for audio production, most of us will become more dependent on computers. Whether you use or plan to use a computer for direct-to-disk audio recording, sequencing, sample editing and archiving, generating score sheets or simply balancing the books, it's important to understand enough basic terminology so that you can understand the problems.

The following is a purely practical exposé of what all of those intimidating terms really mean:

- *386, 486.* The average number of pages found in the chapter titled "Plugging in the Mouse," in a manual for one of the newer-generation of IBM-compatibles.
- *A/D.* Anguish/Despair. The point in time near the beginning of a direct-to-disk recording session during which you realize the software has just enough bugs to prevent the completion of a project before the client's deadline.
- *Aliasing.* The practice of addressing an uncooperative computer with various derogatory nicknames — the majority of which are unprintable.
- *Bias.* A preference for the Macintosh's eloquent graphical-interface system brought on by a DOS-system user's struggle with its cryptic command language.
- *Buffer.* An ingredient found in many analgesics that calms the digestive tract during release of beneficial medication.
- *Brightness.* A measurement of the mental capacity needed to decipher the gobbledygook contained in a software manual.
- *Byte.* The largest portion of a meal that a computer user is able to consume between problems.
- *Card.* A thin, magnetically coded plastic rectangle useful for deferring the cost of necessary computer accessories.
- *Clock speed.* The perceived speed at which time passes while working toward a deadline — slowly at first and more quickly as things begin to go wrong.
- *Contrast.* The difference between a light area and a dark area (i.e., the difference between the darkest area of a computer screen and the circles under the eyes of a computer user).
- *CPU.* An acronym for Corporal Punishment Unit, a slang name for the computer's "brain."
- *Crash.* An instantaneous loss of consciousness caused by too many problems, too little sleep, and a diet rich in sugar and caffeine.
- *Cut-and-paste.* A procedure used to remove certain words from magazines and/or newspapers to write a threatening anonymous letter to the company that sold you the faulty computer gear.
- *D/A.* Despair/Anguish. The point in time following A/D (Anguish/Despair) during which the frustrated user realizes he can still beat the client's deadline — if he can convince the 12-year-old neighborhood computer whiz to debug the software.
- *DAT.* Diacritical Audio Termination. The ability of software to identify and accidentally delete only irreplaceable audio files.
- *Default.* A figure of speech used by someone who has just accidentally erased a hard disk. (i.e., "It's default of desoftware.")
- *Disk fragmentation.* A spinal condition caused by too many late nights hunched over a keyboard.
- *Dither.* A state of flustered excitement caused by a screen message, such as "eras-

Moretti is a writer, producer and cartoonist based in Denver, CO.

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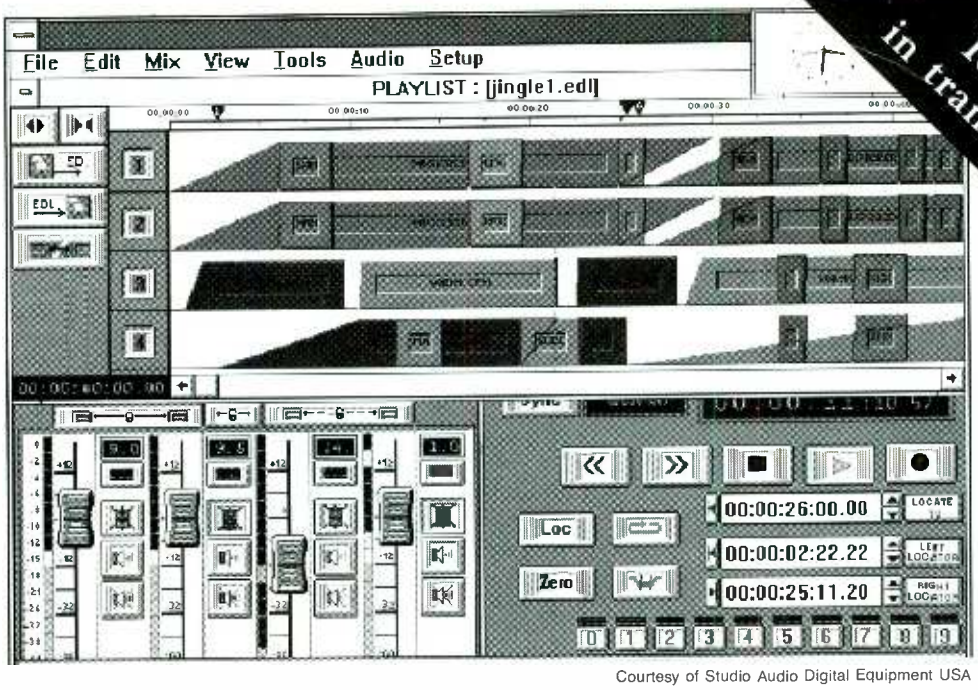
ing hard disk now."

- *DOS.* Destroyed Optic Syndrome. An eye condition brought on by prolonged viewing of a tiny, monochrome screen turned to full brightness in a dimly lit studio.
- *Dot pitch.* A slang term for throwing frozen hockey pucks into the monitor of a misbehaving computer.
- *Extended memory.* The mental capacity needed to recall important commands without re-reading an entire manual chapter.
- *FFT.* Fastest Failure Time. The length of time between completing setup of a computer-based studio system and the first failure of an integral piece of software/hardware — usually several hours.
- *File.* A police department document that describes when and where a computer novice was found running naked through the streets, screaming hysterically. Also see "dither."
- *Floppy.* The state of your legs following an 8-hour session in front of a computer screen.
- *Hard drive.* A term used to describe the drive home through morning rush hour after an all-night attempt at recovering the data from a crashed hard disk.
- *Hertz.* The sensation caused by crushing a misbehaving computer mouse between your teeth.
- *Import/export.* A fly-by-night computer box house that sells unsuspecting computer novices hardware that was assembled by ex-pro-wrestlers who were paid "by the piece."
- *Interface.* A slang term combining the prefix "inter" (Latin for "between") and "face." The time between grimaces caused by protocol incompatibilities.
- *I/O.* Idiot/Opportunity. Customers who allow themselves to be talked into buying unnecessary items rather than admit they don't understand what the salesperson is talking about.
- *Lockup.* The "guest quarters" of the police department where you stay after being booked. Also see "file."
- *Mac.* An inexpensive, quick meal that contains the four basic food groups and that may be consumed during a "hard drive."
- *Megabyte.* Ingesting an entire pizza in one mouthful, thus simultaneously replenishing the body and making up for the time lost rebuilding an accidentally deleted audio file.
- *Megahertz.* The sensation caused by crushing a misbehaving computer mouse between your teeth the day after you've had a triple root canal.
- *Message.* A recorded communication left on an answering machine, informing a user preoccupied with a serious software glitch that the client's deadline has been moved forward by 24 hours.
- *MIDI.* Masochistic Inclination Dare Index. A numerical system used to rate a user's tendency to ignore crucial safeguard procedures, such as backing up important sequencer files.
- *Millisecond.* The short period directly following an on-screen message, such as "erasing hard disk now," during which the user's mouth opens but emits no sound. Derived from "Milli Vanilli."
- *Oversampling.* Procuring and swallowing enough free samples at the grocery store to warrant an eviction by security. Also see "sample rate."
- *PC/AT.* Paltry Cost/Antique Technology. The direct ratio of cost vs. user-friendliness discovered after rejecting an expensive Macintosh platform for a less-expensive IBM-compatible one.
- *PCM.* Pre-Catastrophe Mode. The lack of concentration caused by gross overconfidence. This usually precedes the accidental deletion of an impossible-to-re-create digital sample.
- *Peripheral.* The portion of human vision that weakens after long periods of time spent staring at a computer screen.
- *Playlist.* A mental list of enjoyable activities repeatedly recited as incentive to finish a long and stressful period in front of a computer screen.
- *Port.* A dark-red, extremely sweet wine, available at many all-night convenience stores. Often used in conjunction with analgesics.
- *Power spike.* The figurative name for a jackhammer, one of the few known tools that can remove the contents of a jammed disk drive.
- *PPQN.* Parasympathetic Panic Quotient Number. A numerical system for rating the brain's ability to withstand absolute crisis before instructing the parasympathetic nervous system to shut down the heart. Also see "dither."
- *RAM.* Read And Mangle. A type of computer processor that converts the information stored on a disk into unintelligible on-screen gibberish.
- *Real time.* The actual time of day or night, as opposed to that indicated by a wristwatch severely damaged by the fist-pounding that follows a disk crash.
- *Resolution.* A promise you make to yourself to change to a less-stressful career, such as selling penny stocks.
- *ROM.* Random Order Malfunction. The apparently non-sequential order in which software and hardware snafus occur.
- *Sample rate.* The rate at which you are able to procure and swallow free samples at the grocery store, where you normally would be buying groceries, if there was any money left over from carpal tunnel syndrome therapy.
- *Screen saver.* Any type of computer screen covering that can withstand the impact of a hurled piece of furniture.
- *Scrubbing.* Removing printing ink and glue from your hands by a combination of washing and hard rubbing. This action usually follows "cut-and-paste."
- *SCSI.* (pronounced "scuzzy") The condition of your body following 36 non-stop hours of trying to install properly a connection between a computer and a synthesizer. SCSI stands for "Shower Critical, Smell Inescapable."
- *SDIF.* Sentient Device Impatience Formula. A mathematical formula used to determine how much impatience can be exhibited by the user before a new computer senses it and freezes the keyboard.
- *SMPTE.* Sacred Mystic Pagan Technology Entity. An imagined, wrathful and vindictive gatekeeper of the digital domain, believed by many computer users to decide the fate of precious data.
- *Software.* Comfortable guest clothing provided by the police department. Also see "lockup."
- *SPDIF.* Sentient Paranoid Device Impatience Formula. A mathematical formula used to determine how much impatience can be exhibited by the user before an older and emotionally abused computer senses it and freezes the keyboard.
- *System prompt.* A letter from the bank (the system) requesting (prompting) you to make last month's installment payment on the loan that financed the computer.
- *Time code.* An ambiguous description of the length of time required to perform a given function, provided by a software or hardware manufacturer's marketing department.
- *Time squeeze.* A situation in which a client's deadline is approaching faster than the computer is working.
- *Utility.* Publicly provided electrical power that flickers, surges and disappears at precisely the wrong time.
- *VGA.* Vasoconstrictive Gelatification Aptitude. A measurement for a monitor's ability to turn your eyeballs into something akin to overcooked pasta.
- *Waveform.* The way in which your body begins to sway slowly from side to side before toppling over. Also see "crash."
- *Waterfall.* The manner in which a beverage flows over the lip of a jostled container and directly onto a keyboard.
- *Windows.* Handy structural openings through which you can leap after the power dies, instantly obliterating all audio files that are not backed up.
- *WYSIWYG.* (pronounced "wizzywig") A hair style caused by trying to install an add-on board in a computer without first disconnecting the power supply. WYSIWYG stands for "Wattage You Suck In When You're Grounded."

In today's increasingly technical world, it's sometimes hard to keep your sense of humor. The editors of *BE* hope you enjoyed this lighthearted treatment of computer "gobbledygook." April Fools! ■



Courtesy of Studio Audio Digital Equipment USA

Digital audio production systems

Digital audio systems are revolutionizing radio production.

By Ken Tankel

The Bottom Line

The creative soul of a radio station lives in its production studio, where experimentation with new technical toys has always been welcome. But the stakes are rising as digital systems offer replacement of nearly the entire existing facility with a single box. Upcoming purchasing decisions therefore will exert unprecedented influence on the sound, style and future success of a station. An experienced user shares some insight on how to proceed in this month's radio revision report.

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Tankel is director of technical operations for the East Coast region of CBS Radio.

Photos by Ken Tankel, courtesy of WOGL-FM, Philadelphia.

From its beginning, radio has steadily undergone technical development. In the past, most of these changes were evolutionary, taking place within the worlds of familiar analog audio and RF principles. Today, however, these changes are occurring in more fundamental and revolutionary ways.

Current digital audio technology offers the ability to manipulate, store, move and control audio in ways that far surpass what has been possible with the analog technology that preceded it. As a result, digital technology is being applied to radio broadcasting at a staggering rate.

In particular, digital editing and production systems have attracted significant attention. This technology may be the single best studio improvement a broadcaster can make. Its impact on production equipment has grown dramatically despite the difficult economy.

This must mean that digital production tools are answering broadcasters' needs. (In other words, this is technology that can improve the bottom line.) In this regard, the following are important questions for which broadcasters seek answers:

- How can we get more work done in a given amount of time?
- Can the quality of our product be improved?
- Can expenses be reduced?
- How can we take maximum advantage of our existing facilities?

Products that best serve these needs ultimately will be the ones that succeed in the marketplace. User reports consistently state that digital production systems address all of these important considerations.

Of course, if all your production work consists of dubbing music and agency-produced spots to cart, you can safely lock yourself in your existing production studio and not let new equipment in or money out. For virtually everyone else, however, a digital production system will guarantee that work gets done faster, quality improves and tape costs are reduced.

Decisions, decisions

Choosing from among the many digital editing systems available can be a daunting task. A good place to start is the price.

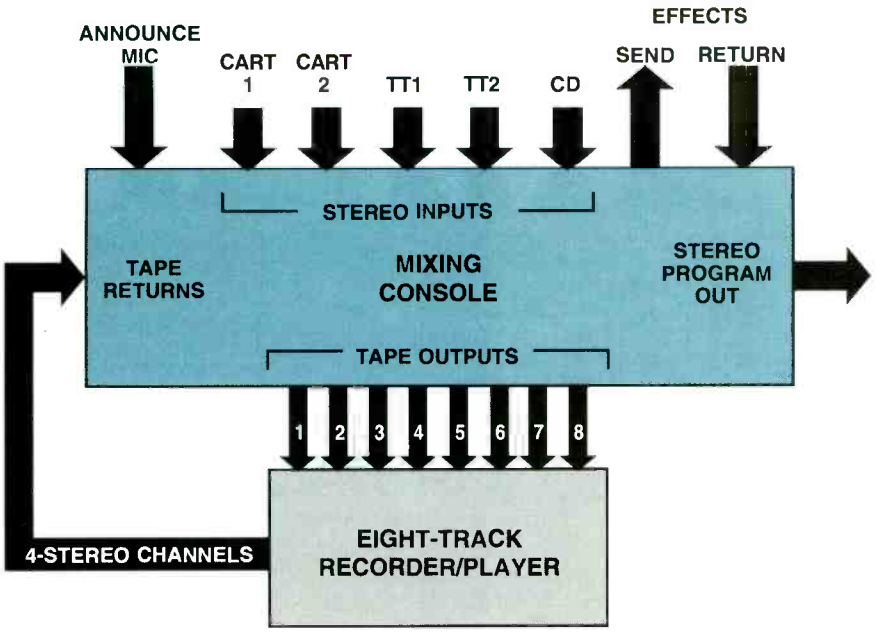


Figure 1. A traditional analog multitrack production studio configuration.

Set a budget figure, then look for systems in that price range. You will find that some editors include EQ, effects, mixing, time compression and expansion, time-code lock and chase, and multitrack editing. Some of these features may be unnecessary, and doing without them may reduce the cost without losing any features you require. But in examining these additional features, your opinions about them may change, and you may find some of them increasingly desirable. Therefore, the research process may have the effect of increasing what you are willing to spend.

Don't write off a system just because you have never heard of it or dealt with the manufacturer before. Many of these systems come from companies peripheral to the traditional broadcast industry. Consider the company's stature and stability, however. You are certainly going to want good, reliable support and service for some time to come on any digital production system that is purchased.

Take a test drive

It is essential to obtain personal demonstrations of as many systems as possible. Understanding what different devices offer can help you make an informed decision about the one that fits your particular application. Price is not the ultimate indicator of which system is better suited to your needs. The particular application at your station is what must drive your choice. Even a listing of a system's functions is not particularly useful, because that list alone does not tell the whole story. The system's user interface and ease of mastery are critical to making use of its production features.

For example, if your main production concern is preparing spots for air, and you have only one production studio (combo-operated by air personalities during their daily production sessions), a system that features speed and ease of use is of chief importance. If, on the other hand, you emphasize original in-house production and have a full-time production director who needs sophisticated multitrack capabilities, then a system with a steeper learning curve and more complex operation is justified to obtain the extra capabilities.

Also, consider that the system you purchase may have to respond to (or may itself generate) new and different production requirements down the road. Therefore, flexibility and room for growth are essential.

Real or virtual?

While shopping, bear in mind that a distinct difference exists between input/output (I/O) channels and recording tracks in these systems. Most units allow multitrack operations during production, but many of them allow input of only two channels at a time, and the output of a stereo mix.

The multiple tracks in such a system are called *virtual* tracks, in that they exist only in software and not in hardware. Other systems offer capabilities identical to multitrack tape recorders (see Figure 1), by which 4, 8, 16 or more tracks can be input and output simultaneously through individual, dedicated I/O channels (*real* tracks).

Be sure that you have an application that requires simultaneous recording and playing of multiple, separate tracks before you invest in a system equipped with real multitrack operation. For many broadcast applications, 2-channel I/O and virtual multitracking is sufficient, because productions are assembled from prerecorded 2-track sources. Most digital production/editing devices allow *track-slipping*, whereby the sources can be placed in any time relationship to one another after they are uploaded to the system. Real multitrack capability is only required if multiple tracks must be recorded in real time. This is much more common in performance or

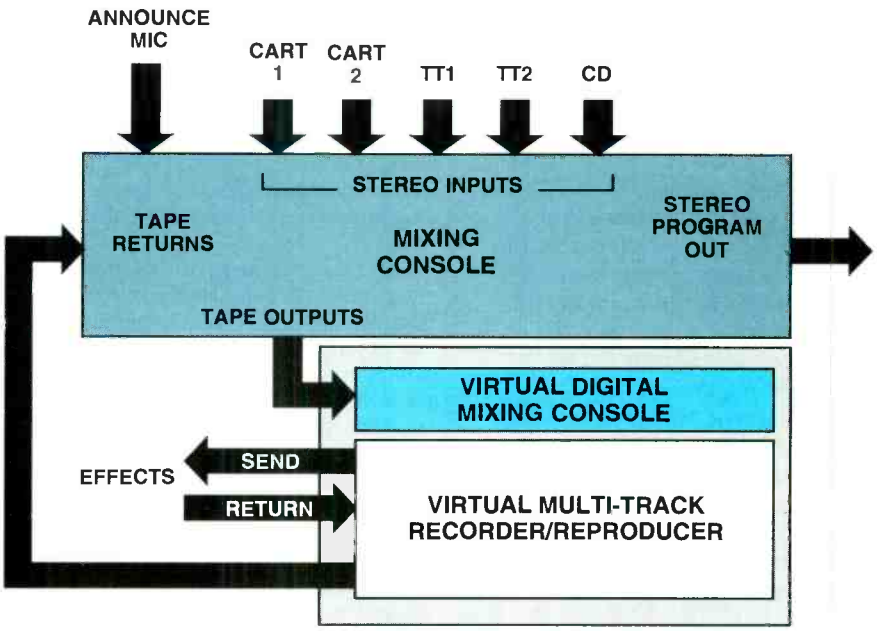
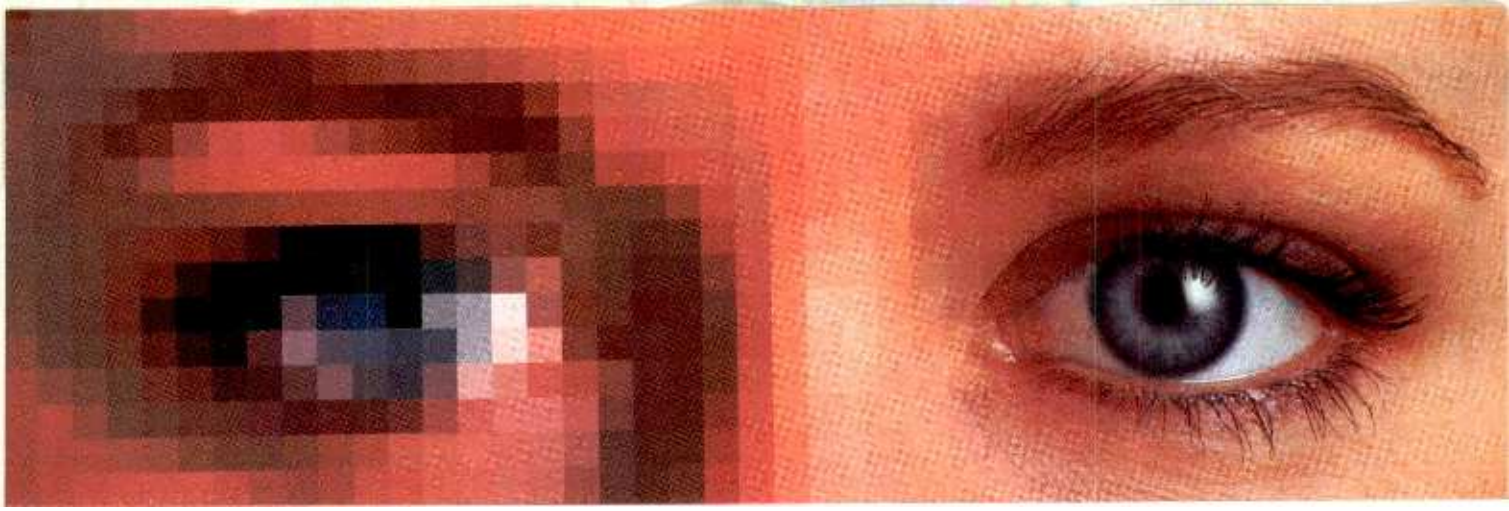


Figure 2. A production studio incorporating a virtual multitrack digital production system. Note that the existing analog mixing console and other traditional hardware may still be included in this hybrid configuration, and that the number of recording tracks may be greater than the number of inputs and outputs on the recorder.



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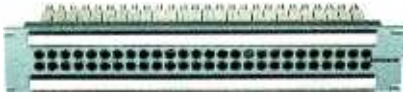

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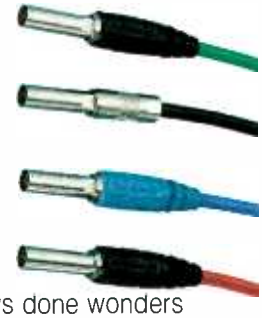

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music recording applications than in typical radio production.

On a 2-channel virtual multitrack system, an auxiliary pre/post-send may be all the additional I/O that is needed. The simpler stereo configuration allows a digital production system to be installed in any stereo facility as easily as connecting a stereo tape recorder, while all of the multiple track mixing capability resides inside the system itself. (See Figure 2.)

The next question concerns the actual number of tracks required. A typical radio spot production might require two for the stereo music bed, two more for the intro and outro, one or two for voices, and one or two for effects. This means that six to eight tracks of internal mixing capabilities are probably a minimum requirement. If you can do with less, say four, be certain that the system you choose can be economically upgraded later.

Disk or RAM?

Some systems are disk-based and some are RAM-based. There are pros and cons to either strategy. At one extreme is a system that records audio onto hard disk(s) and uses RAM to store information about the edits that are made. This editing process is often called *non-destructive* because the original audio is never really altered. The edits are compiled into an *edit decision list* (EDL), which contains instructions about where to start and stop playing audio from the disk, how to fade in and out, and so forth. With this approach, the system can record for long periods of time onto high-capacity disk(s) while saving and comparing EDLs, allowing edits to be done and redone forever. But such a system can exact a speed penalty when you want to hear the edit or the entire edited piece. Up to 50% of the actual play time of the piece can be required for the system to prepare the edited piece for playback.

A radio production studio using a virtual multitrack digital production system in an analog-interfaced application.

At the other extreme is an editor that works totally in RAM. This approach is extremely fast at carrying out editing operations and can always playback instantaneously. On the downside, editing in these systems is often *destructive*, in that cuts actually delete audio data (usually after you have the chance to review and undo the action), and recording time is limited by the amount of RAM.

Systems today occupy both extremes of this spectrum, and many exist in between, combining features of disk and RAM storage to create unique approaches.

Control interface

The user-control interface is another element that distinguishes systems and determines their suitability for your application. People constantly switch between serial and parallel processing modes. For instance, you are operating in parallel mode when you create a mix and control several faders at once. When you adjust EQ or an effects device, you typically work on one parameter at a time, which is the serial mode.

A production system that can be controlled only by a keyboard and a mouse (or trackball) requires you to stay in serial mode all the time. It will require several steps to do a simple crossfade. In fact, some systems will require switching between screens to make an edit — one screen to set the crossfade points and another to set the mix levels. Systems that provide dedicated hardware controllers offer the user real faders, transport buttons and other controls, allowing production to be done in a familiar and parallel fashion. Hardware controllers also eliminate some of the screen switching, perhaps making production move faster. Of course, such dedicated (or hard) controllers generally increase the size and cost of a system.

Remember that digital audio at the radio station eventually will move beyond the production system (if it hasn't already) and become integrated into the whole facility. Therefore, consider archiving and backup capabilities, digital I/O, networking between editors and audio file formats that allow files to be shared between different systems.

Tomorrow's work at the radio station will involve such integration of the entire station into a unified digital audio and control network. The experience gained by learning about and using the digital technology currently available will prove invaluable when these more complex systems arrive. Meanwhile, digital production systems can be used to your advantage today.

A virtual multitrack digital production system in an all-digital (digitally interfaced) radio control room.

➡ *For more information on digital audio production systems, circle Reader Service Number 304.* ■

Field Report

Xymox Systems' Myriad Facility Manager

By Douglas Eady

Henninger Video, located just outside of Washington, DC, in Arlington, VA, is a high-end digital post-production facility. It offers six suites of on-line editing, off-line editing, video sweetening, duplication and standards conversion. The company also operates digital audio production, captioning and graphics divisions.

In an attempt to maintain high levels of productivity and creative excellence, Henninger set out four years ago to find facility management software that would conform to its needs. The first two years were spent developing an in-house system, using off-the-shelf Macintosh software. This system ran slowly, and its programming always seemed to be one step behind the facility's requirements. Eventually this project was abandoned, and a bona fide facility management system was sought.

The system chosen was the Myriad Facility Manager by Xymox Systems. For two years it has provided Henninger with on-screen scheduling, job management, accounting, videotape library management and office automation. The company has grown significantly during this time, adding video editing and graphics facilities in Richmond, VA, and a consulting and equipment rental service in New York. The software easily accommodated these additions under separate company headings, connecting the Richmond facility to the Arlington computer via dedicated data line, and tying in the New York office via dial-up service.

System description

Xymox Systems has been developing this software since 1982. As production and post-production companies have joined the Xymox user list, different system modules have matured into a flexible and efficient facility management software package. The basic program that drives the software is Metropolis by Alpha Base. This is an adaptable *relational* database. A relational database allows the user to link (meaning to join or create a relationship between) information stored in many different disk files. It allows interchange and cross-referencing of information between different types of records, such as comparing the data in a group of invoices to the data in an inventory.

Performance at a glance:

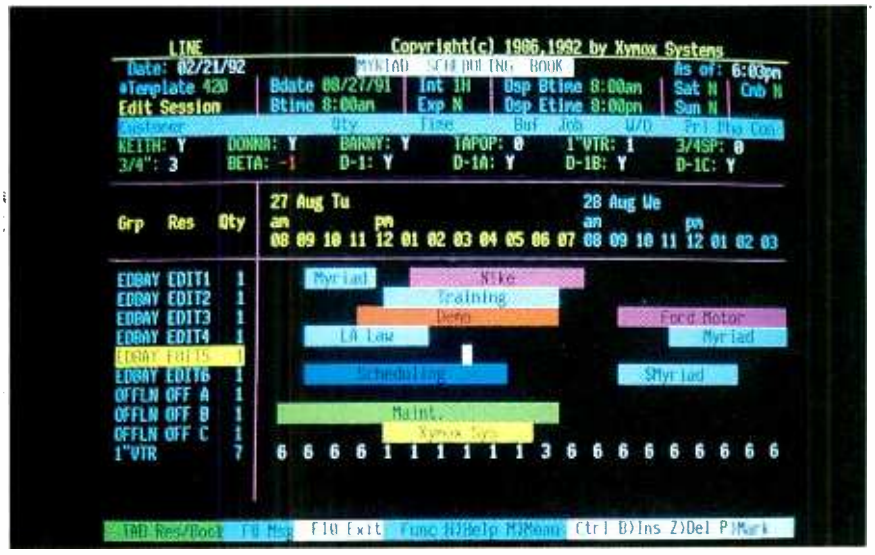
- *Comprehensive production facility management software*
- *Modular design allows the user to configure system as needed*
- *Runs on a variety of platforms*
- *Software is customized by manufacturer for each application*
- *Uses fast and flexible relational database design*
- *Supports bar coding for inventory control*
- *On-line help and support provided*

Henninger Video has 73 staff users on the system, so speed is always an issue. The database uses *key files* to help the search capabilities of the system. Key files contain *pointers* that keep track of how the data in the computer is organized and stored. Key files are associated with *data files*, which are collections of data that logically belong together. For example, a "company file" is a data file containing such information as names, street addresses and phone numbers of companies. An associated key file describes the format of this data's storage in the data file. This structuring process allows the computer to retrieve information quickly.

Installation

Proper installation is a major part of any computer setup. First, software and hardware decisions must be made. Hardware decisions include selecting a host computer, power and backup power, climate control, cabling and workstation/platform choice (dumb terminals, Macintoshes or PCs). Substantial flexibility is available in the Xymox system, which can become an operational benefit. For example, Henninger's project coordinators (schedulers) are a central source for client contact, so their scheduling screens were required to show as much information as possible. Each of the schedulers was therefore equipped with a 19-inch color monitor and an uninterruptible power supply (UPS), which allow the schedulers to continue booking jobs even while the power is out.

Based on a detailed installation kit completed by the user, Xymox does the software setup. The company works with the client's system administrator to assure maximum use and performance of the system. The system administrator chosen to set up the software should be well-versed



Eady is director of management information systems at Henninger Video, Arlington, VA.

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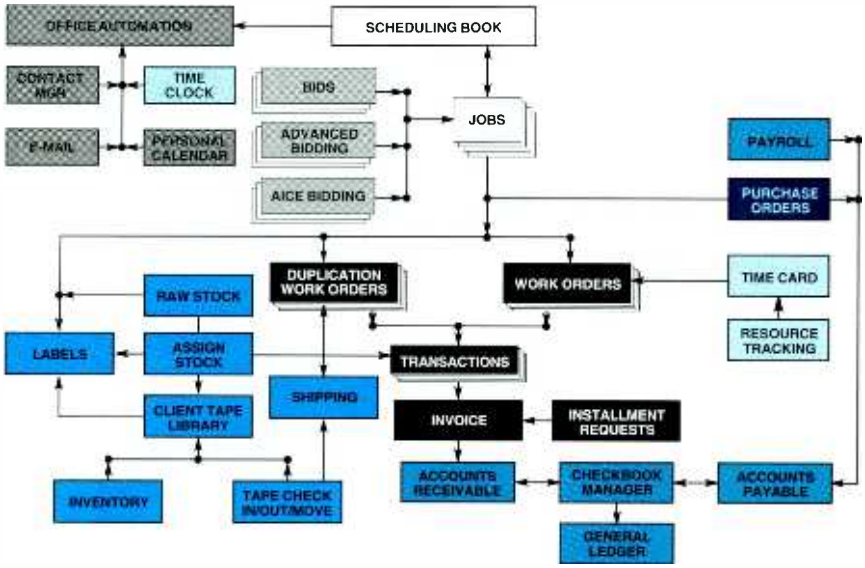


Figure 1. *Block diagram of a fully outfitted Myriad Facility Management software package from Xymox Systems.*

in all facets of the facility. Because the facility management will link job management, tape library, purchase orders, accounts receivable, accounts payable, general ledger and the like, you will need a person who is able to make decisions and convey information on how the facility currently operates. Xymox works closely with the user here, and this can have substantial positive impact on the resulting system.

Some key points to remember at this stage include:

- Keep your clients in mind.
- Avoid establishing operations that will slow down the way you work.
- Be open-minded to change.

The facility management program can offer you new ways to be more efficient.

Naturally, training is critical in any new software installation. It's also a good idea to involve employees throughout the process. They probably will have mixed feelings about issues that change their jobs, and keeping them informed can help them maintain a positive attitude toward the new system.

Operation

The Xymox facility management process uses a streamlined approach. Work orders are scheduled into the computer once, and that information then becomes part of the job management system. As the job is completed, work orders are updated and billed. The invoice information carries over to the accounting side of the computer, where it is posted and awaits payment.

Since Henninger Video installed this facility management software, the company's size has grown tremendously, yet the support staff has not. This is due in part to the automation process. Here's how the system is applied in Henninger's operation: Each business day, schedulers book clients, move bookings and resolve conflicts. Every booking consists of a suite, an editor, an assistant editor and a hardware complement (recorders and effects equipment). As bookings are scheduled, templates load predetermined room configurations into the work order. The scheduler looks at the given room configuration and eliminates or adds resources as needed. This approach works well because the scheduler doesn't have to remember what is available in the suite or from the floating inventory. Once a work order is confirmed, the scheduler prints the order, and it's ready for the edit session.

The editor writes any changes made during the session on the work order and totals the actual times. The editor also fills in any duplication requests on the work order. After the editor and the client sign the work order as annotated, it is returned to the scheduler, who updates the account accordingly, collecting such data until the job is finished and ready to bill.

Throughout the process, any special rates due to the client are applied and calculated automatically (or else, system default rates are used). Once the job is ready to bill, all corrected work order data is sent to the accounting department, which prints a rough draft of the project's bill, has it approved by marketing, and finalizes the invoice.

Other system elements that can further coordinate a facility's efforts are the Video Tape Library, Purchase Orders and Time Clock/Time Card. As a client brings tapes into the facility, the Tape Library allows you to bar code sources and masters, and relate those tapes to a job. Tapes then can be searched for in a number of ways, such as by client, bar code ID, job number and tape title. The Tape Library also has an inventory program that enables blank tape stock to be tracked and billed.

The Tape Check-In/Out program allows tapes in the library to be scanned (via bar code) and quickly released from the facility with a printed shipping form.

The Purchase Order system allows anything purchased for a job or the facility to be tracked and, when appropriate, assigned to a work order. This information flows into accounts payable and provides an additional level of reporting detail.

The Time Clock module allows tracking of personnel with an electronic time in/out register. It displays or prints a status report for managers or the receptionist, indicating who is in the building. Tracking billable and non-billable hours is provided by the Time Card module. Billable work is entered against a job and/or work order and automatically posted for billing or job-cost tracking. Records of sick leave, vacation and overtime also are tracked here.

Results

The information you gain with such facility management software can seem overwhelming at first, especially if your facility has never been automated. You probably will begin to learn more about your facility and how it works. For example, it will show you the services your clients are using and those they are not. Information is stored on your salespeople, editors, machines — anything you schedule. Virtually unlimited reports are available.

The information the computer system provides has aided in the development of capital and personnel planning at Henninger Video. It also has been helpful to have access to information concerning work orders, client tapes and invoices for a client in a matter of seconds. Clients don't have to wait long for answers, and the staff doesn't have to spend a lot of time getting them.

➡ *For more information on Xymox Systems' Myriad Facility Manager, circle Reader Service Number 305.*

Editor's note: Field reports are an exclusive *BE* feature for broadcasters. Each report is prepared by the staff of a broadcast station, production facility or consulting company.

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

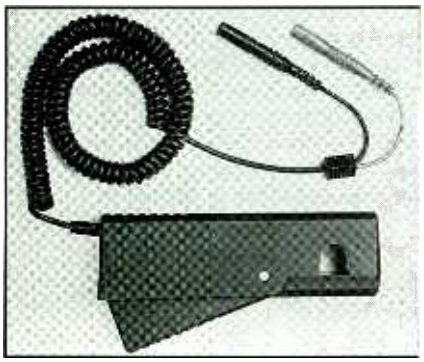
It is the responsibility of *Broadcast Engineering* to publish the results of any device tested, positive or negative. No report should be considered an endorsement or disapproval by *Broadcast Engineering* magazine. ■

New Products

AC current adapter

By A.W. Sperry

• **Model CA-200:** measures 0-199.9A AC with 3% accuracy on 50-400Hz circuits; works with all A.W. Sperry digital multimeters and most other manufacturers' models having a 0-200mV range and >1M input impedance; provides True RMS reading when used with a True RMS DMM, $^5/_8$-inch jaw capacity; weighs eight pounds; 5.75″×2.75″×1.25″.



Circle (366) on Reply Card

STL system

By BEC Technologies

• **Digital fiber-optic STL system:** transmits up to 64 channels of full-bandwidth, bidirectional audio; maximum transmission is two miles multimode,with standard LED driver, or 25 miles single mode with an optional laser driver; 10Hz to 22.5kHz (±3) frequency response; THD+N less than 0.01%; dynamic range better than 92dB; fault-tolerant redundant communication technology assures fail-safe signal integrity.

Circle (369) on Reply Card

Caption system

By Blue Feather

• **Caption box:** battery powered (7-25VDC, 12V nominal) allows for captioning on remote shoots; 6″×6$^1/_4$″×2$^1/_2$″; weighs one pound; features three ways to caption: Immediate mode allows user to caption while typing; Scroll mode allows user to type in the text ahead of time, and then play back the text with a remote speed control; Cursor mode allows user to type in text ahead of time, and then play it back one text line at a time by pressing a key; teleprompter with 12-inch viewing screen automatically included with caption box.

Circle (370) on Reply Card

Software products

By Chyron

• **CODI-X:** a UNIX-based GUI software product introduced by Parsec Systems for the Chyron CODI; combines multiprocessing power of UNIX with the user-friendly characteristics of a GUI; a "C" library of CODI-X programming subroutines for software developers and systems integrators is offered by Parsec Systems.

• **CODI control panel:** a Microsoft Windows-based software program introduced by R.E. Snader & Associates to control the Chyron CODI text and graphics generator, using 386 PC desktop or laptop computers; offers a GUI that includes menu bars and command buttons for selecting fonts, colors, solid or ramped backgrounds, and the character placement functions of the CODI; additional screens allow creation of auto sequences for auto playback or editor control as well as creation of master templates for repetitive text entry.

Circle (371) on Reply Card

Editor

By Sony

• **BVE-2000:** features include a twin recorder, pre-read and full list management; interfaces to a video switcher, audio mixer, monitor switcher and four VTRs; includes a built-in floppy disk drive; can be configured to simultaneously control up to six devices, and a maximum of 12 devices can be connected to the editor.

Circle (372) on Reply Card

Digital audio workstation

By Avid

• **AudioVision version 2.0:** non-linear video editing system employs TimeLine Micro Lynx and Lynx-2 synchronization; Micro Lynx and Lynx-2 options include simultaneous control of multiple transports, machine control from the AudioVision screen, slave AudioVision to external time code, control of ATRs, VTRs and film transports, and output of time code and MIDI time code from AudioVision.

Circle (373) on Reply Card

Multichannel automation system

By Odetics

• **OmniCart:** compiles, records and plays-to-air simultaneously; software developed by Louth manages recording, program replay and spot insertion for several independent stations on a 24-hour-per-day basis; manages up to eight playlists for recording, replay or compiling; supports up to 300 multispot cassettes and accommodates mixed cassette sizes; supports a maximum of 11 to 14 VTRs; compatible with all broadcast VTR formats.

Circle (375) on Reply Card

Synchronizer

By Alesis

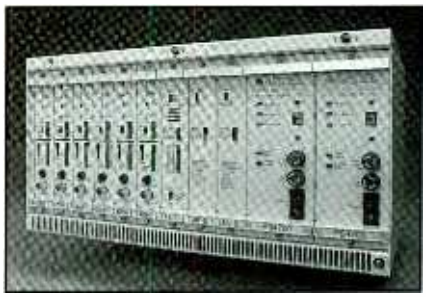
• **AI-2:** a companion synchronizer for the ADAT digital recorder, designed and manufactured by TimeLine; permits standalone operation of ADAT professional digital audio recorders with Sony video editors, MIDI control devices and the TimeLine Lynx-2 and Micro Lynx synchronizers; features include SMPTE/EBU timecode chase, Sony BVE-900 video editor interface, LTC and MTC generation, and internal and external digital word clock interface.

Circle (374) on Reply Card

Multichannel digital video transmission system

By Artel

• **SL4000:** delivers six broadcast-quality video channels plus up to six audio signals and eight data signals per video channel over a single fiber; exceeds all RS-250C short-haul requirements; uses 12-bit digital architecture; provides signal-to-noise ratios through high-quality, non-compressed digital encoding; transmits over 40km without repeaters; supports up to 15 repeaters with no loss of baseband signal quality.



Circle (376) on Reply Card

Digital switch matrix

By ST Olektron Systems

• **AMISM 4856:** unrestricted switch matrix allows users to connect any one of its 48 inputs to any or all of its 56 outputs; crosspoints can be controlled remotely from a host computer via RS-232 (422) serial interface or an IEEE-488 system; data is passed through matrix with modulation outputs widths of ±105 of input data and amplitude recovered to standard value.

Circle (367) on Reply Card

Hard disk automation system

By BLU Electronics

• **DigiStation:** for use in airing spots, weather, etc.; replaces conventional automation and cart machines; includes computer (386-33 or better), color VGA monitor, 170 minutes of recording time, 300W UPS, printer and cables, modem, operation/installation manual, break time correction and 6-month warranty.

Circle (378) on Reply Card

Adapters

By Tru-Connector Corporation

• **RF coaxial adapters:** offered in four general types for solving connector incompatibility problems in series or between series; available with any gender combinations; include lay-on-the-bench types, which are provided without mounting hardware, panel-mounted versions, through bulkhead right angle or straight-through types, and 3-way or 4-way adapters; capable of mating almost all types of incompatible plugs, jacks and receptacles.

Circle (356) on Reply Card

Bidding module

By Xymox

• **Advanced bidding module:** provides spreadsheet functionality and flexibility in unlimited user-defined bid formats; full integration allows all designated bid rates to be accurately reflected in invoicing over a period of time or on a single job.

Circle (351) on Reply Card

Acoustic foam blocks

By Netwell Noise Control

• **SuperMAX:** 12″×12″ squares made of polyurethane foam; designed to deaden the harshest noise sources in a variety of applications; 6-inch, 8-inch or greater standard thickness.

Circle (353) on Reply Card

Coaxial adapter

By Pasternack Enterprises

• **Model PE9368:** 75Ω N female to 75Ω BNC male has low loss over the frequency range of DC to 4GHz; features a brass nickel-plated body, uses PTFE insulation, a silver-plated contact and has an operating temperature range of −65°C to 165°C; mates with any 75Ω N male and BNC female connector that meets the interface requirement for MIL-39012.

• **Model PE9364:** 75Ω BNC male to 75Ω BNC male features low loss over the frequency range of DC to 4GHz; features a brass nickel-plated body, uses PTFE insulation, a silver-plated contact, and has an operating temperature range of −65°C to 165°C; mates with any BNC female connector that meets the interface requirement of MIL-39012.

• **Model PE9369:** 75Ω BNC male to 75Ω BNC female features low loss over the frequency range of DC to 4GHz; features a brass nickel-plated body, uses PTFE insulation, a silver-plated contact and has an operating temperature range of −65°C to 165°C; mates with any 75Ω N female and BNC male connector that meets the interface requirements of MIL-39012.

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Standby power system

By Patriot

• **300 VA model:** microprocessor-controlled detection system transfers to inverter in 4ms or less under all conditions; 3- to 5-year battery life; regulated invert-

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Software product

By SunRize

• **SMPTE output:** stand-alone software product used to stripe LTC time code onto audio- and videotape; generates and sends the SMPTE time code out of the Amiga's audio jack; locks to the video sync pulse of each frame of video when used in conjunction with a gen-lock or Video Toaster; includes 24, 25, 29.97 and 30 frames per second time-code generation, drop frame and non-drop frame time code, multiple reset points, fast forward, rewind, play and pause buttons.

Circle (352) on Reply Card

Routing switcher

By Knox Video

• **RS16×16:** a 16×16 audio/video matrix switcher in a streamlined $1^1/_2$-inch chassis; easy front-panel key-pad operation; can be controlled via the RS-232 input; any of 16 NTSC or PAL video inputs may be routed to any or all 16 outputs; stereo audio can follow or be routed separately; can store and retrieve 16 preset crosspoint patterns.

Circle (362) on Reply Card

Touchscreen

By Troll Technology

• **Troll Cam:** 14-inch color rack-mounted touchscreen for remote control of broadcast camera systems; users can control all camera facilities from the screen and touch the live video picture window to steer the camera in elevation and azimuth; camera positions and settings can be stored for future use or reference.

Circle (363) on Reply Card

Waveform/vectorscope

By Hamlet/James Grunder & Associates

• **PC-Scope:** fully operational monitoring and measuring device for desktop video; plugs into any Amiga or IBM PC; produces highly accurate, digitally generated waveform and vector signals for display on any NTSC monitor; features variable gain control, built-in calibration pulse, and SC-H and color framing indication; offers store and freeze functions, and composite and Y/C inputs and outputs.

Circle (364) on Reply Card

Transmitters/receivers

By Nucomm

• **PT-3 and RX-3 series:** units each weigh less than eight pounds; incorporate all of the existing possible frequencies available for ENG in the United States or internationally, including the offsets; band and frequency selection are made using rotary front-panel switches to directly select the channel and band; units have a total of 151 synthesized RF channels in the U.S. bands; include two field-programmable audio subcarriers with off-line-mic switches located on the front panel; audio channels have a built-in tone generator; video has an optional built-in video test generator with a programmable ID; built-in video generator can generate SMPTE color bars or multiburst test signals.

Circle (361) on Reply Card

Dual time base corrector

By Feral Industries/James Grunder & Associates

• **Dual Micro 4:2:2:** 1-unit-high, rack-mountable time base corrector/framestore synchronizer; features full-frame memory, 8-bit 4:2:2 component processing and individual input memory; 2-digit control position readout indicates changes in proc amp levels.

Circle (365) on Reply Card

SMPTE time-code generator

By Horita

• **GPS-MTG:** uses the atomic clocks in the Global Position Satellite system to generate SMPTE longitudinal time-code matched to UTC time and date; can be used as a precision stand-alone SMPTE studio clock to time and control events or studio automation systems; continuously monitors UTC satellite time every second; will correct the generator time if the accumulated video frame error exceeds five frames in 24 hours; occupies one-third of a standard $1^3/_4$″×19″ rack panel.

Circle (357) on Reply Card

Pre-amp

By D.W. Fearn

• **VT-1:** vacuum tube microphone preamplifier enhances the sound of audio studios' microphones; features modern components and computer-optimized circuitry.

Circle (368) on Reply Card

Serial digital components

By Gennum Corporation

• **GENLINX:** a family of integrated circuits for the interconnection of digital TV equipment using the SMPTE 259M serial digital standard for coaxial cable.

Circle (358) on Reply Card

Equipment shelter

By FWT

• **Aggregate exterior communications equipment shelter:** designed to meet domestic and international cellular market demands for a light-weight shelter to protect critical communications equipment; weighs one-third that of a traditional shelter; easy to transport; bullet resistant.

Circle (359) on Reply Card

Routing switchers and DAs

By Nova

• **RGB component video routing switchers and DAs:** use NovaBlox video processing system modules; available in stand-alone, rack mount or computer plug-in configurations; switcher and DAs available in two versions, one for either RGB with sync on green or Y/R–Y/B–Y, and the other for RGB/S with separate sync; all units feature video bandwidths in excess of 40MHz, >70dB signal-to-noise ratio, <0.3% to 0.3° differential gain and phase; 4×1 vertical interval routing switchers offer several switching control methods; DAs may be configured as either 1×5 or 1×4 with looping inputs.

Circle (360) on Reply Card

■

Preview

MAY...

Program Transmission Systems

- **Building an STL System**

Building an STL system requires careful design because of the high reliability required. The author describes a process to help ensure that adequate fade margins are built into a station's STL.

- **Measuring RF Levels in Complex Environments**

Learn about the complex process of measuring RF field intensity on the New York World Trade Center. In what is probably the most comprehensive analysis of an RF environment, the author discusses the problems faced in measuring the multistation installation.

- **Selecting a Transmission Line**

Selecting the correct coaxial transmission line and then properly installing it is the key to long equipment life.

- **Replacing TV Antenna Systems**

As a TV station antenna system approaches 30 years old, it needs to be replaced. The question becomes what system to buy and how to have it installed with as little downtime as possible.

- **2A–B and Other Intermodulation Nightmares**

Despite the sophistication of today's transmitter and antenna systems, intermodulation products do develop and can cause interference to your viewers or listeners.

- **Sectionalized AM Towers**

With the increased use of antenna farms, reradiation and cross-modulation problems are a common occurrence for AM stations.

- **Radio in Transition**

News is one of the most profitable formats for radio. The article will look at new systems available to help stations implement the format.

JUNE...

NAB Convention Replay

- **From the Convention Floor: A Perspective**

A look at the latest developments from the NAB convention floor and session rooms.

- **Pick Hits of '93**

BE's panel of experts toured the exhibit floor looking for those special devices and equipment for this year's winning roundup.

- **Engineering Conference Report**

A review of the major technical themes presented at the 1993 Engineering Conference.

- **Show of Shows: A Comprehensive Exhibitor Listing**

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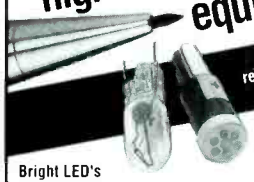

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HELP WANTED

F/T ELECTRONIC MAINTENANCE ENGINEER for television station. Individual must have electronic repair experience, able to read schematics, and perform limited climbing. Salary commensurate with experience, full vacation/benefits package. Interested persons should call (703) 433-9193 M-F, 8a-5p. or send resume to: WHSV-TV, P.O. TV3, Harrisonburg, VA 22801. EEO.

TELEVISION MAINTENANCE ENGINEER — Northern Michigan television station seeking enthusiastic individual, familiar with RF, audio and video. FCC general class license required. Must have ability to troubleshoot to component level. Send resume to dept. 735. c/o Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66282-2901.

CHIEF ENGINEER. Telemation, the leading post production facility in the Rocky Mountains, is seeking a Chief Engineer. Must share our deep commitment to customer service. Edit suites feature CMX, Grass Valley, Abekas A-82, D-2. Rank Ursa telecine with DaVince. Experienced only. EOE. Send resume to General Manager, Telemation, 8745 E. Orchard Road, Suite 500, Greenwood Village, Colorado 80111.

WYCC-TV a PBS affiliate owned by the City Colleges of Chicago has an opening for Assistant Chief Engineer. Experience in trouble shooting to component level in the studio and UHF transmitter equipment areas required. Send resume to: Klynne Chaplik Aleskow, General Manager, WYCC-TV/Channel 20, 30 East Lake Street, Suite 1113, Chicago, Illinois 60601. Chicago residency required within six months of hire. The City Colleges of Chicago is an Equal Opportunity/Affirmative Action Employer: Male, Female and Handicapped.

SERVICES

HELP WANTED

CHIEF ENGINEER OF TELEVISION/ITV COORDINATOR NEEDED. Salary range $28,297 — $38,284. Applicant must possess strong technical administrative, and instructional te evision experience. Applicant will maintain to component level an around the clock ITFS microwave, 3/4 U-matic, VHS, SVHS, 8mm and Hi-8 systems, industrial cameras, several SEG's & TBC's, several character generation systems, several audio consoles, video distribution equipment and a LAN based computerized booking system and must be willing to be on call 24 hours a day, 365 days a year. Applicant must have grant writing experience for assistance in writing school system grants and must be able to mange a small staff and find and train volunteers for elaborate production activity. Applicant should understand the A/V software and hardware needs of educators. Applicant must hold a current FCC General Radiotelephone License or SBE Certification, have five years experience as a broadcast Chief Engineer or equivalent experience. Send resume and a copy of credentials to Don Brown, Director of Vocational, Adult and Community Education, 1036 Varsity Drive, Brooksville, Florida 34601. Phone number is (904) 799-7838.

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HELP WANTED

ELECTRONICS FIELD/SHOP ENGINEER. Swiderski Electronics, Inc. located in the Chicagoland area, is looking for an Electronics Field/Shop Service Engineer with a min. of 2 years exp. Individual to work with Broadcast/Industrial ½", ¾" & 1" VTR's and related equipment. Full time position. Full company benefits. Send resume & salary history to: Human Resources Dept., 1200 Greenleaf Ave., Elk Grove Village, IL 60007. Fax resume to: (708) 364-5019.

AUDIO/VIDEO ENGINEER. The University of Texas Medical Branch at Galveston, located 50 miles south of Houston on the Gulf of Mexico, is seeking an experienced individual to provide specialized skills in installing, operating, maintaining and repairing video production and post production facilities and audio visual equipment. Experience with installation of facilities, cable TV and satellite preferred. Professional appearance and strong customer relations and communication skills also are preferred. Please send resume, identifying JOB #930502. to UTMB, Human Resources Department, Box 55146, Galveston, TX 77555-5146. UTMB is an equal opportunity and affirmative action employer. M/F/H/V. UTMB is a drug-free/smoke-free workplace. UTMB only hires individuals authorized to work in the United States.

POSITION WANTED

DIRECTOR OF ENGINEERING, CHIEF ENGINEER, SYSTEMS ENGINEER. 28 years experience in broadcasting, cable and satellite communications. Project management involving systems design of radio and TV facilities, UHF, microwave and satellite transmission systems. FCC 1st class licence, BSEE. Resume, professional references and salary requirements furnished upon request. Contact: **Dan (516) 798-1945.**

TRAINING

FCC GENERAL CLASS LICENSE. Cassette recorded lessons with seminars in Washington, Newark, Philadelphia. Bob Johnson Telecommunications, Phone (213)379-4461.

Ad Index

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#					
#					
#					
#					

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1	29	57	85	113	141	169	197	225	253	281	309	337	365	393	421	449	477
2	30	58	86	114	142	170	198	226	254	282	310	338	366	394	422	450	478
3	31	59	87	115	143	171	199	227	255	283	311	339	367	395	423	451	479
4	32	60	88	116	144	172	200	228	256	284	312	340	368	396	424	452	480
5	33	61	89	117	145	173	201	229	257	285	313	341	369	397	425	453	481
6	34	62	90	118	146	174	202	230	258	286	314	342	370	398	426	454	482
7	35	63	91	119	147	175	203	231	259	287	315	343	371	399	427	455	483
8	36	64	92	120	148	176	204	232	260	288	316	344	372	400	428	456	484
9	37	65	93	121	149	177	205	233	261	289	317	345	373	401	429	457	485
10	38	66	94	122	150	178	206	234	262	290	318	346	374	402	430	458	486
11	39	67	95	123	151	179	207	235	263	291	319	347	375	403	431	459	487
12	40	68	96	124	152	180	208	236	264	292	320	348	376	404	432	460	488
13	41	69	97	125	153	181	209	237	265	293	321	349	377	405	433	461	489
14	42	70	98	126	154	182	210	238	266	294	322	350	378	406	434	462	490
15	43	71	99	127	155	183	211	239	267	295	323	351	379	407	435	463	491
16	44	72	100	128	156	184	212	240	268	296	324	352	380	408	436	464	492
17	45	73	101	129	157	185	213	241	269	297	325	353	381	409	437	465	493
18	46	74	102	130	158	186	214	242	270	298	326	354	382	410	438	466	494
19	47	75	103	131	159	187	215	243	271	299	327	355	383	411	439	467	495
20	48	76	104	132	160	188	216	244	272	300	328	356	384	412	440	468	496
21	49	77	105	133	161	189	217	245	273	301	329	357	385	413	441	469	497
22	50	78	106	134	162	190	218	246	274	302	330	358	386	414	442	470	498
23	51	79	107	135	163	191	219	247	275	303	331	359	387	415	443	471	499
24	52	80	108	136	164	192	220	248	276	304	332	360	388	416	444	472	500
25	53	81	109	137	165	193	221	249	277	305	333	361	389	417	445	473	501
26	54	82	110	138	166	194	222	250	278	306	334	362	390	418	446	474	502
27	55	83	111	139	167	195	223	251	279	307	335	363	391	419	447	475	503
28	56	84	112	140	168	196	224	252	280	308	336	364	392	420	448	476	504

PLEASE WRITE LEGIBLY FOR NUMBERS ABOVE 504

R3D

FOR ISSUE OF APRIL 1993
USE UNTIL JULY 1993
(After this date, please contact supplier directly)

1 **IMPORTANT: Do you wish to receive/continue to receive *Broadcast Engineering* FREE?**
☐ Yes ☐ No

_____
Signature required

Title _____

Date _____

2 **Please check the ONE type of facility or operation that best describes your business classification.**

19 ☐ Low-Power TV Station
20 ☐ TV Station (Including Network)
21 ☐ AM Station
22 ☐ FM Station
23 ☐ AM & FM Station (Including Network)
24 ☐ TV & AM Station
25 ☐ TV & FM Station
26 ☐ TV, AM & FM Station
27 ☐ CATV Facility
28 ☐ Non-Broadcast TV including CCTV
29 ☐ Recording Studio
30 ☐ Teleproduction Facility
31 ☐ Microwave, Relay Station or Satellite Company
32 ☐ Government
33 ☐ Consultant (Engineering or Mgmt.)
34 ☐ Dealer, Distributor or Manufacturer
35 ☐ Post-Production Facility
39 ☐ Cable Television (Including Network)
40 ☐ Other _____ (please specify)

3 **Which of the following best describes your title? Write the number in the box (select one number only):**

A ☐ **Company Management**—(1) Chairman of the Board, (2) President, (3) Owner, (4) Partner, (5) Director, (6) Vice President, (7) General Manager (other than in charge of Engineering or Station Operations Mgt.), (8) Other Corp./Financial Officials

B ☐ **Technical Management & Engineering**—(9)Technical Director/Mgr., (10) Chief Engineer, (11)Other Engineering or Technical Titles

C ☐ **Operations & Station Management/Production & Programming**—(12)VP Operations, (13) Operation Mgr./Director, (14) Station Mgr., (15) Production Mgr., (16) Program Mgr., (17) News Director, (18) Other Operations Title

D ☐ **Other:** Specify _____

4 **If you checked 19 through 26 on question No. 2, which of the following best describes your over-the-air station? (check only one):**

A ☐ Commercial
B ☐ Educational
C ☐ Religious
D ☐ Campus Low-Frequency
E ☐ Community
F ☐ Municipally Owned

5 **Which of the following types of equipment will you be evaluating for purchase in the next 12 months?**

A ☐ Cameras/lenses
B ☐ Video switchers
C ☐ Video recorders
D ☐ Graphics/effects/titles system
E ☐ Editing system, incl. desktop
F ☐ Signal routing/dist'n
G ☐ Signal processing
H ☐ Automation equipment
I ☐ Monitors (audio & video)
J ☐ Audio consoles
K ☐ Audio recorders/players
L ☐ Microphones
M ☐ Transmitters
N ☐ Antenna systems
O ☐ Remote production vehicles/pgm relays
P ☐ Test/measurement equipment
Q ☐ None of the above

6 **What is the budget for equipment you are evaluating for purchase in the next 12 months?**

1. ☐ Less than $10,000
2. ☐ $10,000—$24,999
3. ☐ $25,000—$49,999
4. ☐ $50,000-$99,000
5. ☐ $100,000—$299,999
6. ☐ $300,000—$499,999
7. ☐ $500,000 and up

7 **What is the ADI rank of your station?**

A ☐ Top 20
B ☐ 21 to 50
C ☐ 51 to 100
D ☐ Over 100

8 **Which statement best describes your role in the purchase of equipment, components and accessories?**

A ☐ **Make final** decision to buy specific makes, models, services or programs
B ☐ **Specify** or make **recommendations** on makes, models, services or programs
C ☐ Have **no part** in specifying or buying

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