

BROADCAST

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June 1987/\$5

ENGINEERING

NAB '87

Assembling
the
technology
puzzle

Inside
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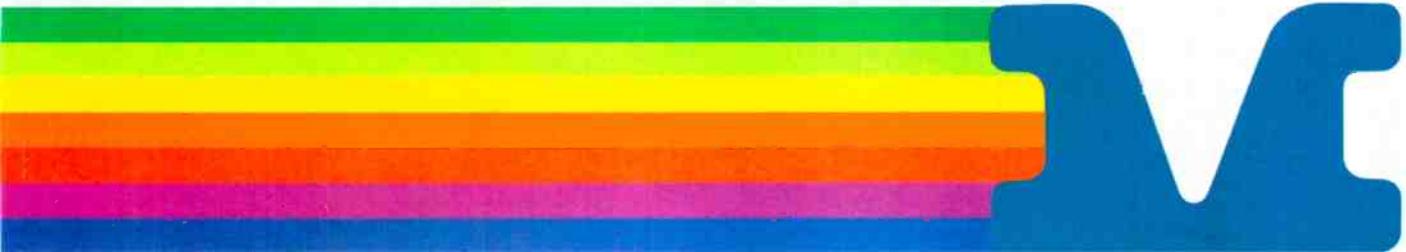
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BROADCAST ENGINEERING

NAB CONVENTION REPLAY:

The annual NAB convention is the clock that drives the broadcast industry. It is the place to see major equipment introductions and to hear important company announcements. This year's show in Dallas offered even more surprises than usual, with significant moves by manufacturers and users into new technologies. Our NAB convention replay special report includes the following elements:

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The broadcast industry's main event showered attendees with new products, raised some new questions and answered others.

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At this year's NAB Engineering Conference, quality was the big issue for broadcasters.

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The 1987 NAB convention brought together nearly 700 exhibitors, more than 40,000 attendees and hundreds of new products.

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By Chip Behal, broadcast engineer, Manhasset, NY

Many broadcasters are looking to the synchronous amplifier as an effective way to improve signal coverage and to reach new markets.

ON THE COVER

Many different elements must come together to make the magic of radio and television work. The pieces of this technological puzzle were brought together at the NAB convention in Dallas. Our NAB show replay issue puts the convention into perspective and highlights the new products introduced. (Cover concept by Kristi Sherman. Circuit board photograph, showing the main PC board of the Eventide SP2016 digital reverb/processor, by David Emberling.)

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HOW THE SK-110D PUTS AN END TO THE REIGN OF ERROR.

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ABC selects Betacam

After two years of intensive technical evaluation of competing formats, Capital Cities/ABC has announced plans to adopt Betacam and Betacam SP as its 1/2-inch format of choice. Announcement of ABC's equipment upgrade includes a decision to purchase products from both Ampex and Sony. The choice was based, in part, on the format's availability from a second-source manufacturer.

The network's decision lays the foundation for a 5-year plan to gradually complement existing 1-inch VTRs and replace 3/4-inch ENG systems with Betacam equipment. The plan involves network news operations, worldwide news bureaus, owned-and-operated stations, and other selected broadcast activities including ENG, EFP and sports. Delivery will start this summer, with the majority of deliveries expected in 1988.

A major factor in the timing of the decision involves the need for lighter and more versatile field equipment for

coverage of the upcoming 1988 conventions and elections. Conversion of field-recording equipment to Betacam is scheduled to begin with the first deliveries of equipment.

For a more in-depth look at ABC's decision, see "Strictly TV" on page 10.

ATSC plans HDTV broadcast tests

The Advanced Television Systems Committee (ATSC) has announced plans for a series of tests in the UHF and SHF bands of terrestrial systems capable of delivering high-definition television to the consumer. ATSC has established a technical specialist group to study spectrum availability, conduct field tests and recommend suitable systems for delivering HDTV signals to the consumer via terrestrial broadcast, cable and satellite.

The tests, scheduled to begin this fall, will study propagation characteristics such as reflection, shadowing and rain attenuation in the selected bands and

how they affect signals carrying wide-band video and audio information. Test sites will include a variety of urban, suburban and rural environments. The group is asking HDTV researchers to provide information about the signal characteristics of their proposed systems as an aid in designing these tests.

With predictions that HDTV products will reach the U.S. consumer market in three to five years, the TV industry is concerned that standards must be developed that will serve the needs of all media and, ultimately, the public.

Terrestrial broadcasting has been given high priority because the FCC is considering a proposal that would allow 2-way business radio users to share parts of the UHF TV spectrum. The proposal, if accepted as is, would preclude HDTV broadcasts in that band because this spectrum will be needed to carry the wider bandwidth of HDTV signals. Even so, bandwidth compression techniques will be required because HDTV produc-

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BROADCAST engineering

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Under new management

For the past 30 years, Ed Gayou has been synonymous with the exhibition portion of the NAB's annual convention. Gayou, as head of the Gayou Management Company, managed the difficult and sensitive questions of booth size and assignment, and hundreds of minor details. That company, under contract to NAB, organized the convention. The 1987 Dallas convention, however, was Gayou's last as head of the effort.

Gayou announced his retirement from active participation in the convention, which became effective following this year's show. He was succeeded by Richard Dobson Jr., who has joined NAB to start up an in-house exhibit office.

Gayou's tenure at NAB has not been without controversy. The greatest one in recent memory followed the 1985 NAB convention in Las Vegas. Problems centered on low booth traffic in the Hilton exhibit center and concern over booth assignments when the show moved to Dallas in 1986.

Dobson, in his newly created position of director of exhibits, will oversee the planning and staging of the equipment portion of the association's annual spring convention and the fall radio convention. Dobson's first show will be the 1988 NAB convention, April 9-12 in Las Vegas.

Dobson served as associate director of conferences for the American Federation of Information Processing Societies for the past four years. He was responsible for exhibit/conference operations and exhibit sales.

Following the problems at the 1985 show and the subsequent outcry from exhibitors, an Exhibitors Advisory Committee was formed to iron out problems between the manufacturers who exhibit at the show (and pay for most of the NAB's activities through rather substantial booth space charges) and the association. Committee members reported cooperation from NAB and Gayou on this year's convention. Several members also expressed confidence that the new arrangement with Dobson at the helm will promote direct communication with the association. Dobson has been given high marks by several committee members for his organizational abilities.

The move next year to Las Vegas brings with it a number of potential problems for exhibitors. The change involves a reshuffling of the deck insofar as exhibit space and booth size are concerned. These types of changes should be of more than passing interest to attendees, because the exhibitors, by and large, pick up the tab for the convention. And if manufacturers do not get a fair shake at one show, they tend to gravitate to another.

Late in April, about a month after the close of this year's convention, the Exhibitors Advisory Committee met in Washington with Dobson and other NAB leaders to iron out a new booth assignment scheme. Primary criteria included:

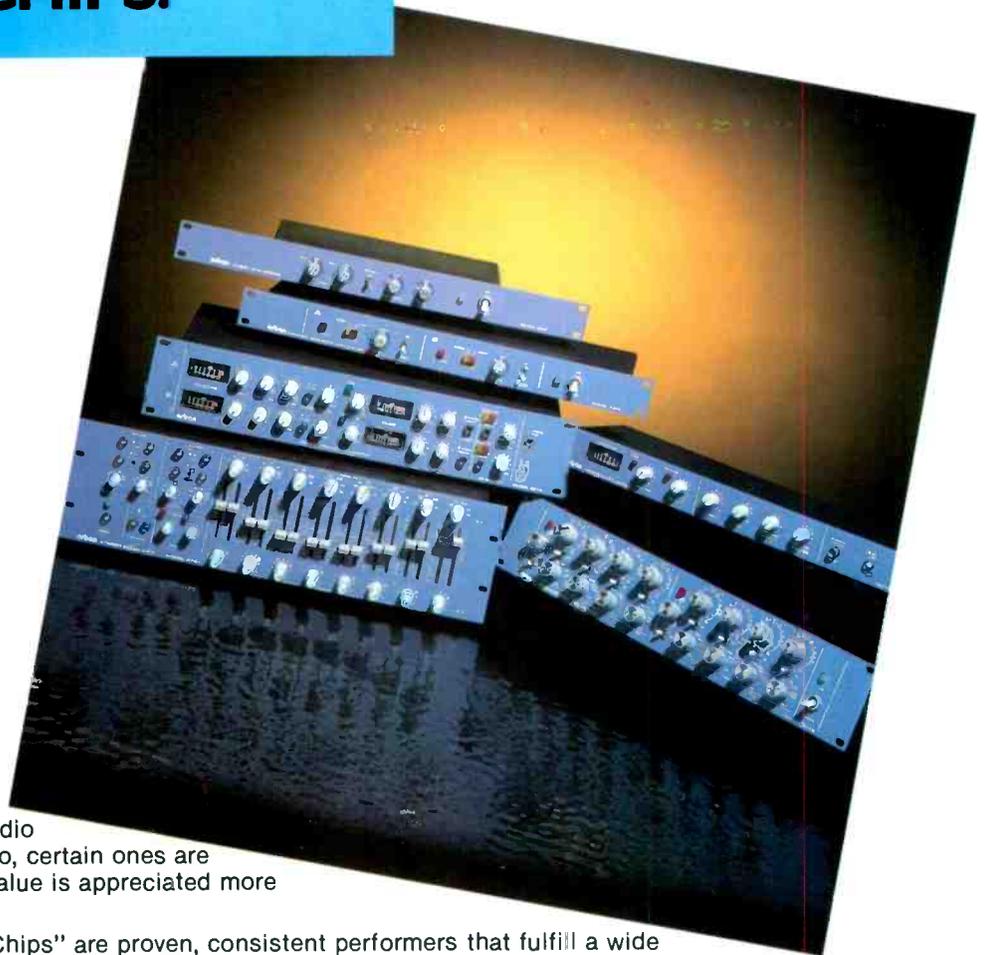
- 1) the number of years of exhibitor participation at NAB conventions; and
- 2) the number of square feet used each year.

The committee chairman described the arrangement as a fair balance.

Dobson hopes to arrange the exhibit hall so that large exhibits are spread throughout the hall, thereby eliminating the "fortress" effect that has been a problem at previous Las Vegas conventions. The hope is to have major exhibitor booths located in areas that draw attendees through the halls and provide for a more even flow of traffic.

So, it's back to Las Vegas next year for a 2-year stint. (In 1990 the convention will take place in Atlanta.) Any change of venue for a convention the size of NAB brings with it a new set of problems and opportunities. Given the track record of the past two shows, NAB is well on its way to another record convention in 1988.

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A TRISTAR COMPANY

Format war ends, marketing war begins

By Jerry Whitaker, editorial director

What if Sony and Panasonic started a war and both sides won? That's the conclusion of the **BE** editorial staff over the outcome of the year-long Betacam-vs.-M-II format fight for marketplace endorsement as the de facto small-format standard.

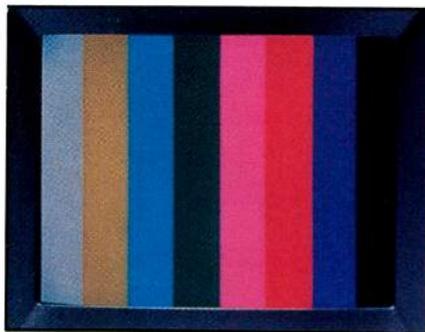
Without a doubt, one of the big topics of conversation and speculation at the NAB convention involved the likely outcome of the great format debate raging in the TV industry. The question of which format, Sony's Betacam (and more recently, Beta SP) or Panasonic's M-II, would emerge as the format of choice to replace the huge, aging installed base of 3/4-inch U-matic tape systems is—as you might suspect—not a trivial one. The stakes are high and the rewards can be great. Both companies have invested heavily in all types of field, editing and studio hardware married to their own formats. Plus, enter three additional players in the battle—Ampex, BTS (Broadcast Television Systems) and Thomson, each marketing Betacam products and tooling up to produce their own versions of Beta hardware.

Such second-sourcing of Betacam products is a tremendous boost for the format's viability in the marketplace. Recognizing the need to have more than a single supplier for its M-II systems, Panasonic has arranged with JVC to supply M-II hardware, through the companies' common parent, Matsushita.

This year's NAB convention saw all six players in the format war showing products keyed to their own customer bases and marketed in their own individual styles.

What about ABC?

Perhaps the big unanswered question to come out of the convention was which way ABC-TV would go, Betacam or M-II? The suspense lifted early in May when ABC committed to a gradual move toward Betacam and Beta SP products. Suppliers for the ABC conversion will be Sony and Ampex. The upgrade program will involve news operations for the network, its owned stations and worldwide news bureaus. No specific dollar amount was disclosed.



According to officials at Ampex and Sony, ABC will purchase Betacam and Betacam SP equipment during the next five years to complement its existing 1-inch type C production capabilities, and will replace its 3/4-inch equipment. Quantities have yet to be determined, but the network has indicated the value of the purchase to be in the tens of millions of dollars. Included will be video cameras and portable and studio recorders/players. Although some shipments will start this summer, the majority of the deliveries will begin in 1988.

According to Julius Barnathan, president of broadcast operations and engineering, Capital Cities/ABC, the transition will be gradual. Field camera and recording gear will be replaced at ABC News and several Capital Cities owned stations. Conversion of individual edit suites and Capital Cities/ABC technical operating centers will take place on a longer-term, evolutionary basis. Barnathan reported that ABC also is considering the use of Betacam SP for production of documentaries, network delay and other selected applications.

Barnathan said the technical evaluation of Betacam and M-II formats had been extensive, lasting about two years. The large installed base of Betacam products (reported to be about 35,000) and second-sourcing capability were major considerations in the decision, according to Barnathan.

A major factor in the move this year and early in 1988 to new, lighter and more versatile field cameras and recorders involves the upcoming presidential elections and conventions. Barnathan said the existing installed base of 3/4-inch U-matic hardware is operating without significant problems, and so there are no plans to make wholesale changes in the equipment complement at network news centers and owned stations.

Barnathan said that ABC does not plan to encourage its affiliate stations to purchase Betacam systems. He said stations' engineering management should decide for themselves the best route to take. The availability of field-editing capabilities for news crews using Betacam

recorders was not seen as a problem. Barnathan said the news crews could bump up to 3/4-inch or 1-inch if necessary. For remote locations where the necessary editing and recording hardware might not be available, Barnathan said the news division simply would send out field-editing machines with their news crew.

NBC's M-II conversion

NBC's unbridled enthusiasm with the M-II format was in evidence again at this year's NAB convention. It was just one year ago that the network announced it was adopting the Panasonic format as an eventual replacement for all tape-recording equipment, from field units to studio production to spot playback. Michael Sherlock, NBC president of operations and technical services, told a press conference at the convention that his company's move to M-II will result in a savings of more than \$26 million on equipment and tape purchases during the length of the 5-year contract with Panasonic Broadcast. Sherlock said the projection does not include operational savings resulting from the simpler-to-use and lightweight portable gear.

Sherlock said that NBC now has M-II hardware in the field and is happy with its performance. He reported that the network is processing orders for 245 pieces of M-II equipment for the second quarter of this year, bringing to 650 the number of pieces ordered to date. It is expected that 900 pieces will have been ordered by the end of 1987, raising NBC's M-II commitment to more than \$23 million.

What about CBS and the *other* formats? (You remember, 1-inch and 3/4-inch?) That story next month.

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Radio wave propagation

By John Battison, P.E.

This is the first in a series of columns on propagation, or in layman's terms, getting the signal away from the transmitter. Some of this material may be familiar to seasoned engineers. To other, less-experienced engineers, the information may provide useful background for later work in this area. I'll also review some of the changes that have taken place in the FCC rules because of the U.S. participation in international radio rules as an active member of Region II.

WARC

In 1981 and 1982, the Region II World Administrative Radio Conference (WARC) took place in South America. These meetings were held to incorporate the broadcasting standards of the Region II nations into the world broadcasting standards.

This action became necessary because of the increasingly rapid advances in communications technology. The technology made it necessary for close neighbors, and distant ones too, to adhere to common standards in order to prevent chaos on the broadcast bands.

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

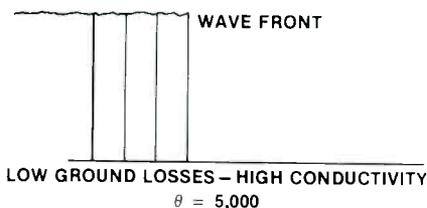


Figure 1. With low ground losses the angle formed by the earth and wavefront is about 90°.

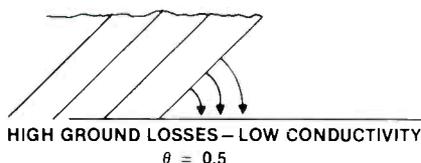


Figure 2. As the ground loss increases (low conductivity) the angle between the earth and the wavefront decreases, resulting in signal dissipation into the ground.



The U.S. participation in the WARC also sped up the adoption of the metric system. So the inverse field is now referred at 1km and quantities are expressed in meters and kilometers. Recently, the groundwave conductivity curves were reissued with kilometer delineations instead of miles. In fact, the commission won't consider measurements made in miles.

Radiating systems

If you mention the phrase radiating system to many broadcast engineers, antenna is their first thought; unfortunately, it is often their only thought. The antenna is the first thing that is noticed because normally it is sticking straight up in the air, which makes it rather hard to miss. If the antenna is not sticking straight up in the air, it is quite possible that it has been neglected and needs maintenance.

There is another part of the antenna system that is often even more neglected—the ground system. This major part of the antenna system frequently suffers damage. The damage can be either mechanical or gradual deterioration. Unfortunately, what sometimes happens is that the station engineer discovers the deterioration only when the station manager complains about not being able to hear the station at home.

Ground systems

Whenever you consider ground systems and operating efficiency, the assumption is made that the antenna is operating over a smooth, perfectly conducting flat surface. The engineer obtains a fair approximation of this by using a buried system of copper straps, wires and rods. This conglomeration is generally buried about 12 inches below ground. The reason for burying the ground system is purely mechanical and for protection.

The same effect can be obtained by using a counterpoise. This is a ground system mounted above ground and extended over a similar amount of area. This type of system is more expensive and the risk of damage is much higher. These systems are still found in the few rooftop-mounted antennas still in use.

The assumption of perfectly conducting, smooth earth formed part of the original CCIR rules. An accompanying table was used to rate the antenna efficiency based on the ground system. The use of the table seemed, at first, to be a reasonable factor. However, the addition of another variable in the determination of antenna efficiency merely complicated matters. And, because the overall effect of the table was slight, it was deleted from the rules.

A vertical radiator mounted above ground without any kind of ground system requires that the current returning from the radiator pass through the ground. Unfortunately, the earth is generally a poor conductor. To overcome this loss, a system of ground radials and a ground screen at the radiator base is used.

The power that is radiated leaves the antenna and passes through space and back to earth. Thus, the lines of force from the antenna form the continuation current in a closed circuit via space. This current, when entering a perfectly conducting earth, returns to the base of the tower and becomes part of the antenna current. If the antenna has a good ground system, the wavefront leaving the antenna will be at right angles to the earth's surface as shown in Figure 1.

If the ground is not a perfect conductor, the wavefront will be tilted forward, with the front edge forming a less-than-90° angle to the earth. See Figure 2. Therefore, part of the signal enters the ground and is dissipated in the form of I²R loss. This means that the higher the conductivity, the less wavefront tilt and the lower the signal loss.

In actual practice, ground current returns to the antenna base along the radial wires, which form the ground system. The current also returns directly through the ground between the radials. If the ground system has few radials or broken radials, the chance for high earth return losses is great. This is why ground systems use sheets of expanded copper screen and/or additional short radials spaced at 1.5° intervals between the long radials. The technique helps minimize the return resistance where the current is highest.

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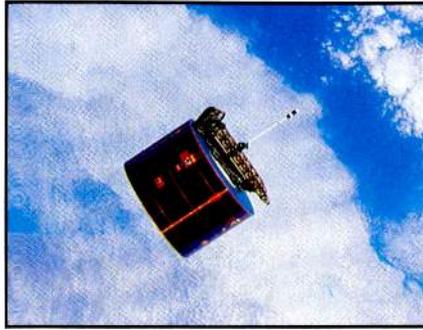
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Low-noise amplifiers



By Elmer Smalling III

The most critical receiver element in any earth station is the low-noise amplifier (LNA). This device does more to establish the station G/T (figure of merit that takes into consideration the system gain and temperature) than the antenna or satellite receiver.

In the early days of satellite communications, the LNA usually consisted of a bulky parametric amplifier that had to be cryogenically cooled to meet noise specifications. Parametric amplifiers were employed for receiving the first orbiting and reflecting balloon satellites in the 1960s. In many cases, keeping parametric amplifiers cool and operating dependably was expensive and required patience and skill.

The development of the gallium-arsenide field-effect transistor (GaAsFET) paved the way for today's wide variety of LNAs. Microwave GaAsFET devices have the property to provide high gain at

low-noise temperatures. In 1980, microwave GaAsFET LNAs with an operating noise temperature of 120°K were available for thousands of dollars. Today, LNAs with noise temperatures of 65°K can be purchased for one-tenth of the 1979 cost.

LNAs are available in three basic operational configurations:

- 1) As a pure LNA, which receives and amplifies the complete frequency band desired (3.7GHz to 4.2GHz for C-band or 11.7GHz to 12.2GHz for Ku-band;
- 2) As an LNB (or low-noise block converter), which receives the desired frequency band and converts the original band to a lower frequency (800MHz to 1,300MHz for example); or
- 3) As an LNC (or low-noise converter), which receives and amplifies the desired frequency band and converts it channel-by-channel to a 70MHz IF frequency tuned by a satellite receiver. The satellite receiver must send the LNC a small dc voltage (tuning voltage)

to select transponders. This voltage is carried by a separate cable between the receiver and the LNC.

Unlike earlier parametric amplifiers, LNAs are built within a short piece of waveguide section that attaches directly to the antenna system. The output from the LNA is usually a type N connector feeding low-loss foam or air-filled cable.

Systems that employ true LNAs usually include a downconverter (to 70MHz IF) close to the LNA to avoid line losses at microwave frequency. Both the LNA and the downconverter are powered by a dc voltage delivered on the center conductor of the coaxial cable. This voltage is added after the transmitter/receiver using a voltage block, which passes the microwave signal but not the dc. It is possible to convert the desired microwave frequency band to a lower UHF frequency for distribution (in SMATV systems) using a block downconverter.

Regardless of the type of LNA used, it requires care to remain reliable. LNAs should be kept as weatherproof as possible. All connections should be tight and grommets. Two of the greatest causes of LNA failure are physical abuse and moisture.

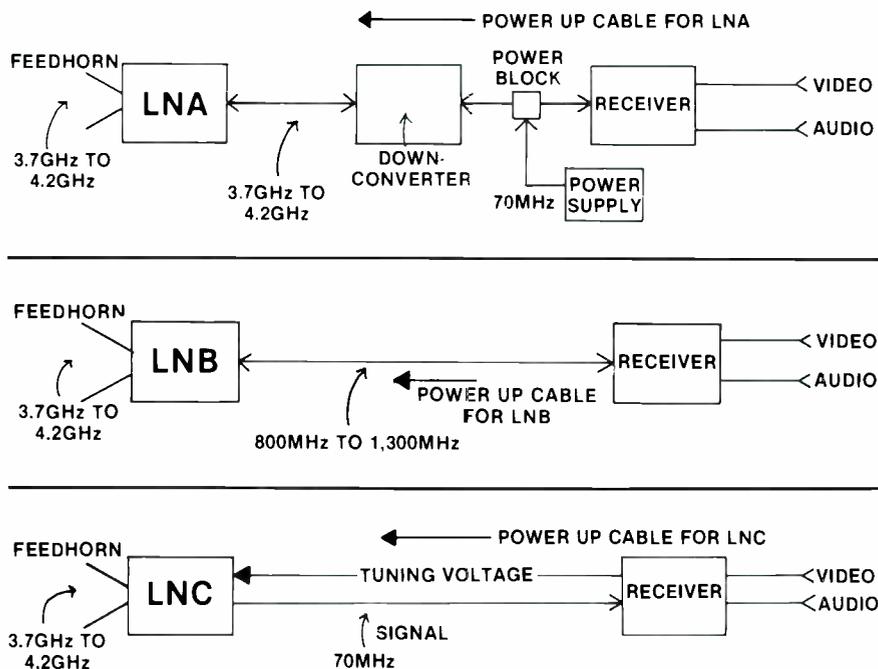


Figure 1. Receiving and amplifying a microwave signal is accomplished by using one of three typical operating configurations.

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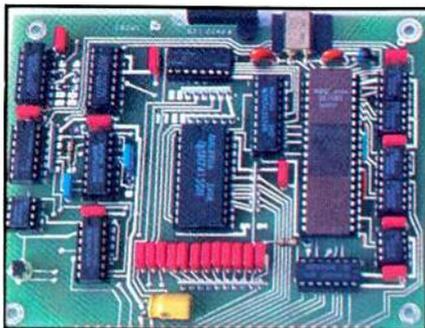
Circle (11) on Reply Card

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Inside digital technology

By Gerry Kaufhold II



In order to cause a reaction in a circuit, a digital signal must rise to the correct voltage level and must maintain that voltage level for the minimum setup-and-hold time of the circuit. Sometimes, erroneous signals occur that satisfy the electrical conditions of the receiving circuit. These erroneous signals are called *glitches*, and they can cause unpredictable results.

For example, Figure 1 illustrates a counting circuit similar to the one shown in last month's column. When a transition between 01 and 10 takes place, the INPUT to the NOR gate could actually be 00 for a brief time. Because the NOR gate changes state when its inputs are all zero, an erroneous glitch could be sent out to the next circuit in the chain.

Because the NOR gate is a valid logic circuit, its output will have sufficient electrical drive to cause the glitch to be received as a correct signal, even though the intent of the circuit is to provide an output when the counter is reset to 00.

Notice in the timing diagram that the

glitch is short, but it might sometimes be long enough to cause an error. This sort of intermittent timing glitch is the most typical glitch, and is also the most difficult kind to discover.

Circuit design

During the design phase of a new digital circuit, engineers will use computer programs that simulate the operation of the circuit. Possible causes of timing glitches will be discovered, and additional circuits will have to be added to the counter to prevent glitches from happening.

Even commercially available equipment cannot be completely tested for all possible timing states.

Figure 2 shows one method that might be used by a digital design engineer to prevent the glitch caused by the circuit in Figure 1. An extra input has been provided to the NOR gate.

This extra input is the *master system clock signal*. During the time that the flip-flops of the counter are changing

states, the NOR gate is effectively locked in a known-correct state. The output of the NOR gate will go HI only when the counter is reset to 00. The circuit at the receiving end of this signal might also be synchronized to the master clock to provide added protection against glitches.

This illustrates the importance of the master system clock signal, and demonstrates one way that the master clock is used for synchronizing signals in a digital circuit.

The master system clock signal is used so often for synchronizing the outputs of digital gates that many textbooks define a glitch as *any signal that occurs more than once during one complete cycle of the master system clock signal*.

The hardware glitch-catcher decoding circuits used in logic analyzers operate using this definition. The glitch function is simply a counter that resets at the end of each master clock cycle. If a signal occurs twice during one complete master clock cycle, it is captured and displayed as a glitch.

Kaufhold is an independent consultant located in Tempe, AZ.

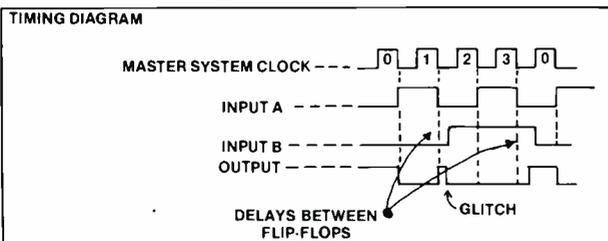
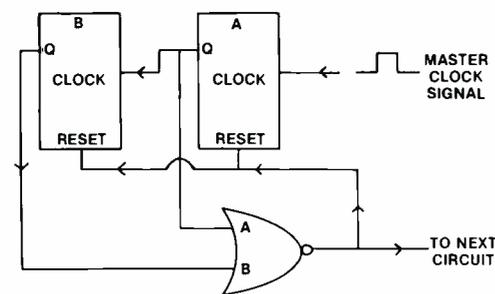


Figure 1. When the NOR gate changes its state, the delay in its transition could cause a glitch that would be misinterpreted by the counter.

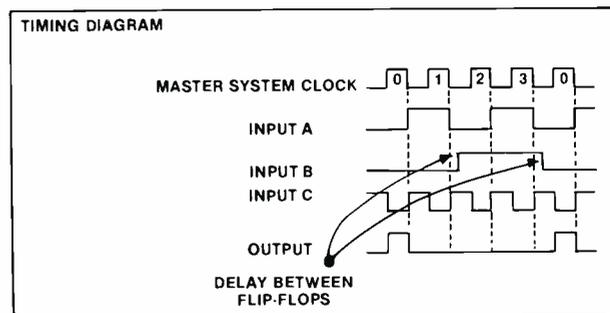
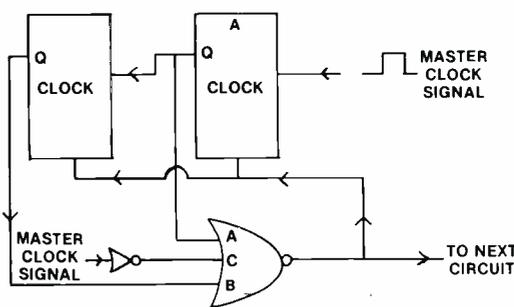


Figure 2. The counter circuit uses a master clock to synchronize the output and prevent glitches.

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Subjectively, this should make the most ardent audiophiles happy. Objectively, the 8185A has far fewer overshoots to light the peak flashers and possibly overload your exciter.

Improved noise reduction circuitry results in even better separation measurements with both swept-sinewave and dynamic program.

There's also true peak-reading metering of input, circuit, and composite output levels for easy set-up and verification of proper operation, and an easy-to-follow Installation and Operation Guide is included.

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Maintaining a reel-to-reel VTR

By Mark A. Bunker

Consider the fact that a full complement of video heads for a typical 1-inch VTR can cost more than \$2,000. Also add lost revenue, air freight, phone calls (or inventory costs) and the engineer's time. Clearly, any means that will reduce head damage and extend head life will pay you back handsomely.

The most productive, machine life-preserving, cost-effective practice that will increase VTR head life and reliability is to thoroughly educate those people who regularly work with VTRs. As the prime cleaners and performance evaluators, tape-handling practitioners are the best problem spotters, and hold the key to extended head life.

All hand-threaded VTRs can benefit from the four basic rules for saving video heads: operator awareness, cleanliness, tape handling and regimented routine maintenance.

Operator awareness

Operators should be fully trained in the basics of tape handling. Hands-on instruction will familiarize operators with the appropriate solvents, materials, frequency and methods to clean each surface, and to note the difference between metal, plastics, heads and rubber.

A quick review of the physics of helical-scan video heads and tape guides will help the operator understand why gentle tape handling and frequent cleaning is so important.

The video and sync heads project about 3.4mils from the scanner drum, which spins at a rate of 3,600rpm. This results in a tip speed of about 57mph. As an example, a typical 3.4mil ferrite tip scanning a 1mil tape has only 5.6mils to clear the 10mil drum-to-guide clearance. As the irresistible force of a ferrite head tip, traveling at 57mph, strikes an object, less than seven ounces of resistance will chip or destroy a head.

Some common material that finds its way into this 5.6mil trap includes printed masking tape or hold-down tape (5mils to 10mils), creased and crumpled videotape (3.5mils to 25mils), human hair (3mils),

cotton fiber (6mils) and dust (1.5mils).

The ends of videotape present an opportunity for trouble unique to hand-threaded machines. One of the most common problems is tape that was creased or folded on the end when it was wrapped around the reel hub. Any creased, crinkled and/or sticky ends of tape reels should be trimmed.

If a short leader makes cutting impossible, then the tape must be carefully threaded and unthreaded by hand so that rough ends do not come in contact with the video head tips. When recording or dubbing new tapes, make it a practice to leave about 15 seconds of blank tape before color bars and after the final fade to black, for future clipping.

Magnetic tape of any kind should never be stored on its side or close to a bulk tape eraser. Never throw or drop reels, including reels in shipping cartons. Even the way your local delivery person handles shipping cartons plays an important role in extending the head life of the machines on which the tapes are loaded.

Always use the appropriate take-up reel. If your VTRs have switches that must be set for different reel sizes, operators should know where the switches are and when to use them.

Cleanliness

Dirt and contaminants can be compared to sandpaper grit. Uncleaned deposits cause heads and the tape path to wear at an abnormal rate, and can irrevocably scratch tape.

Tape itself is dirty. New tape always loses some oxide on its first few passes. Because of this loss, heads and guides should be cleaned every 30 to 60 minutes when you're using new tape stock.

Retension all new reels by fast forwarding to the end of the reel and rewinding back again. The tightness of the pack in new tape and irregularities created during shipping and handling can cause variations from the tensions with which most machines like to operate.

Check older stock and archive stock for contamination and eliminate the tapes when necessary. On the inside of some tape reels, the foam or its binder will deteriorate over time and dry to a

crumbling powder or a sticky goo, ruining the absorbent stock beside it.

Moisture is the cause of stiction and can be controlled by lowering the humidity in the tape environment.

Tape handling

Tape handling refers not only to how people handle the tape as it is shipped, boxed and loaded, but also to how the machine handles tape as its various modes are invoked.

VTRs must handle tape gingerly to avoid stretching, creasing or otherwise damaging the tape. Guides and sapphires must be clean and free from wear that will tend to roll the edge or scratch oxide from tape. Tensions must be within specs to prevent abnormal wear and optimize tape-handling characteristics.

Most importantly, a VTR must never change tape motions abruptly, jerk or pop tape or engage the capstan pinch roller while tape is in motion. A transition from one mode to another, such as from fast forward to play or stop, must never exert undue stress on the tape.

Regimented routine maintenance

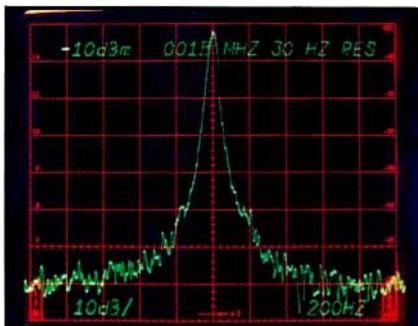
A properly maintained VTR runs smoothly, has fewer interim problems, and costs less to operate—period.

Many VTRs cannot be thoroughly cleaned without removing some trim, guides or perhaps the entire front panel. Scheduled routine maintenance periods are for just such problems.

VTRs have a nasty habit of failing during the worst possible times, such as while on the air or during an expensive production session. Time spent following a regular routine maintenance schedule can be done during non-essential hours and will usually reveal potential outage before it happens.

Most VTRs that are casually operated and maintained can expect from 400 to 1,000 hours of head life. Gentle tape handling, religious trimming of tape ends when required and good cleaning practices can extend head life beyond 4,000 hours. Under optimum conditions, more than 10,000 hours of head life is not unusual.

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Bunker is an engineering supervisor at KSHB-TV, Kansas City, MO.

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NAB '87



Assembling the technology puzzle

By Jerry Whitaker, editorial director

The broadcast industry's main event showered attendees with new products, raised some new questions and answered others. Here's one observer's view of what happened in Dallas.

What did I think of the show? I thought it was great. The best in years. The technical sessions were superb. Lots of new products on display. No shortage of controversy.

The NAB's 1987 convention and engineering conference received high marks from attendees and exhibitors alike. The show was not without its problems, such as unexpectedly cold temperatures and, yes, even snow. In Dallas? In April? Strange, but true. The weather aside, however, the broadcast industry couldn't have asked for a better convention. High booth traffic and interested buyers were a welcome site to manufacturers, who have seen a generally soft equipment market for the past year and a half.

Attendees were treated to an impressive list of technical sessions and speakers, and all the new products they could absorb.

Buy now or buy later

The convention opened against the backdrop of a gloomy equipment sales market for both radio and television, large markets and small. The broadcast industry has been going through some lean times, and the effects have been felt at almost every level. Theories to explain the tight equipment budgets vary, but all center on two main themes: debt service and more competition in the marketplace.

It is no secret that stations, groups and even networks have been bought and sold in record numbers during the past couple of years. And many of these sales have involved enormous sums. The new owners, however, may come into possession of the property with a large debt that must be serviced. Management immediately looks for areas in which economies can be made. Personnel and

new equipment purchases often are high on the list.

Then there's competition—fierce competition—in the marketplace. Record numbers of radio and TV stations are now on the air, and the FCC receives applications for more every day. The hammerlock that television—and, to a lesser extent, radio—used to have on the delivery of entertainment and information to consumers in their homes has been eroded. Cable penetration continues to climb, along with VCR usage and home video rental. Radio is facing increased competition from closed-loop delivery systems, such as cassettes and compact discs, that can deliver outstanding quality in the home, in the car or clipped to your belt.

All of these factors have combined to produce a market in which the advertising pie is being divided into smaller pieces. Make no mistake about it: The TV and radio industries overall are doing quite well, thank you. But the costs of operation (including debt service) generally have not kept up with income.

So, why the heightened interest and increased sales at NAB this year? Well, competition. Stations are finding that, in these times of greater choices, delivering the best possible product is more important than ever before. Stations have reported that although budgets are tight, they *cannot afford* to wait any longer to upgrade equipment or replace aging, unreliable hardware.

Several of the larger companies at the convention reported record sales for an NAB show. There was a general feeling that the pent-up demand for broadcast hardware finally was beginning to translate into product sales.

On the floor

Plenty of new products were available

for eager buyers. Pick a product area, and you could find something new to see. Standout introductions included:

- New hardware for the Betacam tape format;
- New products for the M-II format;
- Product introductions and enhancements for 1-inch and U-matic systems, graphics and imaging systems, and portable and studio cameras;
- Developments and demonstrations of digital (D-1 and composite) tape systems;
- New audio console designs;
- New developments and introductions in audio recording/playback and switching systems;
- Accelerated movement in CCD camera technology;
- More efficient and higher-power radio and TV transmitters;
- Versatile new test equipment for analog and digital hardware;
- New SNV trucks—some bigger, some smaller; and
- Automation systems with greater power and simplified operation.

Hit of the show

A favorite question for any convention attendee is, "What do you think was the hit of the show?" Well, here's my vote.

My nomination for the hit of the 1987 NAB convention is not a single product or line of products but, rather, it is a *concept*. That concept is *expandability*. After two days on the convention floor and 13 press conferences, a recurring theme emerged. That theme was to expand and enhance an existing product, rather than throw it out and start over.

Sure, you'll tell me that the upgrade concept is nothing new. Agreed. However, the number of companies that were practicing it in Dallas was amazing.

Continued on page 26



Nobody expected snow in Dallas, but it came anyway. Attendee traffic through the outdoor exhibits was down, but the hardy managed to brave the 30° to 40° temperatures and high winds on the second day of the convention.

Continued from page 23

More companies than perhaps at any time in the past were talking upgrade.

We saw graphics systems, character generators, audio and video switchers, editing systems, videotape recorders, remote-control gear, audio consoles, audio- and video-processing equipment and even transmitters that were designed with upgrading in mind. The buyer can add new features as improvements in technology take place.

In this era of tight budgets, most stations cannot afford to buy equipment that may have a limited lifetime. Let's say you're a technical manager looking for a graphics system or character generator. Should you buy this year or wait until the next convention to see what the design engineers have cooked up? The dedicated technology syndrome makes your buying decision a tough one.

Contrast the *one-box-one-menu* approach with an expandable system that can grow with your station's financial resources and the ingenuity of the manufacturer. Your decision becomes much easier. True, the expandable approach may cost you more at first, but you won't look like a fool at the next convention because you bought "at the wrong time."

The concept of expandable systems, obviously, does not apply to all products, or even most products. But, for high-ticket items that are seeing rapid technological growth, it appears to be an idea that is gaining acceptance.

Call to arms

Eddie Fritz, NAB president, set the overall theme for the convention in an

opening ceremony speech that challenged the broadcast industry to plan for the future, to fashion itself collectively as "a force, not a fortress."

"Broadcasting may be at a crossroads today that will determine our direction for a long time to come," he said. "We will meet this challenge best by anticipating and planning, not by merely defending, and by plowing ground and planting seeds for an industry we want."

Fritz singled out the association's recent move to establish a for-profit subsidiary, NAB Technologies Inc., to carry on existing developmental work in technologies such as terrestrial delivery of HDTV and refinement and implementation of FMX. A secondary step, he said, will be the formation of an internal working group to develop a plan that, ultimately, will lead to the creation of an NAB Technology Center designed to "assure that broadcasters will have access to the technological advancements that will keep us competitive."

Fritz characterized technological development as the "wild card" in broadcasting's future.

"Broadcasting's ability to be competitive over the long term is directly linked to our ability to develop and apply new technology. Without technological innovation and refinement, this industry cannot discover new ways to serve the public and cultivate new market opportunities," he said.

The call to arms for the broadcast industry was echoed by Congressman Don Ritter (R-PA) at the NAB Engineering Conference luncheon.

"Innovations must not be stopped in their tracks because broadcasting needs to cut costs to meet competition," he said. Ritter warned such a policy was self-defeating in the long run. "Competitors have invested massively," he said. "You must do the same."

James McKinney, FCC mass media bureau chief, hammered home the need for technical excellence in the broadcast industry as a whole, and AM radio in particular.

"People want quality in all things, and radio station operators cannot ignore this trend," he said.

Reciting a familiar theme, McKinney told the engineers and technical managers that the responsibility for improving the performance of their stations lies with them, not with the FCC.

"The government has historically done a very poor job of establishing quality standards for broadcasting," he said. "For our part, we want to get out of your way. You know more than we do. Your incentives to provide quality in the marketplace are strong and perpetual."

McKinney wholeheartedly endorsed the recommendations of the NRSC regarding AM pre-emphasis and audio

band-limiting. He urged the audience to implement the NRSC standard and AM stereo right now.

"If we do not, we will continue to lose listeners, (market) share and revenue," he said.

The best way to deal with the marketplace battle over which AM stereo system may ultimately emerge as a de facto standard, according to McKinney, is simply to ignore it. Each station should make its own decision and move quickly to upgrade to stereo operation, he advised.

"Every month that you postpone the installation of the system you believe has won the marketplace battle, you suffer," McKinney said. "Those who counsel falsely that you should wait a little while longer...are doomed."

Fowler's farewell

This was Mark Fowler's last NAB convention as chairman of the FCC. The always-controversial champion of deregulation and marketplace solutions to what ails broadcasting went out with a characteristic bang. Fowler reviewed the deregulatory accomplishments during his 6-year tenure at the commission during an opening session speech, and urged the audience to use "backbone" to resist any move to roll back the deregulatory clock.

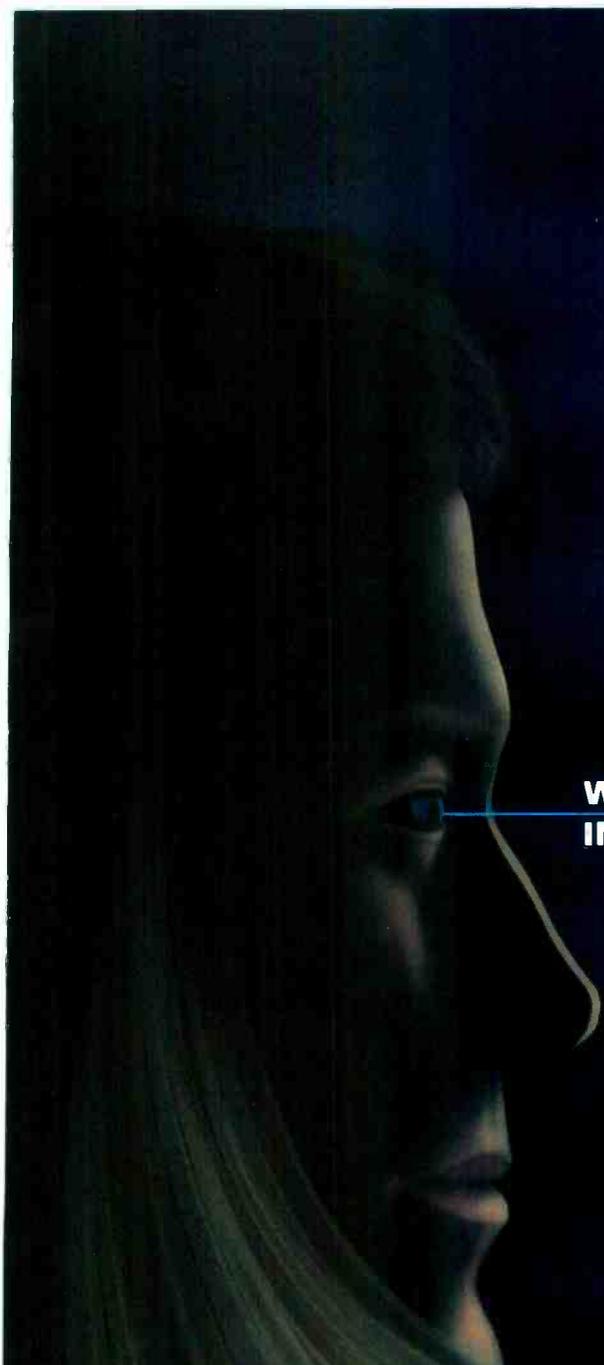
"If I have sought anything for this great industry, it is to remind us of how people, and not governments, make the magic (of radio and television) occur," he said. In reviewing his chairmanship of the commission, Fowler said he has "loved every minute of it."

Under Fowler's leadership, the commission deleted hundreds of pages of technical and licensing requirements for radio and TV broadcasting, eliminated the 3-year rule regarding the sale of broadcast properties, sliced station logging requirements to a bare minimum and threw out the first-class license. Fowler has been described as "visionary" by some, and as a "1-man wrecking crew" by others. His successor, Dennis Patrick, is expected to continue the zealous drive for deregulation.

NAB engineering award

The crown jewel of the annual NAB Engineering Conference is the presentation of the achievement award at the engineering luncheon. This year's award was presented to Renville McMann Jr., former vice president of advanced TV research at the CBS Technology Center. Presentation of the award was particularly appropriate for McMann, who had been associated with the CBS Technology Center for more than 30 years, until it was closed by the network last year in a cost-cutting move.

Health concerns prevented McMann

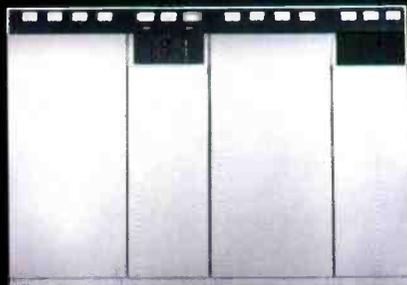


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from attending the convention in Dallas, so the award was presented to him via a satellite teleconference link. He told the luncheon audience that continued development of broadcast technology is vital to the long-term viability of over-the-air television. He said he was concerned and saddened at the closing of the CBS Technology Center last year and, more recently, at the divestiture of the RCA Sarnoff research facility to the Standard Research Institute in California.

"There's something wrong when labs with a 50-year thread of history are closed within two weeks of new management taking over," McMann said.

Presentation of the plaque was made to William Connolly, president of Sony Communications Products, on his behalf.

Saturday exhibits a hit

In a daring break with tradition, the exhibit doors for this year's NAB convention opened on Saturday morning, rather than Sunday, as in the past. The change, in response to recommendations of exhibitors, was designed to eliminate Saturday setup overtime charges and increase the amount of time for attendees to view the exhibits. The show ended on Tuesday at 6 p.m. instead of the usual Wednesday afternoon closing. The changes gave attendees a full four days

to tour the exhibit halls, rather than the three and a half days normally allowed. The concept worked, more or less.

The Saturday opening was an unqualified success. Traffic was heavier than anyone could remember from past shows. It was easily the busiest day of the 1987 convention. People were lined up at booths four and five layers deep trying to view new product demonstrations. Some areas of the upper (main) floor were so crowded that attendees could hardly move. Hallways became impassable in some spots.

After the first wave of eager convention-goers hit the top floor, they marched in large numbers downstairs to see the rest of the exhibits. In contrast to past years, every exhibitor who spoke with our staff was pleased with the overall booth traffic during the show.

If there was any bad news, it came Tuesday afternoon. According to the new convention schedule, the exhibit halls were to remain open until 6 p.m., instead of closing at 2 p.m., as in previous years. Although the concept was a good one, it didn't wash with attendees. By 4 p.m. on Tuesday, exhibitors far outnumbered attendees on both the upper and lower floors. By 4:30 p.m., booth traffic on both floors had almost disappeared. By 5 p.m., some ex-

hibitors began boxing up their wares.

Although Tuesday afternoon left much to be desired on the part of exhibitors, the show had been so good overall that nobody was complaining. A number of explanations were offered as to why Tuesday afternoon didn't work. Suffice it to say that attendees (and probably exhibitors, too) can stand only three and a half days of NAB.

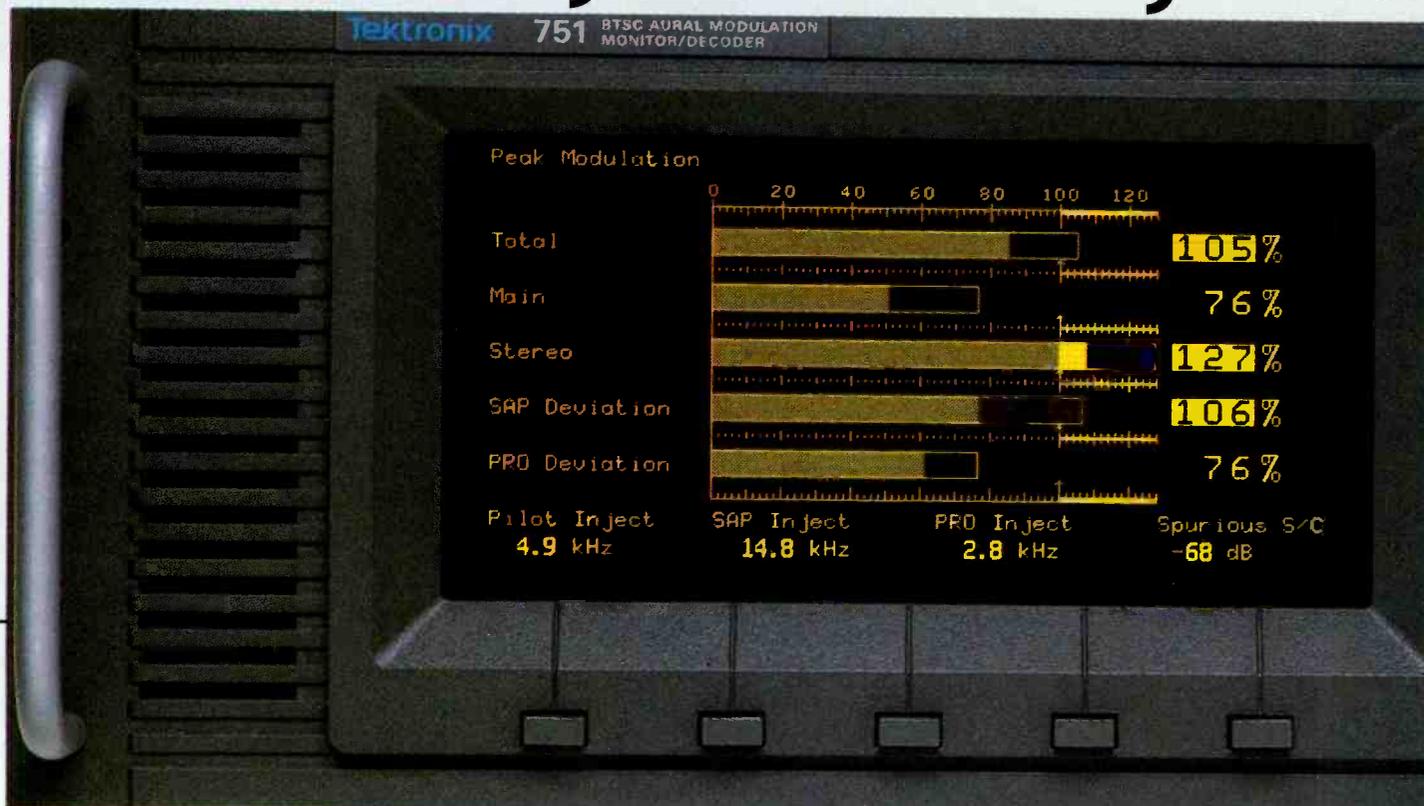
NAB convention trivia

No convention wrap-up story would be complete without a rundown of the attendance figures and other bits of information that make covering shows so much fun.

- **Attendance:** More than 40,000 showed up (estimates by NAB run as high as 50,000 when single-day exhibit passes, exhibitor guests and visitors are counted). The NAB's attendance figures include both exhibitors and the people you would commonly call *attendees*. At least one estimate put exhibitor attendance at the show (including support staffs and guests) at half of the official NAB attendance total.

- **Big names:** Without a doubt, the who's who of broadcasting was in Dallas for the convention. All FCC commissioners showed up, as well as outgoing chairman, Mark Fowler, and mass media

MONITOR, DECODE, TEST



bureau chief, James McKinney.

Other big names in attendance included CBS President, Laurence Tisch, President Reagan (via videotape), and 42 congressmen and senior administration officials. And, of course, there were hundreds of industry leaders from NAB and a dozen other trade associations.

The most important attendees were, of course, the NAB members, engineers and technical managers who came to see the new technology on display (and, perhaps, to buy some of it) and listen to technical papers. Attendees were registered from no fewer than 50 foreign countries, making NAB truly the world's premier broadcast trade show.

- **Exhibit data:** A total of 696 exhibitors were present, consuming more than 313,000 square feet of convention floor space.

- **Convention theme:** NAB said the theme, "Broadcasters...Serving Local America," was designed "to highlight the vast array of community service projects and other efforts undertaken every day by local broadcasters, from the neighborhood to the national level." (Personally, this observer was rather uninspired by the theme, but then, it was better than the 1984 "VOTE" idea. And, no, I don't have a better suggestion for a convention theme.)

Surveys galore

This year's NAB could be described as the year of the survey. The NAB research department brought out a treasure-trove of tables, charts and processed data to explain in statistics who we are and what is going on in our industry. The results identified some interesting trends.

SNVs hot, getting hotter

Satellite news-gathering has been an important topic of discussion for several years, and a survey released by NAB at the convention underscored the growing impact of this technology. Television stations currently using satellite news-gathering vehicles (SNVs) overwhelmingly see them as valuable additions to their station operations. And more than one-fifth of the stations not currently using SNVs report plans to have them in operation within the next three years.

The NAB telephone survey, conducted in early March, questioned 71 stations that own SNVs (all network affiliates), and a random sampling of 253 commercial stations that do not.

Stations with SNVs report using their trucks an average of 12 days per month. Most stations (85%) say they own the vehicles. The price tags for vehicles currently in use range from \$240,000 to \$1.5

million. The average cost is \$440,000 per vehicle, according to the NAB study.

You may find this *average* number to be a bit high. Perhaps the key phrase here is "average." The *median* value, generally preferred in statistical research, may be a lower number. We hope so, because according to the same NAB survey, more than half of the stations planning to acquire an SNV truck said they expected it to cost from \$75,000 to \$300,000.

Respondents to the survey also stated that most SNVs are equipped with videotape-editing equipment, cellular telephones and microwave relay capabilities. Obviously, the amount of production and auxiliary equipment packed onto a truck will have a significant impact on its final cost.

This survey was welcome news to SNV truck manufacturers at the convention. Some company executives—and indeed, users—have wondered more than once how long the growth curve for SNV systems might last. Apparently, the build-up for satellite news-gathering has just begun. Certainly, the operation of SNV systems now has graduated from a largely experimental effort just a couple of years ago to a mature application of proven technology. This year's NAB convention made it clear that SNVs are here

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Booth traffic was heavy throughout the convention, particularly on Saturday, the opening day. Some areas of the convention hall were, at times, impassable.



The NAB engineering achievement award was presented to Renville McMann Jr., formerly of the CBS Technology Center. Because of health reasons that precluded the trip to Dallas, McMann accepted the award via a satellite interconnection from Stamford, CT.



No convention would be complete without some strange people wandering around. This one was the strangest we could find.

to stay in the marketplace.

By and large, the SNVs shown in Dallas incorporated larger size Ku-band dishes to ensure compliance with the new FCC requirements. Improved mounting and pointing systems also were displayed, with a continued move toward automation of antenna siting.

TV's blue skies

The phrase "blue sky" often is used to describe a technology that is far off in the future. It exists in a research lab somewhere, but is far too expensive and untried to merit any serious consideration in the marketplace. At this year's convention, however, technologies that once were considered "blue sky" dreams came face to face with bottom-line realities.

High-definition television—once considered little more than a technology looking for an application—was a hot topic. A study released by NAB at the convention indicated that 77% of the TV broadcasters it surveyed rated HDTV as "important" or "very important" to the future of terrestrial television.

The national telephone survey was conducted just before the convention on a randomly selected sampling of managers at 200 commercial TV stations.

The NAB, in association with the Maximum Service Telecasters, conducted the first North American terrestrial broadcast of HDTV signals in January in Washington, DC. The FCC subsequently chose to delay a decision on whether to increase sharing of allocated UHF TV frequencies with land-mobile users. Broadcasters asserted that the success of HDTV as a new TV medium in the 1990s depends on the availability of channels within the UHF TV spectrum.

Many attendees expressed the opinion that HDTV actually represents a serious long-term threat to conventional over-the-air broadcasting, and that TV stations and networks had better plan for eventual implementation of the technology, one way or another. The general feeling was that unless broadcasters get into HDTV, somebody else will. The attendees said they worry that conventional television could become the AM radio of tomorrow, beset with declining market share because of increased competition from its sister service (in this case, new HDTV transmissions).

As for more familiar new technologies, the NAB survey reported the following:

- 39% of TV stations now broadcast stereo sound;
- 97% have access to a satellite dish;
- 29% use cellular telephones; and
- 79% use microcomputers.

Radio's future

The radio equivalent of the TV "blue sky" survey also was unveiled at the big

show in Dallas. John Abel, NAB executive VP for operations, released a profile of current radio operations that included the following statistics:

- Nearly 25% of all radio stations are using compact disc players on the air;
- 52% of stations use microcomputers in daily operations;
- 21% of stations use cellular telephones in one way or another;
- 48% of FM stations report they are planning to implement FMX within the near future;
- 31% of FM stations currently are using one or more subcarriers;
- AM listening audience shares have declined to 28%, but appear to be stabilizing; and
- 13% of all AM radio stations are broadcasting in stereo.

Who we are

The final major survey released by NAB at the convention was really more of a census of the broadcast industry than anything else. The statistics contained in the NAB's report should make you feel pretty good about our industry. At least, they'll give you some great "did you know" openers for family gatherings or other trying occasions.

- The broadcasting industry employs 215,000 people. That's a little less than 1% of the nation's civilian work force.
- More than 1,200 TV stations and more than 10,000 radio stations exist in the United States.
- Broadcast revenues for 1986 are estimated at \$29.1 billion. Television captured about \$21.6 billion, and radio got \$7.5 billion last year.
- Of the 89.6 million U.S. households, 98% have televisions, and the average TV household views an estimated seven hours and 10 minutes a day.
- Sunday night is the most popular viewing time, with the 8:30 p.m. to 9 p.m. period (Eastern time zone) being the most highly viewed half-hour of prime time.
- Of the more than 89 million households in the United States, fully 99% have radios. And not just one or two. The NAB survey says the average household has 5.4 radios!
- People 12 and older spend more than three hours listening to radio each day. Now you know.

ITS convention planned

The professional audio-video industry seems to have more than its share of trade shows, but get ready for one more. The International Teleproduction Society (ITS) announced plans at NAB to establish its own industry exhibition, produced in cooperation with the National Association of Television Program Executives (NAPTE). The exhibition will be in June 1988. ITS is a trade association of

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video, audio, production/post-production, videotape duplication and standards conversion companies. It was established just one year ago.

The announcement emphasizes the growth of the teleproduction industry and the desire of that segment of the business for a trade show specifically designed to suit its needs and interests. ITS members do not think they receive adequate attention from NAB convention organizers. NAB has, in fact, made it no secret that its convention is designed primarily for its members, *broadcasters*. The general feeling has been that if the show works for other groups, that's nice, but incidental.

The ITS move signals another area of concern to many NAB attendees and exhibitors—namely, that the NAB convention has become too large and unwieldy to be fully effective. Exhibitors cover a wide range of products, but the size of the crowds makes it difficult to carefully evaluate the new products on display.

Tom Angell, ITS president, officially announced plans for the new convention at a Dallas press conference on the opening day of the NAB show.

"Although the annual trek to the NAB has become almost a religious ritual with most of us," he said, "it has grown so large and diversified that it is becoming increasingly difficult to carefully appraise the equipment that is of critical interest to our facilities." That summed up the feelings of many ITS members.

BE's NAB coverage

Our coverage of the 1987 NAB convention attempts to put together the pieces of the technological puzzle, highlighting those events that attendees said were most important. The cornerstone of our coverage is a comprehensive report of the NAB Engineering Conference. With input from an experienced group of broadcast engineers, we look at present needs and future trends.

Continuing a tradition we began in 1985, we have compiled the **BE** "Pick Hits of NAB '87" for radio and television. A panel of independent industry experts toured the show floor to decide on a list of 10 hot radio and 10 hot TV products.

And, finally, our "Show of Shows" listing provides a comprehensive summary of the new products introduced at the convention, organized by product categories. This guide is designed to tell you what you need to know in a straightforward, easy-to-use presentation.

- "Keeping Up With Technology" . . . 36
- A review of the engineering sessions.
- "Pick Hits of NAB '87" 60
- A selection of 10 hot TV products and 10 hot radio products at the show.
- "Show of Shows" 76
- A complete listing of new products, organized by product categories.

Can I get to Stemmons Freeway from here?

Be honest. How many times did you get lost in Dallas during the NAB convention?

An informal survey of attendees conducted at the cab stand outside of the convention center yielded a median of six times during the 4-day event. This compares favorably with the 13 times reported in a similar survey last year. Attendees from out of town reported a higher number of problems.

You know you're in trouble when cab drivers get lost in their own city.

Well, Dallas may not be the worst American city to drive in, but it must rank in the top 10. It's not that the city is so large and spread out. It's just that the freeway signs are camouflaged to prevent drivers from reading them. Getting on and off the freeway system in Dallas involves as much faith as it does logic.

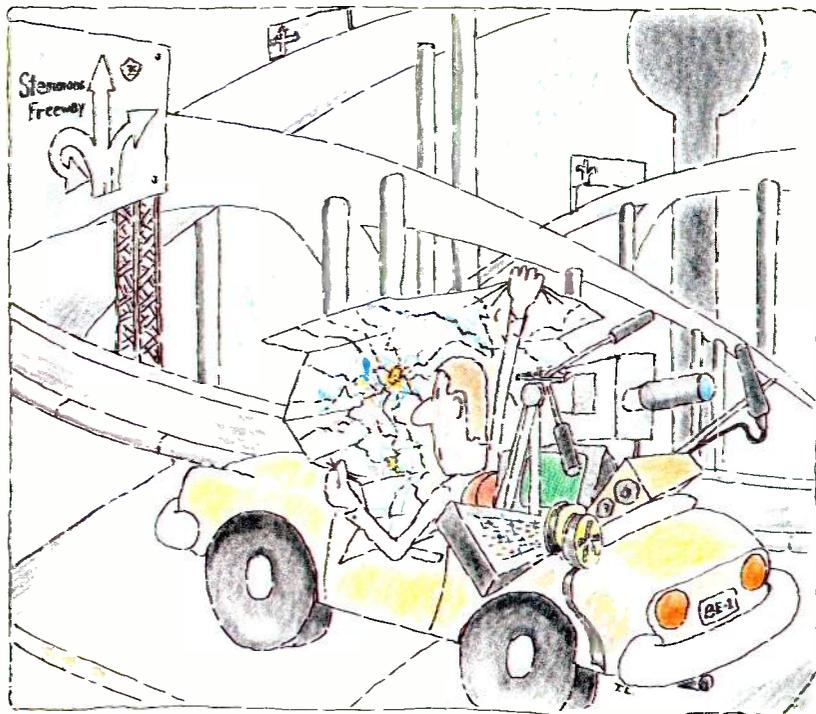
The rental car companies do their part to assist the helpless out-of-towner by printing up the most worthless road maps ever designed. You

need a magnifying glass to read them. (I think NAB sells magnifying glasses in its convention center store for that specific purpose.)

But, we shouldn't complain. The poorly marked freeways, lousy maps and bizarre arrangement of 1-way streets are all a part of the city's efforts to help out the ailing Texas oil industry. Think about all that extra gas you burned up trying to find your way around town.

In fairness to Dallas and the city's convention center, the 1986 and '87 shows went quite well, all things considered. Any town has a tough act to follow when compared with Las Vegas, a city designed for just two things: gambling and conventions.

There were many fears in 1985 when the NAB announced plans to leave the predictability of Las Vegas for a return engagement in Dallas. Most of those fears were put aside through thoughtful planning on the part of the NAB and the Exhibitors Advisory Committee.



Isn't driving in Dallas fun? And now that we've sort of figured out the freeway system, the NAB is leaving the city.

Illustration by Tim Lynch

Rapid Transit

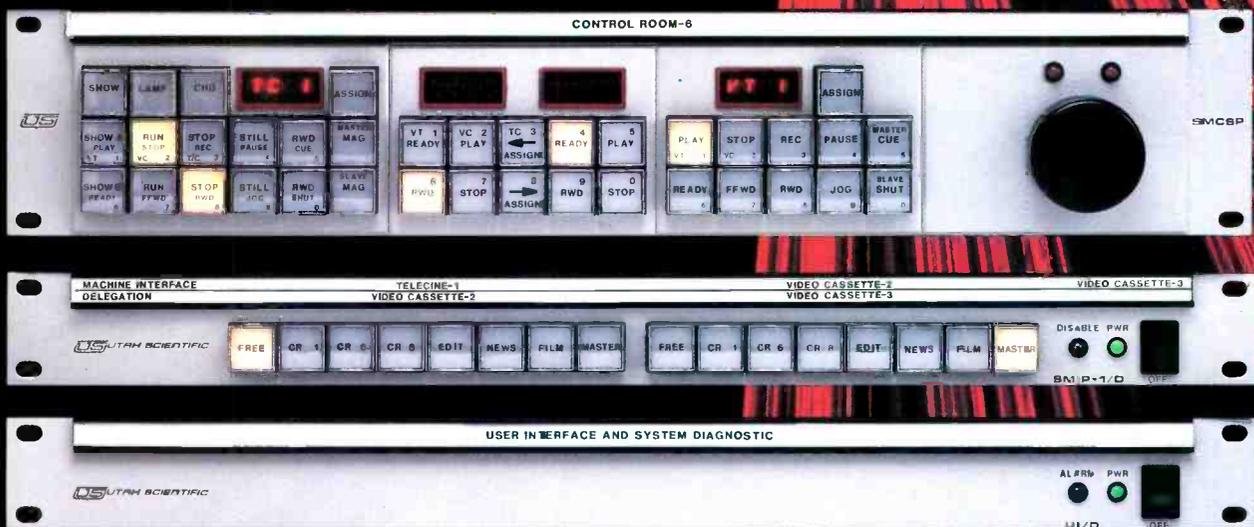
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SMC-1 control panels are modular, allowing you to mix fifteen-function, ten-function, and dual five-function modules. They are also self-assigning so that modules can select any machine by entering the machine name in the display window.

Machine delegation is also provided. It allows the operator to restrict control of a machine to a single control area or to multiple areas.

Perhaps the most important feature is the intrinsic system reliability provided by the DYNABUS network. With fail-safe bus connections and extensive self-diagnostics, and with no central processor as a potential failure point, it is unmatched for safe, dependable control.

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Studer pioneered this concept, and today no other recorder line comes close. On the A820 and A812, for example, over forty different features can be programmed and assigned to any panel button. Even highly specialized production demands are easily accommodated. For example, three different sequences for start locate and rollback are available.

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Technology.



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Keeping up with technology

By Brad Dick, radio technical editor

At this year's NAB Engineering Conference, quality was the big issue for broadcasters.

What a difference a year makes. Because of the general low-key flavor of last year's NAB convention, many attendees were wondering whether the 1987 convention might be a ho-hum repeat. They were pleasantly surprised.

This year's convention was more exciting than the industry has seen in a long time. Exhibitors and attendees seemed pleased with the show. Exhibitors talked of improved sales, and attendees found plenty of new and interesting products.

Although the industry has been driven by technology for years, the 1987 convention approached the issue somewhat differently. In the past, the convention was merely a collage of black boxes, each performing new tasks. This year, the products addressed specific needs of broadcasters. The industry seems to have come to an understanding that technology for technology's sake does not sell products. Today, products must provide specific benefits to the user.

The benefit sought by many broadcasters was enhanced quality. Higher-quality video and audio storage and delivery systems were visible throughout the show.

The issue of quality was again at the forefront as engineers from around the world gathered at the 1987 NAB Engineering Conference. Although broadcasters always have been concerned about quality, today's marketplace demands close attention to the desires of the critical viewer and listener.

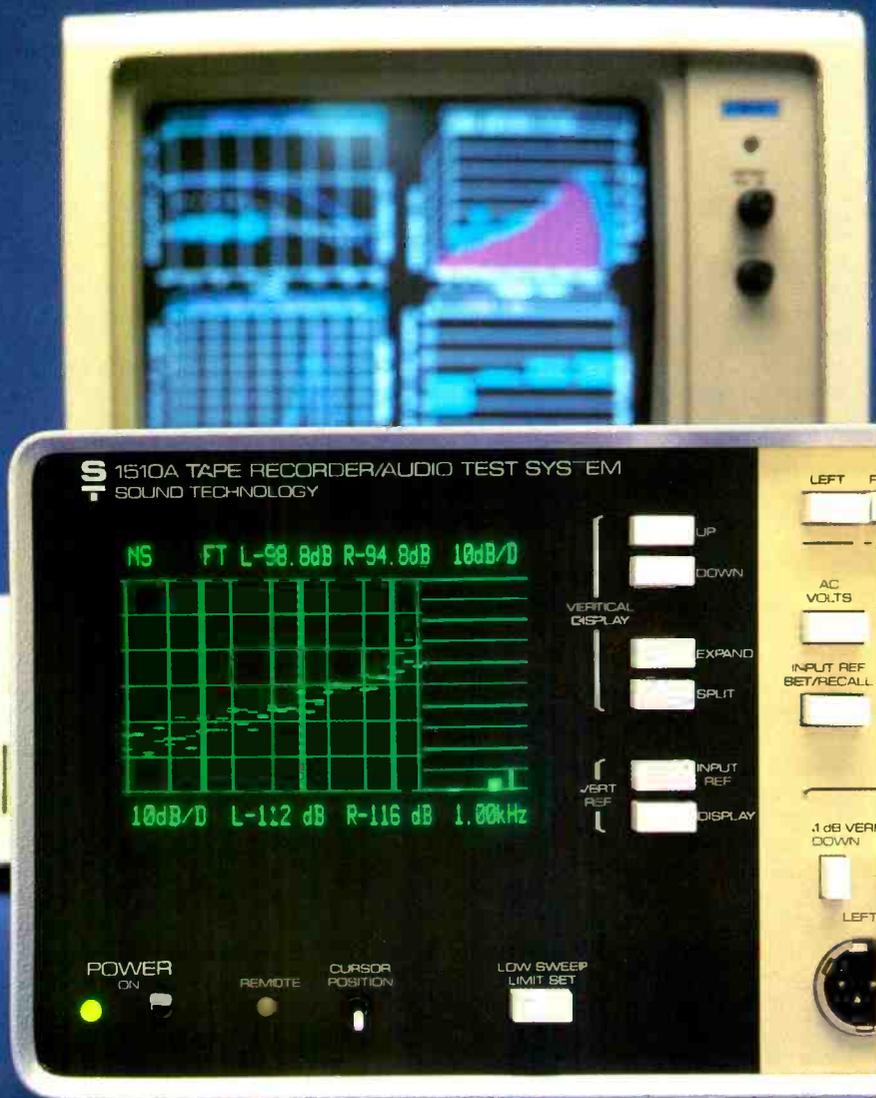
This technical theme was voiced strongly by James McKinney, FCC mass media bureau chief. In his opening remarks, McKinney said that broadcasting in the United States has entered an era of quality. He suggested that broadcasters who recognize this fact and react appro-



Photo by Douglas Schwartz, FlightSpeed Graphics

The NAB Engineering Conference brought some of the industry's top technical experts to Dallas for five days of user-oriented sessions. The primary message was the need for technical excellence in radio and TV broadcasting.

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Until recently, most Audio Test Systems have been either manual stand-alone systems or external-computer driven automated systems.

Engineers have long enjoyed the portability, ease of operation and cost effectiveness associated with manual stand-alone systems. Unfortunately, these systems have always lacked speed and documentation capabilities.

On the other hand, the ideally configured external-computer driven test system can provide speed, data analysis, documentation, graphics and integration with other GPIB test systems. Unfortunately external-computer driven systems are designed for production testing and are not suitable for troubleshooting or field work.

However, Sound Technology has combined the Best of Both Worlds into a portable, intelligent stand-alone system with complete PC compatibility: the Model 1510A! The Model 1510A can be used as an intelligent stand-alone system, and when connected to an external computer it becomes the ideal Automated Test System.

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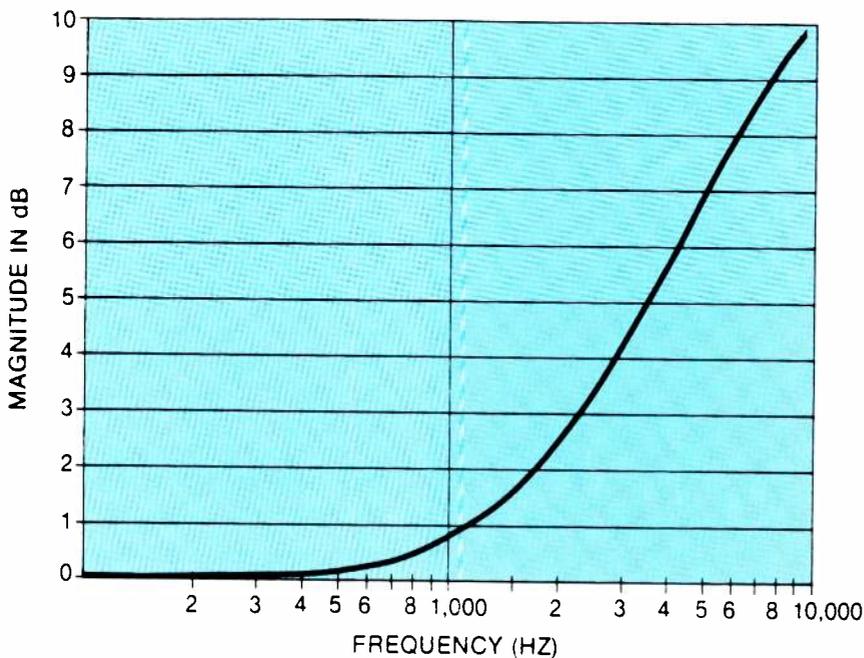
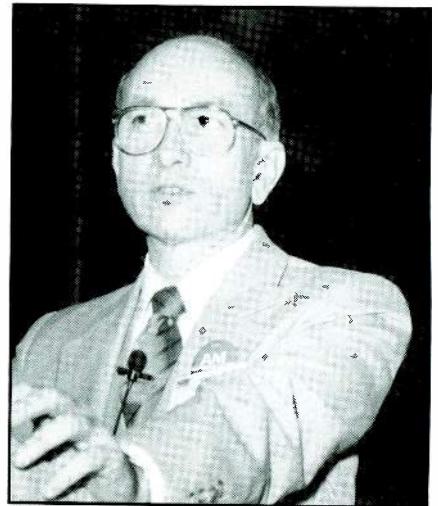


Figure 1. The voluntary NRSC standard relies on a modified 75 μ S pre-emphasis curve. A complementary curve is used in receivers.



Jim McKinney challenged broadcast engineers to meet the needs of an increasingly demanding audience. He said that quality is expected from both television and radio.

priately will reap the rewards.

Technical issues

The engineering sessions addressed a couple of major issues: AM improvement and improved TV transmission systems. The recent National Telecommunications and Information Administration (NTIA) report on AM stereo did little to resolve the issue of an AM stereo standard. Rather, according to some, the report confirmed what many broadcasters fear—that AM stereo is going nowhere.

One AM issue that did receive widespread support was the NRSC proposed AM standard. Speakers at several engineering sessions expressed approval, and manufacturers of AM broadcast equipment exhibited NRSC-compatible gear.

The voluntary standard relies on specified pre-emphasis (see Figure 1) and de-emphasis curves to help reduce the effect of adjacent-channel interference. At management as well as engineering sessions, broadcasters were urged to adopt the standard by installing the required equipment.

With NAB continuing to beat the drum for AM improvement, it was no surprise that a number of sessions were devoted to the subject. The sessions were well attended, which attests to the fact that at least engineers see hope for improvement.

Harrison Klein, of Hammett and Edison Consulting Engineers, San Francisco, reviewed his study on overmodulation, which was presented to the NRSC committee last summer. His paper,

which has been well received by the engineering community, suggested that the main reason for splatter is not that the carrier disappears during modulation exceeding 100%. Rather, Klein said, this problem is caused by excessive high frequencies in the modulating signal. To further compound the issue, he stated, meeting the FCC bandwidth requirements is no guarantee of a clean transmitted signal.

Klein recommended that AM stations minimize excessive occupied bandwidth by using properly designed audio-processing equipment. The audio processors should contain or be followed by an appropriate overshoot-corrected low-pass filter. He also suggested that a protective clipper be used as the last device, just before the transmitter.

Another important factor is dc-level shift. Klein suggested improving a transmitter's low-frequency response down to at least 0.1 Hz. Other suggestions are contained within his paper, which is available from the NAB.

Not all of the engineers agreed with Klein's theories. Another well-respected engineer, Leonard Kahn, of Kahn Communications, Westbury, NY, presented a paper on various AM modulation schemes and theories. His paper led to a discussion of splatter measurement and the best test methods.

Kahn is a strong proponent of single-tone splatter measurements, as opposed to the multiple-tone techniques advocated by some engineers. He suggested that single-tone measurements were especially important for measuring

the bandwidth for stereo AM signals. Kahn noted that, under normal conditions, overmodulation may well be the main cause of adjacent-channel splatter.

New antenna designs

Grant Bingeman, of Continental Electronics, Dallas, resurrected an old idea for directional antenna systems. He suggested using a guy wire as a parasitic element. With this technique, an existing non-directional broadcast site can be modified to produce a directional gain of 3dB—equivalent to doubling the transmitter power. All except the top and bottom insulators are shunted on the selected top-level guy. This guy wire can then be tuned at its base.

Bingeman noted the design's effect on skywave and groundwave with various guy connections and configurations. He pointed out that the excessively high angle of radiation may not be a problem, simply because the signal is not likely to be reflected back to earth.

Apparently, no AM stations in the United States currently use parasitic elements in their antenna systems. Historically, one station (WKYC-AM, Cleveland) used a vertical wire dropped from a guy as an element in the antenna system. The wire was originally intended to be used as a driven element. However, tests showed that it actually dissipated power in the resistor located in the base.

Bingeman's idea is an interesting concept, and one that could be developed in the next few years. The technique may be especially useful for nighttime operation of daytime stations. These stations may require additional radiation control, which might be provided via Bingeman's technique.

Another relatively new antenna design

Continued on page 42

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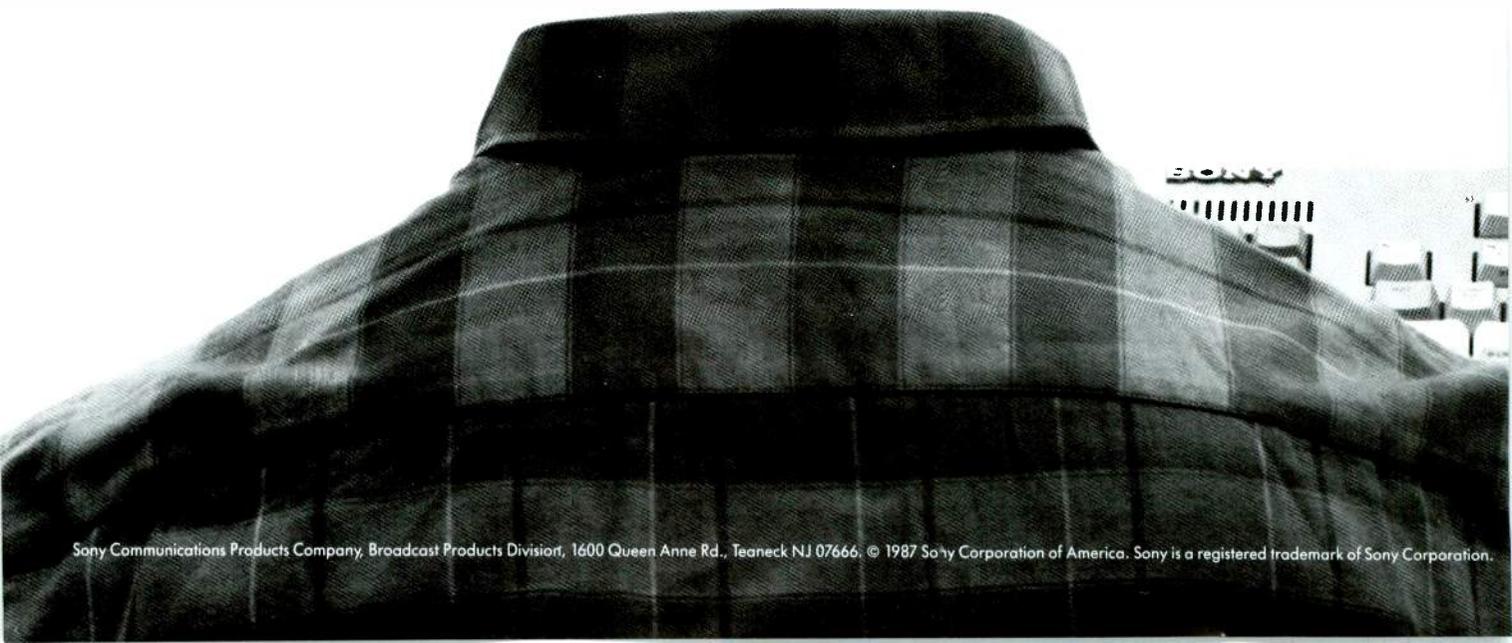
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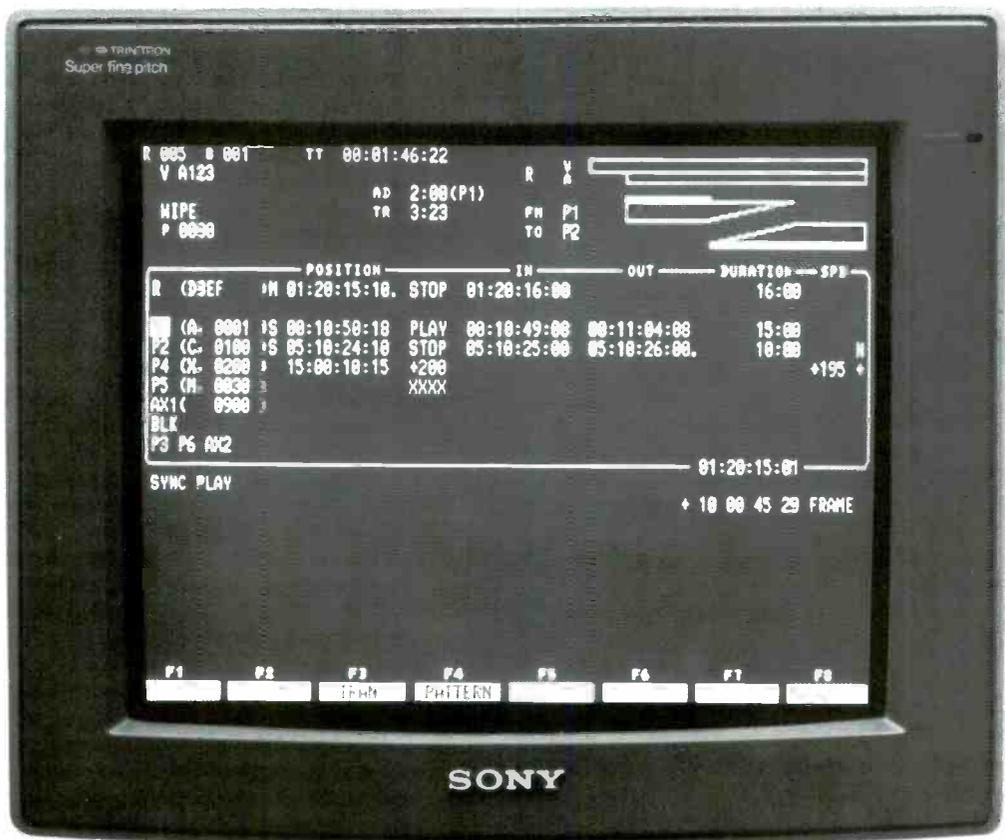
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Continued from page 38

technique was presented by Ben Dawson, of Hatfield and Dawson Consulting Engineers, Seattle. Although many FM stations diplex more than one transmitter into a single antenna, the technique is not as common among AM stations in this country. AM stations have been diplexed into single arrays in Europe for many years.

Dawson discussed the circuitry required to prevent cross-modulation and to provide the filtering needed for the two signals. As FAA site restrictions and

local zoning regulations become more stringent, the use of one site for several AM stations may become common. According to Dawson, with today's technology, even 3-frequency DA installations are possible.

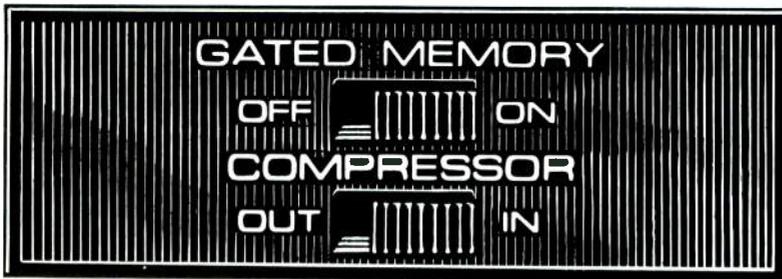
Synchronous operation

New antenna systems were not the only methods proposed to improve AM station coverage. Robert Weirather, of Harris Corporation, Quincy, IL, explained the difference between the European and American versions of synchronous



Robert Weirather outlined the use of synchronous transmitters to improve AM coverage.

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operation. In Europe, high-power synchronous transmitters with relatively little coverage overlap are used. The United States, however, proposes the use of low-power transmitters, serving specific areas, for synchronous operation.

Synchronous operation may be appropriate for stations whose coverage is blocked by terrain or other obstructions or affected by poor ground conductivity or antenna-pattern constraints. However, synchronous transmission cannot be used to extend coverage beyond that specified in a station's license.

The important question centered on what happens when the signal-strength contour from the main transmitter and that from the secondary transmitter are equal in strength. Weirather presented the results of his study of this problem. He explained that the audible result depends upon the various signal-strength ratios between the primary and secondary signals. As long as the difference exceeds 16dB, the resulting degradation is acceptable, according to Weirather. When it exceeds 20dB, there is no perceptible interference.

In order to keep costs low, he suggested, use short, top-loaded towers or diplex with another station for the secondary site. Small, low-powered transmitters can be used at the secondary site.

Not all of the engineers agreed there is a need to carefully synchronize the transmitters, because of the tendency it would have to localize the zones of interference. One engineer suggested that the transmitters be left unsynchronized so that the zones of interference would move about. This would, presumably, prevent a single area from being unserved due to interference. For more information on synchronous AM operation, see "Return of the Synchronous Amplifier," page 176.

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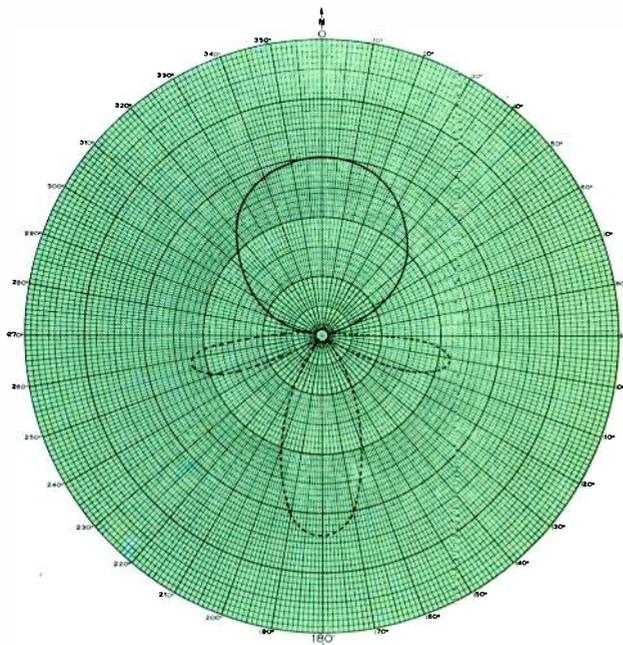


Figure 2. Pattern designed for a 4-tower in-line array. The lower portion represents a 20:1 expanded pattern scale.

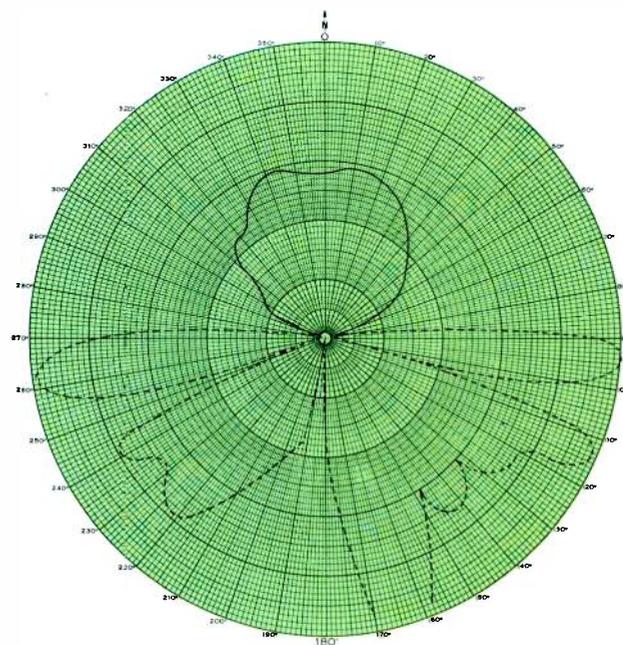


Figure 3. The distorted pattern resulting from a reradiating object located approximately one-half mile from the tower array. Note the highly distorted null structure.

Reradiation problems

One of the problems often encountered by today's AM broadcasters is antenna-pattern distortion. A reradiator isn't necessarily another tower; the distortion can be caused by newly constructed objects within the primary coverage area. Jeffrey Bixby, of Moffett, Larson & Johnson, Arlington, VA, pointed out that buildings, cranes, stadiums, bridges and even smokestacks can reradiate a station's signal. Resolving a reradiation problem can be a time-consuming and expensive task.

Bixby's calculations show that as much as 10% of the incident signal on a reradiating structure can be radiated subsequently, creating severe pattern distortion. A reradiator one mile from a 50kW AM station can radiate as much as 1kW of signal.

Figure 2 shows the theoretical pattern for a 4-tower in-line array. Also shown is a 20:1 expanded scale plot of the null structure. Note that the array offers high gain to the north and deep suppressions to the south. Figure 3 shows the distortion produced by the addition of a reradiating object located 1,000' (approximately one-half mile) from the array, reradiating less than 5% of the incident field.

Note that the null structure has been completely destroyed, and there is considerable null fill. Also, there is considerable major lobe distortion, resulting in a scalloped and reoriented pattern.

Identifying the reradiator is often difficult. Also, because the required detuning system may be complicated to install

and adjust, the radiator must be positively identified before detuning is started. Traditional identification methods using ground-level field-strength measurements are tedious, and frequently do not show sufficient detail to accurately identify the reradiator. Bixby suggested using a helicopter as an effective way to perform the necessary measurements.

Figure 4 illustrates the classic indication of reradiation—the presence of a standing-wave pattern in the measurements taken along a line connecting the source and reradiating object. Other measurement suggestions and techniques are contained in Bixby's paper, which is in the "Proceedings."

Digital transmitter

Hilmer Swanson, of Harris Corporation, outlined a radically new design for AM transmitters. The digital AM system consists of a 12-bit analog-to-digital converter, a digital modulation encoder and a power-multiplying digital-to-analog converter (DAC). A simplified block diagram is shown in Figure 5.

The heart of the transmitter is composed of an array of controllable amplifiers; their sum comprises the final output signal. Depending on the encoder output during each sampling cycle, a varying number of class D amplifiers are turned on. The outputs from all of these amplifiers are added together, producing the desired output power. See Figure 6.

One key advantage of the digital modulation scheme is the high efficiency. In the 10kW version, the transmitter's over-

all efficiency is 80% (ac to RF output).

FM antennas

Robert Surette, of Shively Labs, Bridgton, ME, described how an antenna's mounting structure can affect the radiation pattern for FM antennas. Using various measured antenna patterns, he demonstrated that different tower-mounting techniques can cause serious distortion of the theoretical circular radiation pattern.

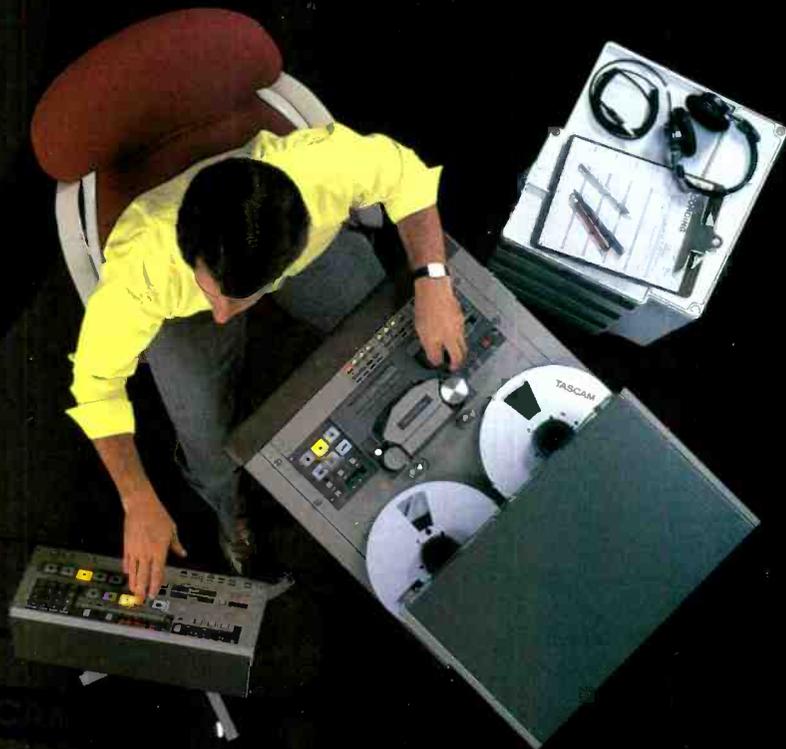
The contribution of each type of tower member (horizontal, vertical, diagonal, or pole) can be measured, according to Surette. With mistation antennas, the pattern distortion also can vary with frequency. The patterns for each of the stations, therefore, may be different.

Several audience members disagreed with some of Surette's assumptions, and a lively debate followed. One engineer insisted that side-mounting circularly polarized FM antennas causes phase shifts that destroy circular polarization.

Speaker Marvin Crouch, of Tennaplex Systems, Nepean, Ontario, Canada, also took exception to Surette's presentation. Crouch's paper discussed the importance of the vertical pattern on the rms gain of the antenna. He seemed to prefer high-gain, multibay antennas, which concentrate the signal on the horizon to maximize coverage.

He also advocated parallel feed systems for multibay antennas. According to Crouch, this method is superior to the more common series- (end) fed technique. With the parallel design, even a 20% frequency change represents only a

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20% change in the differential phase (for example, 20% of $40^\circ = 8^\circ$).

Improved FMX

FMX was alive and well in the engineering sessions. Emil Torick, of the CBS Technology Center, Greenwich, CT, announced the formation of Broadcast Technology Partners, which will continue the work on FMX. The work had stopped with the closing of the CBS Technology Center earlier this year.

Through graphs, Torick explained that monaural FM stations have a predicted range of approximately 128 miles, and stereo FM signals on a monaural receiver cover a range of 100 miles. Stereo signals on a stereo receiver have a limited range of approximately 60 miles.

FMX relies on a technique that expands the L-R channel to extend the stereo range considerably beyond the current range of 60 miles. In order to maintain compatibility, the normal amplitude-modulated L-R subcarrier is retained, while the amplitude-compressed FMX L-R channel is added to the 38kHz subcarrier using quadrature modulation. In addition, a 10Hz pilot is inserted to activate the decoder in the FMX receiver.

In order to minimize noise, most car radios automatically reduce the stereo separation as signal strength decreases. Torick's studies show that, as a result, car radios are virtually reproducing monaural audio as much as 50% of the time.

The major criticism of FMX has been the increased susceptibility of non-FMX radios to crosstalk between the standard L-R and the FMX subchannel when multipath is present. The problem manifests itself as a burst of increased noise during the multipath event. By reversing the phase of the FMX quadrature L-R modulation, the multipath event simply produces a momentary decrease in the audio.

Fine-tuning the compression and expansion characteristics also has improved FMX performance. Torick said that several manufacturers are now tooling up for FMX decoder IC production, so FMX receivers should be close at hand.

NAB continues to work in other areas for FM improvement. John Marino, NewCity Communications, Bridgeport, CT, summarized the goals of the FM transmission subcommittee. In addition to FMX, the group will study interference, Class A FM rule changes, the proposed FM2 band to be located at 200MHz, FM directional antennas, FM boosters and translators. Broadcasters should contact the NAB to request or contribute information.

TV trends

Randy Hoffner, of NBC-TV, New York,

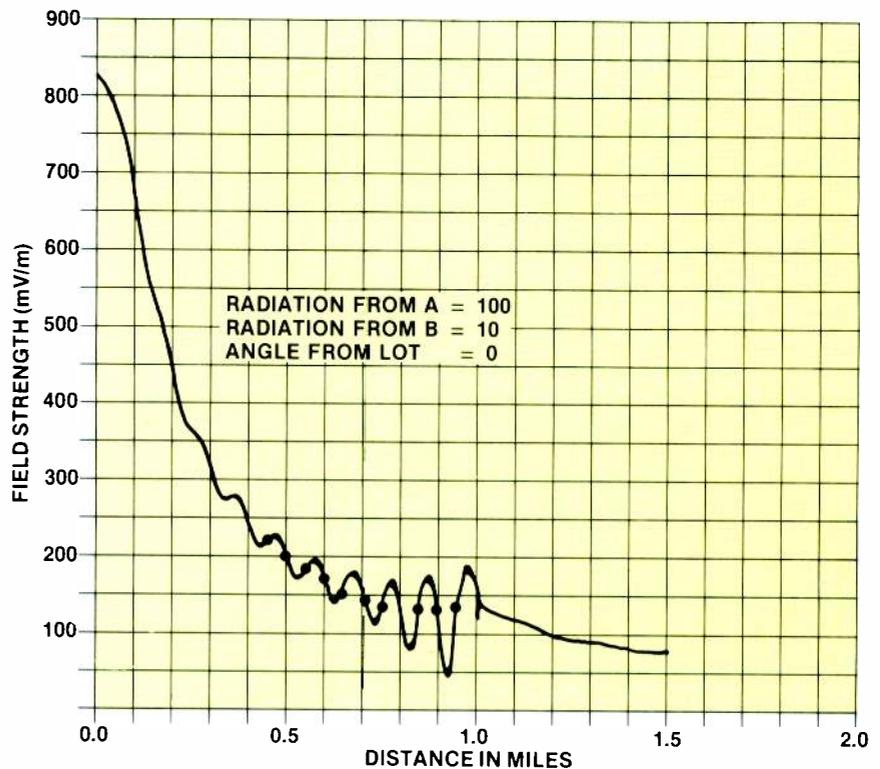


Figure 4. The classic indication of reradiation is the standing wave.

reported that his company expects 137 of the 210 affiliates to be operating in stereo by year's end. Although this rate of growth seems higher than for the industry as a whole, the trend is clear; stereo TV audio is here to stay.

Just when TV broadcasters are becoming familiar with stereo, another audio scheme looms on the horizon. According to Robert Schulein, of Shure Brothers, Evanston, IL, stereo TV audio is not the final solution for broadcasters. He criticized the current BTSC stereo scheme for its inability to reproduce a hard or discrete center channel. According to Schulein, the Dolby Stereo system, originally developed for optical motion picture stereo soundtracks, solves the problem.

In addition to producing a seemingly discrete center-channel output, the system also provides a surround or back-channel output. This allows for a variety of left-to-right, front-to-back and surround audio effects. Surround sound is intended to improve the perceived *dialogue location* on the screen, and to restore location for listeners seated throughout the room.

An example of Dolby Surround Sound—a segment of "Amazing Stories"—was presented for the capacity crowd. The hall sound system consisted of eight surround speakers, clustered at the left and right in the front, and one speaker in the center front under a wide viewing screen. The surround sound sys-

tem seemed to restore location of on-screen characters for listeners throughout the room. There were many favorable comments from the audience.

Surround sound is available today for broadcast use. Schulein predicts that, when implemented, it will have as much impact on the industry as color television did in the early '60s. The system is BTSC and mono-compatible, and has been used in experimental network broadcasts.

HDTV

Many of the engineers were not prepared for some of what they heard in the HDTV sessions.

Ben Crutchfield, of NAB, Washington, DC, presented the opening paper and reviewed the HDTV demonstration broadcast, which took place in January in Washington. The HDTV test not only proved that the idea will work, but may have played a part in an FCC decision. Shortly after the demonstration, the commission backed off from a plan to allow land-mobile users access to the UHF TV spectrum. According to some experts, if this country ever is to see terrestrial HDTV broadcast, the UHF spectrum is crucial.

Some broadcasters have come to consider HDTV as a threat to their operations. Fiber-optic cable, satellites, cable systems, videodisc and cable systems all are capable of delivering HDTV signals into the home. Broadcast is currently the only medium that cannot handle HDTV.

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So that the issue can be addressed, the panel requested a quick response from broadcasters. If you're interested, write the Secretary of the FCC.

Although HDTV is still a dream for U.S. broadcasters, Japan appears to have definite plans in place. Dr. Masao Sugimoto, of NHK, Tokyo, delivered a paper on Japan's plan to begin HDTV broadcasts in 1990. He said that mass production of HDTV receivers will begin in 1989.

Sugimoto stressed that these dates were not a scenario but, rather, a timeline his country will follow. According to Sugimoto, other HDTV equipment soon to be available includes cameras, teletext, digital VTRs, CATV transmitters, rear projection systems for the home and an NTSC converter.

HDTV cameras

Camera design is integral to HDTV production. Lawrence Thorpe, of Sony Broadcast Products, Teaneck, NJ, reported that the 1,125-line system will require cameras to have a luminance-channel bandwidth of 25MHz. Horizontal and vertical resolution capability will more than double, also increasing the demands upon the HDTV camera circuitry.

Thorpe discussed the challenges of HDTV camera design, including tube development and broadband video circuits. The lens requirements will increase dramatically because of the 25 or more elements that are needed. The next generation of cameras will have a widened aspect ratio of 16:9, lower lag and will use CCD pickup devices.

An impressive demonstration tape, "Chasing Rainbows," was shown to the audience. The tape was a portion of a 14-hour program produced for the Canadian Broadcasting Network Corporation. According to the show producers, the cost to produce the HDTV program will be equal to or less than if it had been produced on 35mm film. The demonstration tape alone was almost worth the trip to Dallas.

Attendance of the HDTV Production I session was light—perhaps half the hall capacity—and few of the presenters were asked questions. Perhaps the low turnout was an indication of a lack of interest in HDTV on the part of broadcasters.

Improved NTSC

Not everyone was beating the drum for new broadcast standards. Yves Faroudja and Joseph Roizen, of Faroudja Laboratories/Telegen, Sunnyvale, CA, presented a paper calling for improved NTSC standards. The paper discussed the difficulty in meeting the original NTSC standards in the early '50s and '60s. With vacuum tube technology, broadcasters were forced to spend most of their time

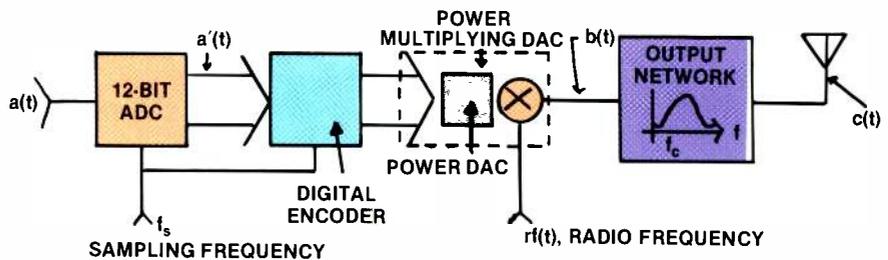


Figure 5. System block diagram for the digital AM modulator.

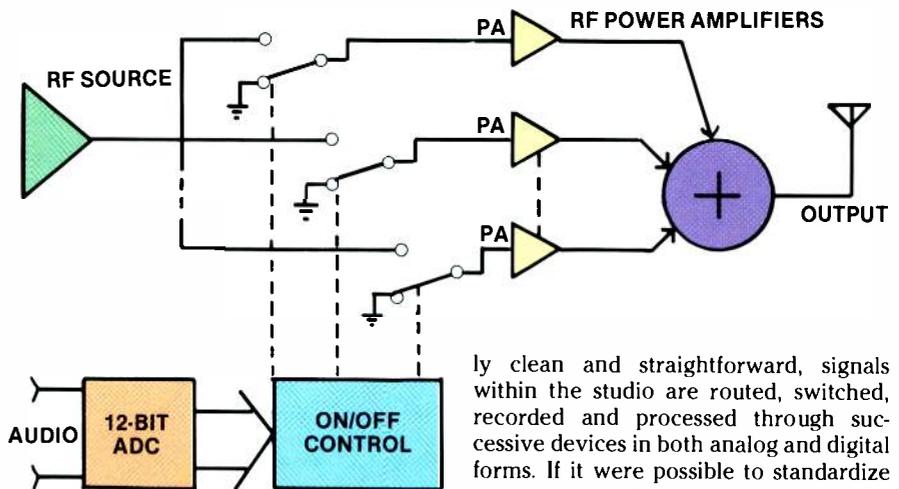


Figure 6. Simplified block diagram of the DAC, an array of controllable amplifiers.

just keeping the systems properly aligned.

Over the past three decades, the quality of equipment used in broadcast stations has improved dramatically. Compact, solid-state circuitry has practically eliminated the problems of meeting minimum signal tolerances. According to Faroudja, little work has been undertaken to determine whether more stringent definitions could be imposed on NTSC standards, which would improve overall operations and, therefore, the user's picture quality.

The authors proposed a 3-way approach to improve the characteristics of the NTSC color system. The key, they said, is to improve the signal while still maintaining full compatibility with the current RS-170A specifications.

The 3-part proposal suggests: a) that the existing NTSC rules be more closely observed in all phases of signal processing; b) that broadcasters adhere to certain rules that are only implied by the nature of NTSC; and c) that some compatible, beneficial changes be made to the rules to improve the picture quality.

Observe specified rules

A major cause of signal degradation lies within the broadcast studio. Although the transmitter path is relative-

ly clean and straightforward, signals within the studio are routed, switched, recorded and processed through successive devices in both analog and digital forms. If it were possible to standardize common practices, perhaps the NTSC baseband video could be maintained at its optimum.

An example of the type of device that can contribute to signal degradation is one that generates signals with fast rise-time video signals. Character generators, computer graphics systems, color keyers and digital effects systems generate such signals. The result is that illegal sidebands often are generated when the signals are applied to the chroma channels of an encoder. The I & Q or R-Y and B-Y chroma bandwidth bounds are, therefore, exceeded. The resulting signals are full of intermodulation overlap, and cannot be properly decoded by even the best comb filter decoder in a monitor or receiver.

A second problem exists with new cameras. When NTSC was developed, the cameras were incapable of producing detail at luminance frequencies above 4MHz. Therefore, the notch filter used in the home receiver to filter out the color subcarrier did little harm to the overall image resolution. That is no longer the case. Modern cameras do have useful high-frequency output above 6MHz. This design requires that the luminance frequencies be recovered after comb filtering of the chroma signals.

Compatible rule changes

Even more can be done to improve performance. One technique relies on 2H comb filters in encoders and decoders

Continued on page 52

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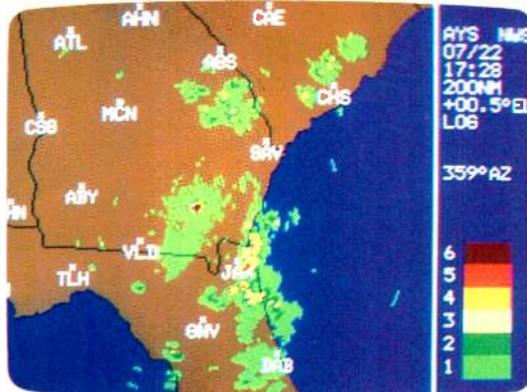
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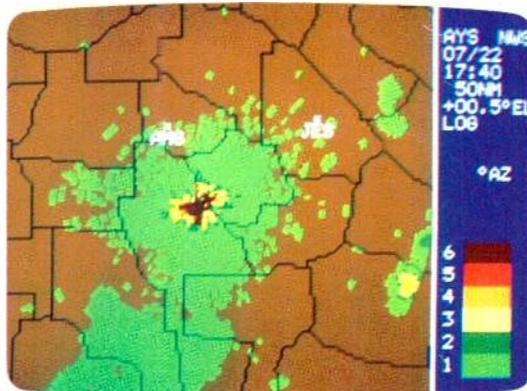
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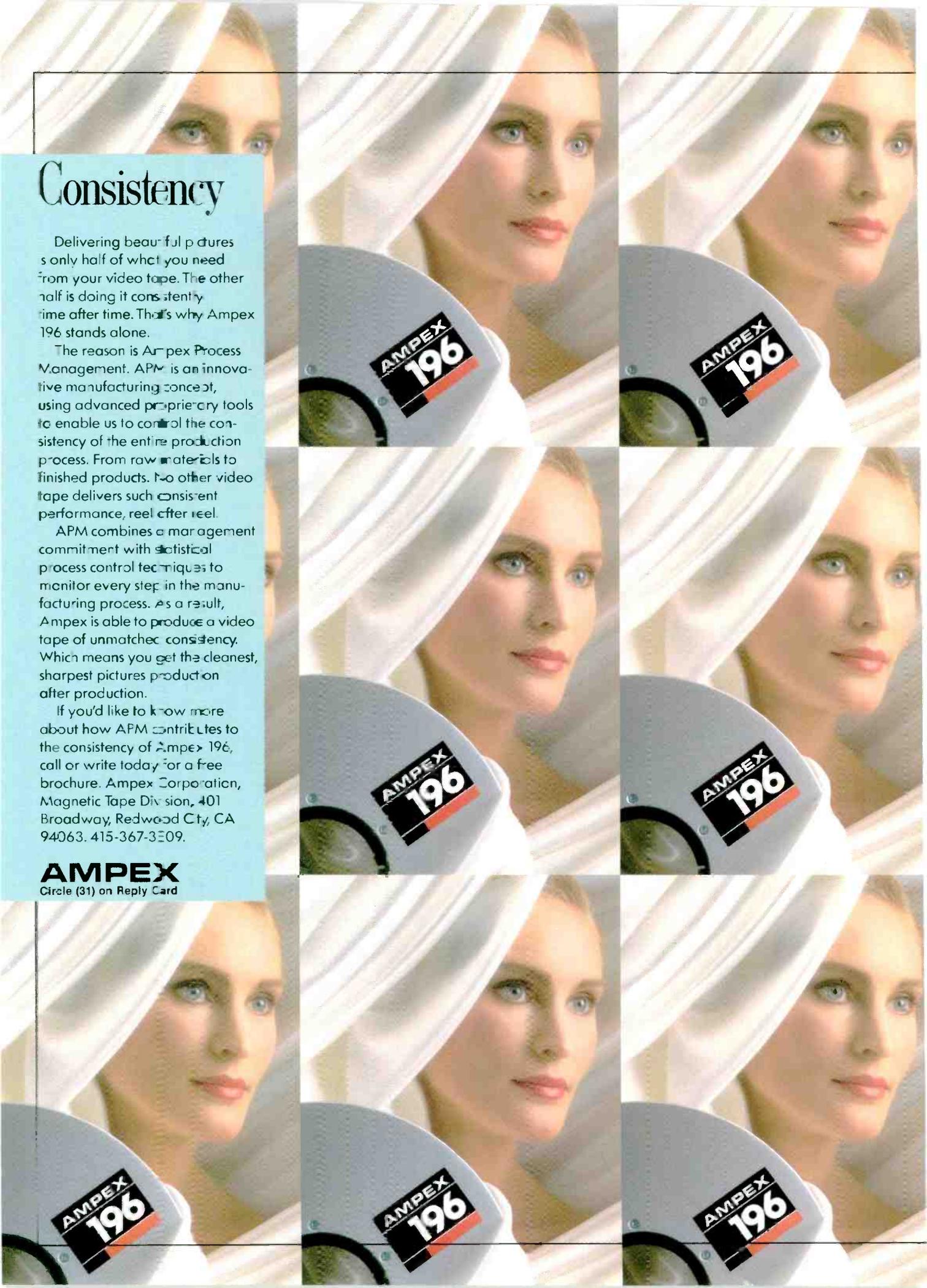
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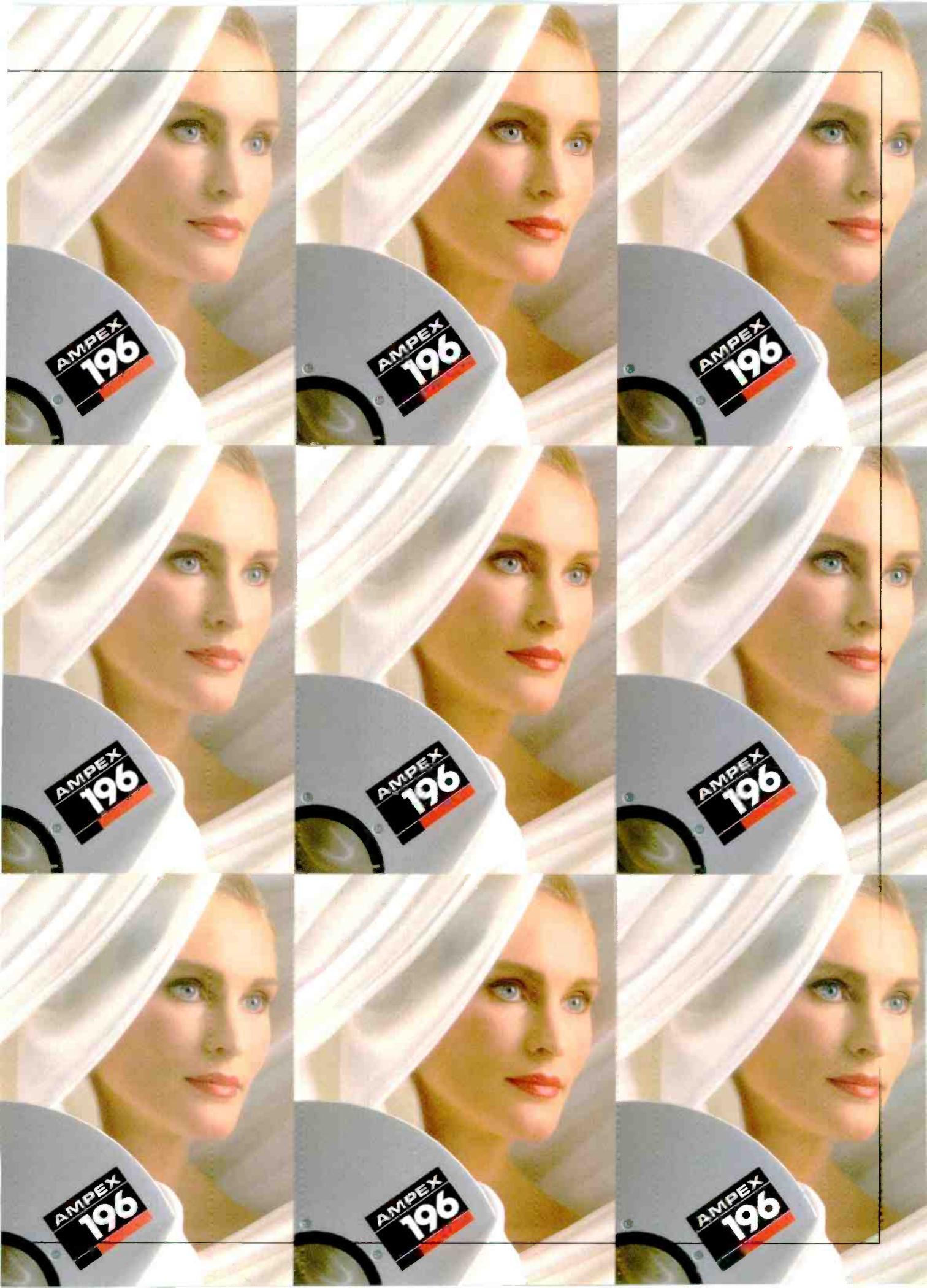
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Continued from page 48

with adaptive logic circuitry. The result is a near RGB-quality picture. Faroudja said that this approach can produce considerable improvement in NTSC images without greatly increasing system complexity and cost.

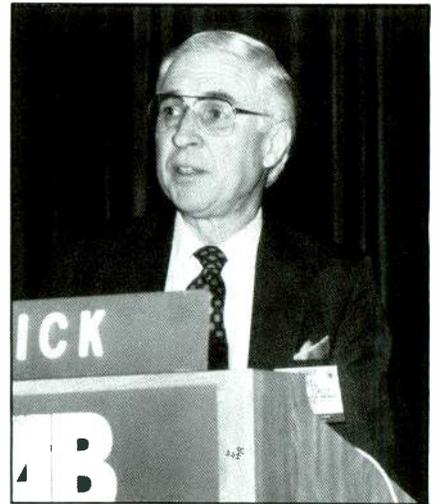
Another technique is to replace the currently differing I and Q bandwidths with equal 1MHz broadband channels with sharp rolloff characteristics. This would help eliminate the effect of cross-luminance in the decoder.

The authors said that these techniques

can create a fully compatible NTSC signal that can be reproduced as a 525-line, 60Hz progressive scan image. This image will be free of ringing, cross-color and cross-luminance, and have all the appearance of a 7MHz RGB signal. Following such practices may, according to the authors, allow the industry sufficient time to design the proper high-definition TV system of the future.

Hot graphics

It was data-driven displays, not glitzy graphics, that took center stage at the TV



Emil Torick updated the audience on FMX improvements. In response to early concerns, several changes have been made to the original FMX design.



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graphics sessions. The introduction was a dazzling demo reel of show opens and graphic effects produced by the Post Group.

After the spectacular opening, Mark Harris, of CBS, New York, provided a historical perspective on graphics systems. He noted that, in the '60s, remote-controlled electromechanical toteboards replaced manually operated ones. In the '70s, these units were replaced with modified CRTs, which displayed large letters. Both of the later devices were shot with studio cameras and wiped onto the program at the switcher.

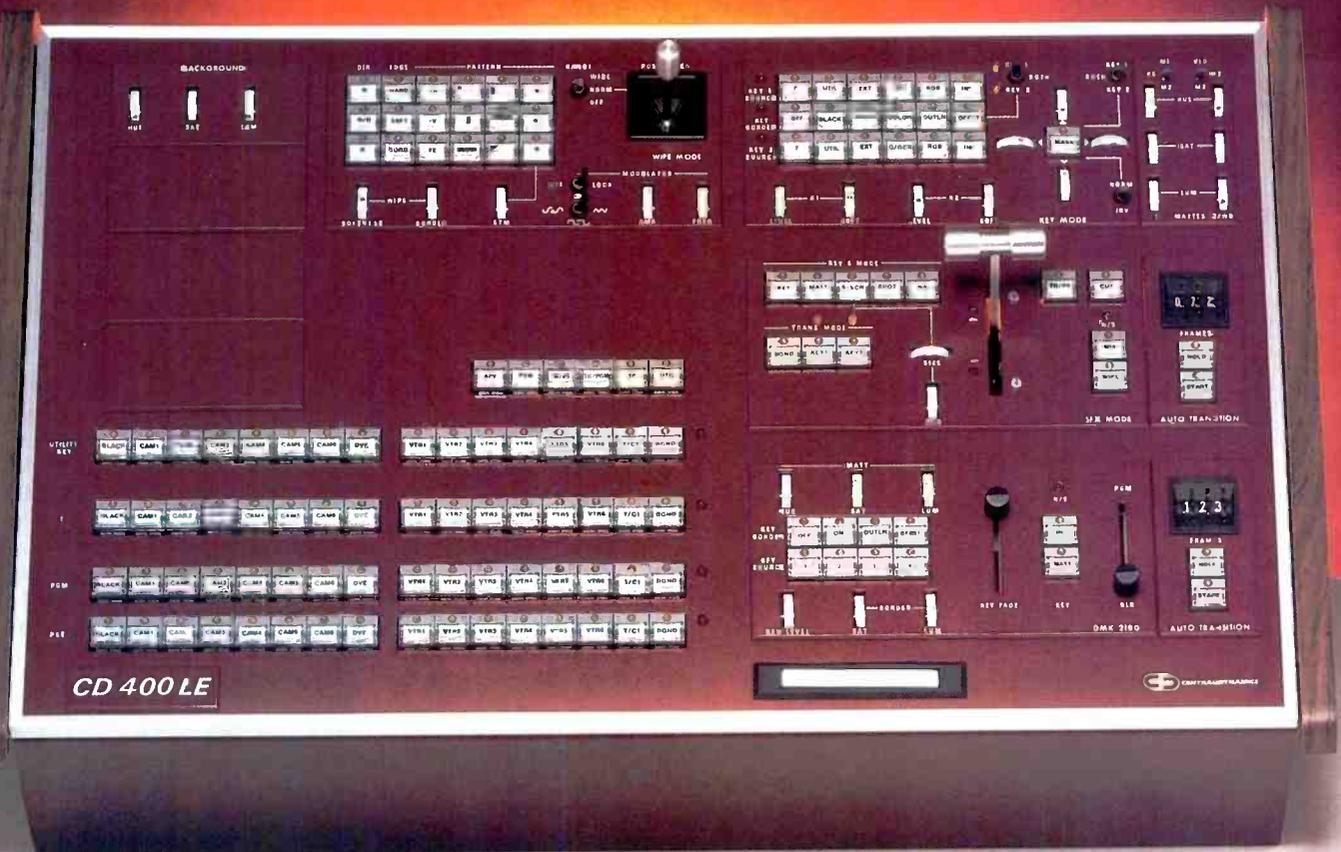
The advent of electronic character generators in the late '70s allowed election data to be inserted into a program electronically. The studio cameras were aimed at art cards, providing the backgrounds for the electronic letters. In time, still-stores replaced art cards, further simplifying studio operations.

By 1982, animation had become popular. Attempts to animate with existing hardware in 1982 and 1984 produced mixed results. The high-quality graphics desired for the 1986 election coverage precluded the use of any one system because nothing could generate the sophisticated graphics required in real time. The system CBS eventually chose for "almost real time" graphics had to meet the following criteria:

- Be fully automated, relying on computer-supplied data;
- Use random-access, producing charts of vote totals and maps of key states without requiring advance knowledge of election winners or presentation order; and
- Employ broadcast-quality, gen-lockable, industry-standard video.

The key equipment selected included

New CD400LE Production Switcher by Central Dynamics.



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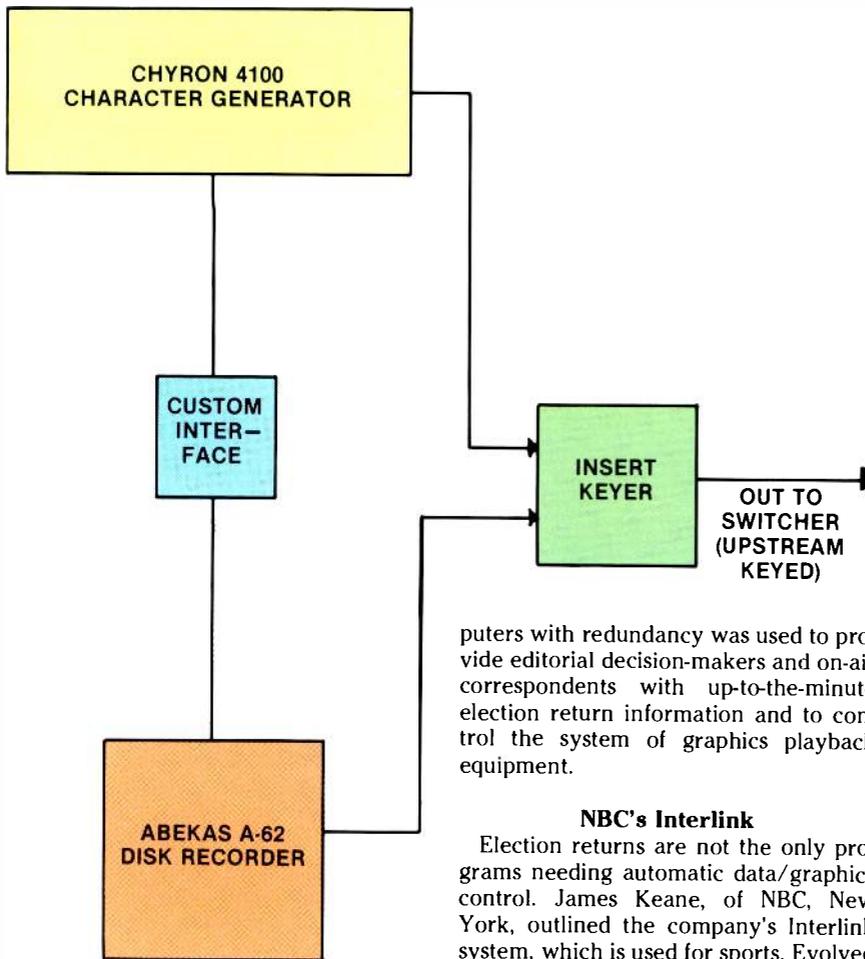


Figure 7. Video insert keys were used by CBS to key the text from the CG over the animation background played from the disk recorder.

an Abekas A-62 digital disk record, capable of storing and recalling randomly up to 100 seconds of video, and the Chyron 4100 character generator.

For the network's election production, a tape containing all possible video elements was prepared at a production facility using a high-end computer graphics system. At CBS, the tapes were played on VTRs and dubbed to the disk recorders. Next, the loaded disk recorders were paired with character generators, and the output from each disk recorder combination was fed to a dedicated, stand-alone insert keyer.

The keyer output was fed to the switcher as an upstream source, already keyed, thereby minimizing the required inputs to the switcher and reducing the number of controls needed at the switcher control panel. Custom interfaces between the disk recorders and the character generators kept the letters and video in sync with each other. See Figure 7.

Finally, a separate network of com-

puters with redundancy was used to provide editorial decision-makers and on-air correspondents with up-to-the-minute election return information and to control the system of graphics playback equipment.

NBC's Interlink

Election returns are not the only programs needing automatic data/graphics control. James Keane, of NBC, New York, outlined the company's Interlink system, which is used for sports. Evolved from a group of spotters with telephones, Interlink is now a PC-based network that can automatically detect new scores at a game, and make that information available at any NBC remote truck within 20 seconds.

In its early days, the Interlink system consisted of a person at each NBC remote site. This person would receive telephone calls from New York about games around the country, and pass the information on to a production assistant who, in turn, passed them on to the character generator (CG) operator. The process was unwieldy, time-consuming and, because it was labor-intensive, subject to errors.

The new NBC system relies on personal computers to recognize when a CG operator enters a new score. The computer then sends the new score to a central computer, which passes the change to all other Interlink computers in the field.

When the sporting event generates too much data for an operator to handle, the local Interlink computer can be driven directly from the site's scoreboard. A file of the decoded data is then available to the character generator.

According to Keane, the system works well, but is only a temporary "patch." The real cure to handling all of this data

will come when the industry addresses, head-on, the problems of data-driven devices and system incompatibilities.

Graphics overview

Steve Davis, of WPRI-TV, Providence, RI, provided an interesting overview of today's graphics equipment. He divided electronic graphics into five separate categories: character generators, still-stores, paint systems, 3-dimensional renderers and weather graphics systems. After describing each of the systems, he offered suggestions on their selection and maintenance.

Davis cautioned that the first step in purchasing a graphics system is to identify management's goals. Graphics equipment is expensive, and if it is purchased solely to support news and promotion, cost justification might be difficult.

He urged the audience to be realistic about the proposed applications. The paint capabilities of some new weather systems make them attractive as production tools, but you may have to fight the weather staff to use them. Some CGs include paint systems, but operation of the paint system could preclude using the device as a character generator, thereby shutting down a studio. For these reasons, he suggested, it might be wise to look into a stand-alone system. Such redundancy can be beneficial because it provides flexibility in scheduling. And, more important, if the equipment ever breaks down, your entire production process won't grind to a halt.

Davis warned about possible union jurisdiction problems. He suggested that the operators be involved in the equipment's evaluation and selection. It doesn't cost much to send them to trade shows or to the manufacturing plants so they can learn as much as possible before the purchase. In fact, he said, the expenses incurred on information-gathering trips would be small compared with the penalties you'd pay for selecting inadequate equipment.

Company support

Because electronic graphics systems are actually computers operating under software control, Davis advised, the attendees should understand the manufacturer's policy on software updates, upgrades and bug-fixes. Check with other users about customer support after the sale. Davis said that a manufacturer who isolates its programming staff from the clients usually responds more slowly to customer input.

Before you make a purchase, he said, ask yourself if the proposed system will fit within the bounds of your current plant. Will additional routing switcher equipment be needed? Will your system interface effectively with other com-

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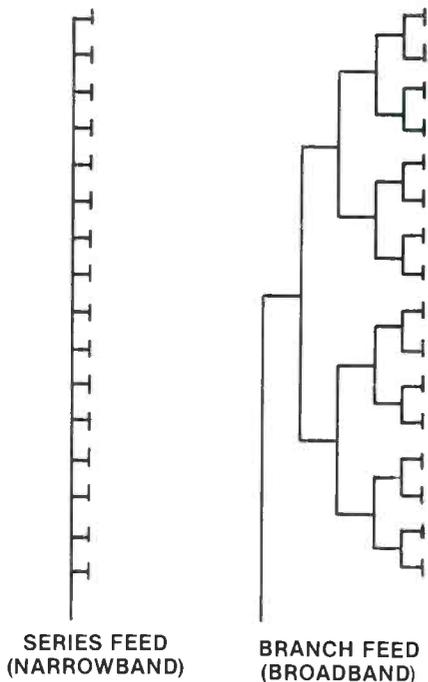


Figure 8. Series-fed antennas result in narrowband performance, while branch-fed systems provide broadband operation.

puters? How does it send its signals throughout the plant? The preferred method is digital, but the format is not universal. One method to ensure connectivity is to pick one manufacturer from which to purchase the entire system.

Finally, don't expect your engineering staff to be completely familiar with the unit's circuits. The best policy is to make sure the manufacturer has a good technical support program and that its representatives will provide information and card-exchange programs.

Switching without switches

Several papers were presented on TV RF topics. One, by Greg Best, Harris Corporation, discussed the general advantages and performance of switchless combiners. The primary advantage of a switchless combiner is that a TV station can remain on the air at reduced power during the switching process. He said the key is to develop a switch design that provides the required isolation without affecting signal quality.

Best's tests show that the maximum achievable isolation in a typical hybrid is not sufficient to prevent visible crosstalk in a demodulated signal. The type of crosstalk depends on several factors, including isolation, frequency coherence,

matched carrier quadrature relationship and locked video signals. According to Best, proper maintenance of these four factors can produce 50dB of isolation, with no observable crosstalk.

UHF multichannel antennas

Another topic that could help TV broadcasters centered on the sharing of antennas by UHF stations. Regulations are forcing broadcasters to re-examine the practice of the one-tower, one-antenna-per-station philosophy. James Stenberg, Micro Communications, Manchester, NH, outlined the advantages of a single antenna and transmission line serving several high-power UHF stations.

The advantages of common sites are obvious. Real estate and tower costs are lower, and FAA and local governments may be more likely to approve cooperative arrangements. Given today's regulatory climate, these factors are almost as important as the RF considerations.

Multiple-channel antennas require wide bandwidth and impedance (VSWR) characteristics. This design is a significant departure from the more common narrowband, single-channel antennas. Typical single-channel UHF antennas rely on series-feed arrangements. Broadband antennas often rely on a branch-

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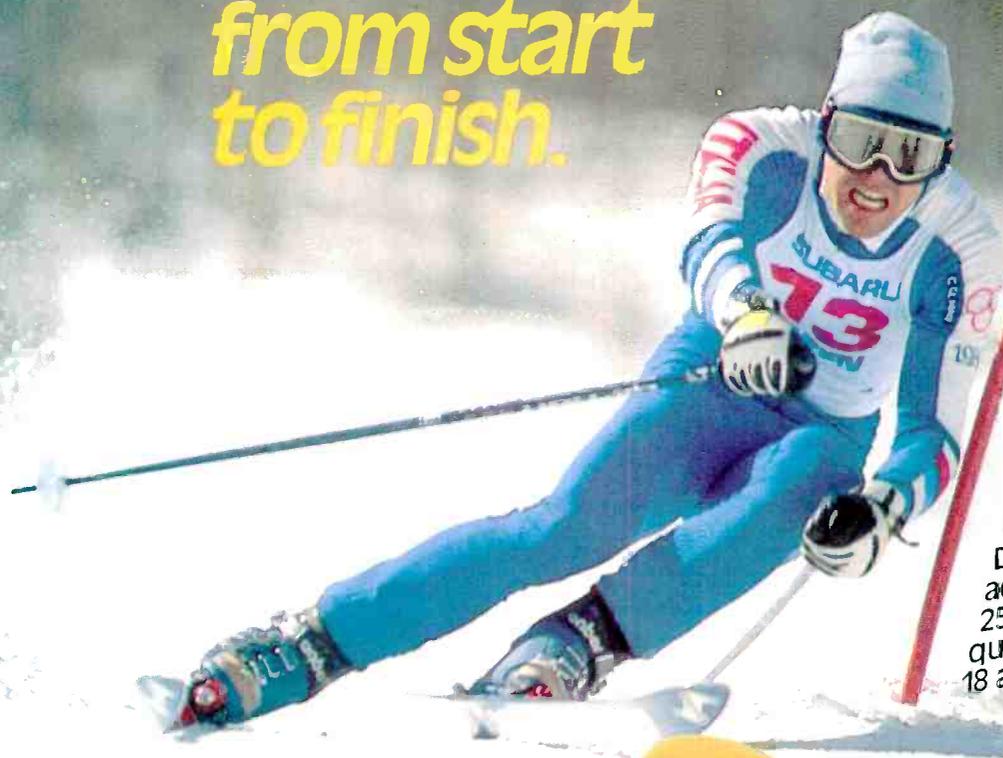
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Designed for cameras and accessories weighing up to 250 lbs. Provides broadcast quality motion control with 18 arc second repeatability.



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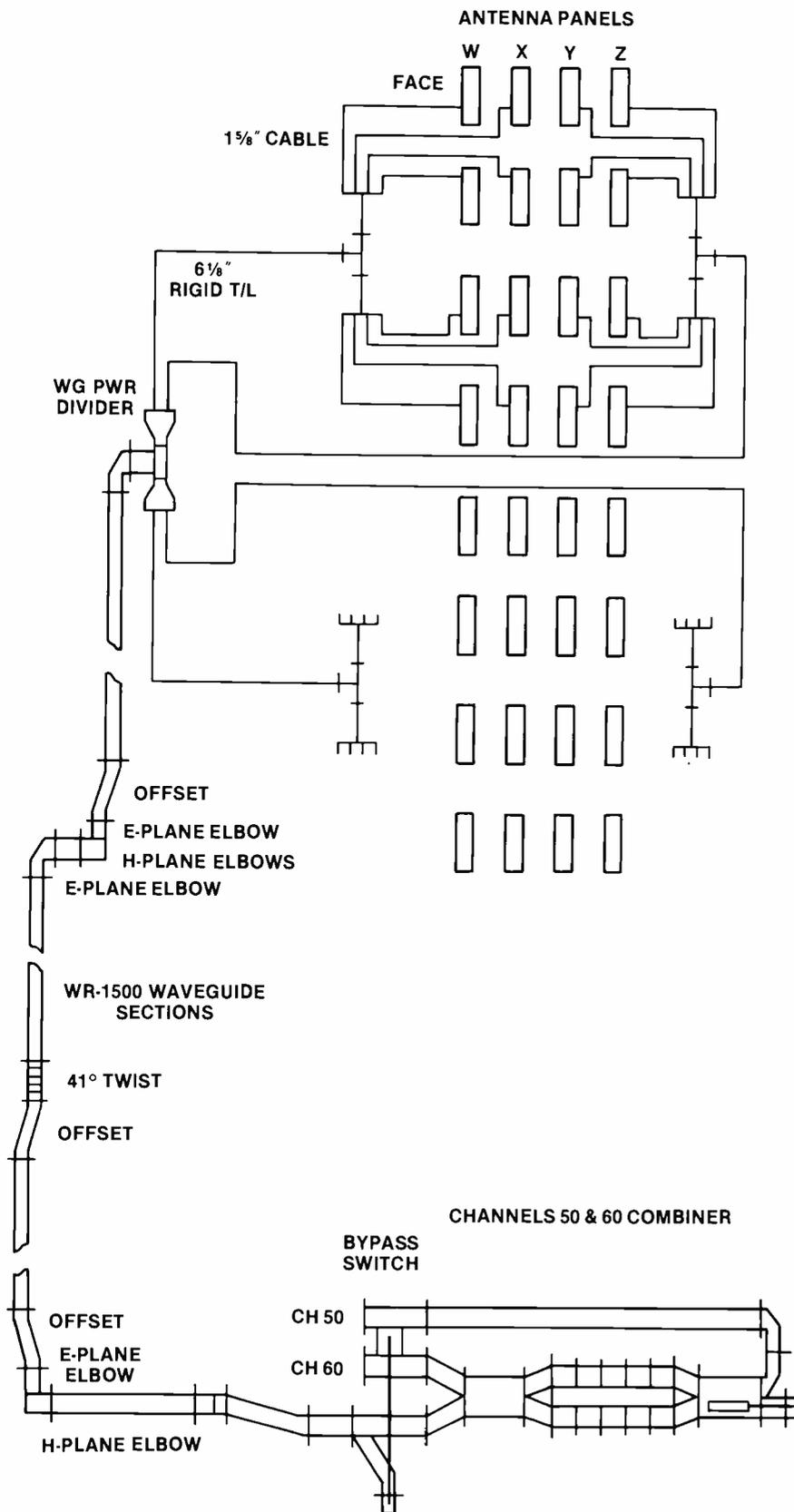


Figure 9. A simplified drawing of the Sears Tower channel 50/60 installation.

feed arrangement (see Figure 8).

At the design frequency, the series feed provides co-phased currents to its

radiating elements. As the frequency varies, the electrical length of the series line feed changes, causing the radiating

elements to no longer be in phase outside of the design channel. This electrical length change causes significant beam tilt out of band, and the input VSWR varies rapidly with frequency.

In contrast, the branch-feed configuration employs feedlines that are nominally equal in length. The phase relationships of the radiating elements are, therefore, maintained over large frequency spans, providing vertical patterns with stable beam tilts, as required for multichannel operation. Broadband VSWR performance also is possible because the input impedance is, essentially, the average of all the radiating element impedances.

Multichannel systems have been common for FM and VHF stations for many years. The advantages are only now being applied to UHF installations. A simplified drawing of the Sears Tower channel 50/60 installation is shown in Figure 9.

The future

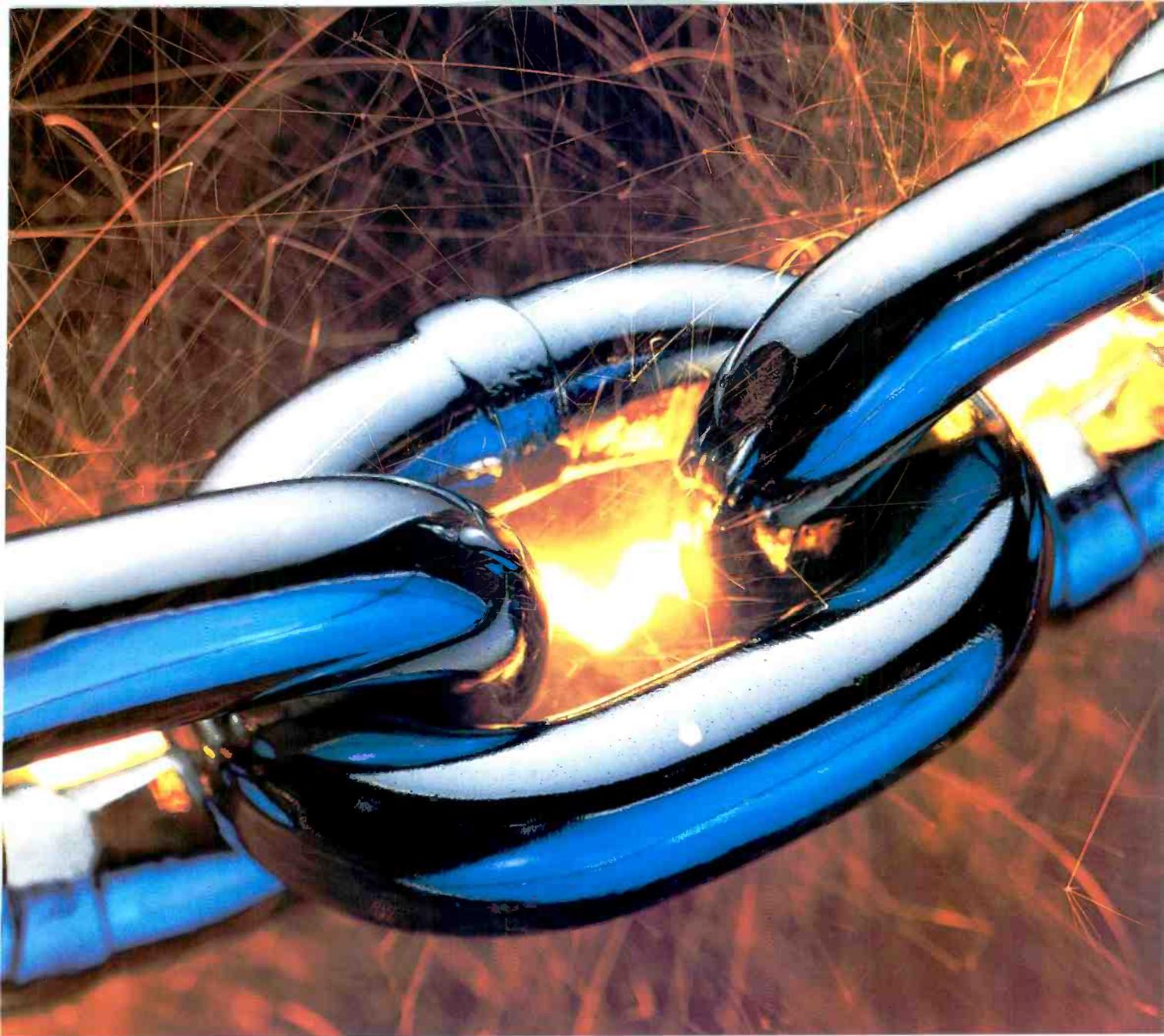
This year's papers were better than ever. To attest to the number of papers presented, this year's "Proceedings" is almost 600 pages. The convention's mood was definitely upbeat. Those who attended learned not only how to make their systems better, but also received a glimpse of what broadcasting might have to offer in the not-too-distant future.

The engineering sessions spanned more days than at any previous NAB convention. It must have been a challenge for the NAB to plan such an ambitious forum. Attendees found the sessions to be topnotch. Other than the SBE national convention and SMPTE, the yearly NAB convention is about the only occasion for engineers to receive timely and up-to-date information presented by such knowledgeable authorities.

Where to from here? Well, for one thing, the convention returns to Las Vegas. That alone will make many people happy. From a technology standpoint, however, the 1987 convention will be hard to top. Based on the rumors heard on the exhibit floor, you should look for even more exciting products next year.

Bibliography: "Proceedings," 41st Annual Broadcast Engineering Conference, NAB, Washington, DC.

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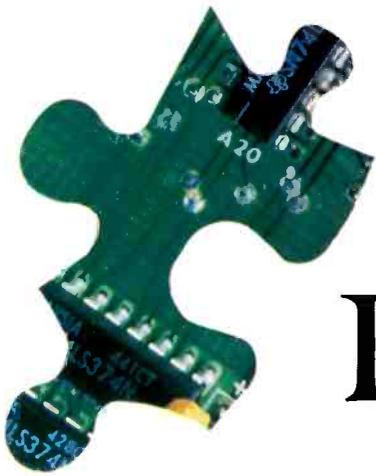
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Pick hits of NAB '87

By Ned Soseman, TV technical editor

The weather was cold, and the products were hot.



Photo by Douglas Schwartz, Flightspeed Graphics

Products, products and more products. The NAB convention featured a bewildering selection of new ways to do old things, and new ways to do new things.

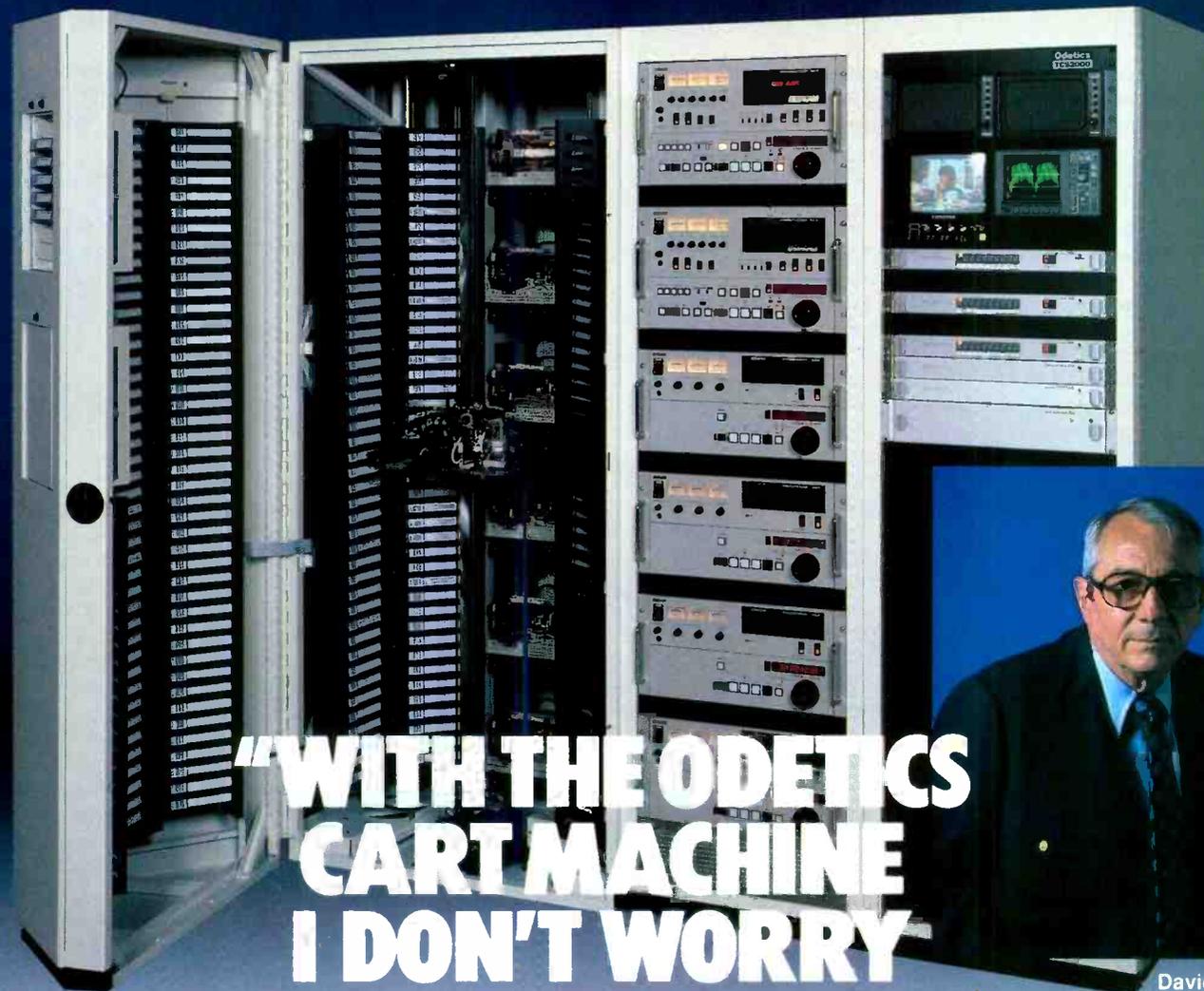
Everybody loves a good trade show, and this year's NAB convention was the center of obiter dictum accolades from the moment the doors first opened. While the Vegas-bound granddaddy of all broadcast equipment shows was saying good-bye to Dallas, many visitors were finding their own good buys in the booths on the exhibition hall floor.

The BE editorial staff responded to the challenge of learning all we could about new products and industry trends. With our crowd of 30 associates, we combed the convention center in a quest for new information; we attended press conferences, demonstrations, formal booth tours and hospitality suites; we met with industry leaders; and we interviewed and queried engineers and exhibitors. Detailed discussions of what we learned about each new and improved product would fill several volumes of BE.

To help us get past the sensory overload and focus on what really happened under all the glitter imposed by the industry's largest trade gathering, BE organized an independent panel of industry experts to inspect the new products introduced on the floor of NAB. For the third consecutive year, our panel of 10 judges (five for radio products only, five for TV products only) was specifically charged with touring the exhibitions to develop a list of new and exciting products. The judges looked for products that were designed to offer useful solutions to common broadcast problems.

The judges followed these basic guidelines:

1. **Items must be new products** (not shown at a previous NAB). In some cases, distinguishing a "new product" from a modified old product was difficult. For our purposes, a new product was one with a new model number or new designation.



"WITH THE ODETICS CART MACHINE I DON'T WORRY ABOUT MAKEGOODS!"

David Zulli
Chief Engineer
KWHY
Los Angeles

Until they installed the Odetics Cart Machine, errors, both human and mechanical, were a costly problem for KWHY.

According to Dave:

"We're a very busy operation. Although much of our programming is live, we air over 200 carts in a nine hour period -- that's programming, promos and station IDs as well as spots. Therefore, we need a cart machine that will consistently air the right tape. With the Odetics Cart Machine, discrepancies and makegoods are extremely rare. Now we're airing a high quality product every day."

The Odetics Cart Machine can automatically manage, record and play-to-air all forms of spots and programs -- including events as short as one second.

The Cart Machine has improved efficiency at KWHY in another way.

"I like the fact that The Cart Machine is quiet and contained because we're in extremely cramped quarters. Our old equipment was cumbersome and noisy, creating a hectic atmosphere," says Dave.

Daily program schedules are smoothly transferred from the traffic department because the Cart Machine interfaces with the traffic computer and automatically downloads the schedules. Armed with a 65,000 cart database and 1,600 event look-ahead feature, The Cart Machine can automatically preplan spot play lists hours, or even days, in advance of airing.

The Cart Machine is available in your choice of small formats.

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2. **Items must have some positive impact on the everyday work of the user.** We were looking for equipment that would be used on a regular basis at a station. The equipment should provide a new solution to a common problem.

3. **The products must offer a substantial improvement in current technology.** The equipment did not have to include unique circuit architecture, but it should include some new ideas on applying current technology.

4. **The prices of the products must be within reach of their intended users.** We were looking for products marketed to a wide spectrum of broadcasters.

5. **The products must be available for purchase.** Equipment must have been displayed on the convention floor (not in suites), and must be in production, or soon to be in production. Products that were demonstrated privately did not qualify.

The judges unanimously agreed that the upgradability and expandability features found in many new products introduced at this year's NAB were a welcome sign of manufacturers' concern for broadcasters' problems.

During the final hours of the show, the judges gathered inside BE's convention

center newsroom. They broke into panels (radio and television), and each judge presented a list of favorite products.

Our deliberative panel examined and discussed all of the products nominated by each judge. Rounds of voting and further discussion narrowed the individual lists to the target of two groups, containing 10 products each.

Although BE's list may omit your favorite product, it represents what each panel agreed are 10 unique, interesting and useful products for their category. The products selected by our panels follow in alphabetical order.

Radio pick hits

• **Broadcast Electronics: phase-tracking cart player**

The *Phase Trak 90* is a new audio cartridge player that continuously monitors and corrects the phase relationship between the left and right outputs. A front-panel LED display indicates the amount of relative phase correction taking place.

The deck also uses a single-ended



noise-reduction system to provide an S/N of more than 80dB with no encoding scheme required. It accepts both A and AA cartridges. Its floating, transformerless output is balanced 600Ω.

The device also offers a non-repeat lockout, automatic and fast recue and automatic high/low level switching for cartridges recorded at higher levels (typically, 250nW/m).

A recorder version will be available in the future.

• **Continental Electronics (Varian): 1kW solid-state AM transmitter**

The *type 314F solid-state AM transmitter* provides 1kW RF output. In a

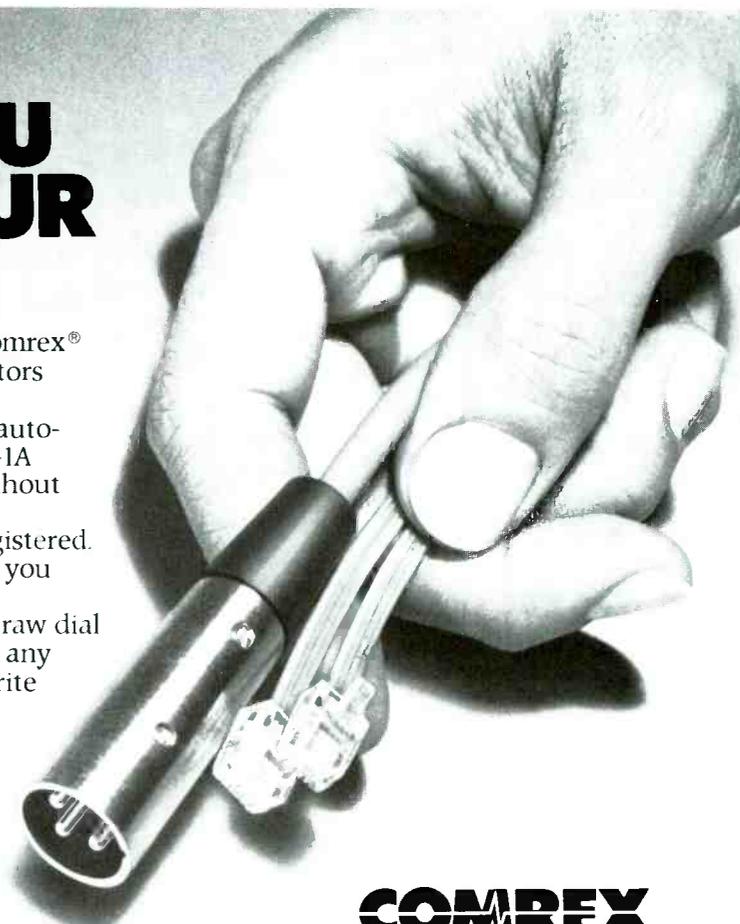
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Built specifically for broadcast, both are FCC registered. And both provide clean audio and the dependability you expect from Comrex.

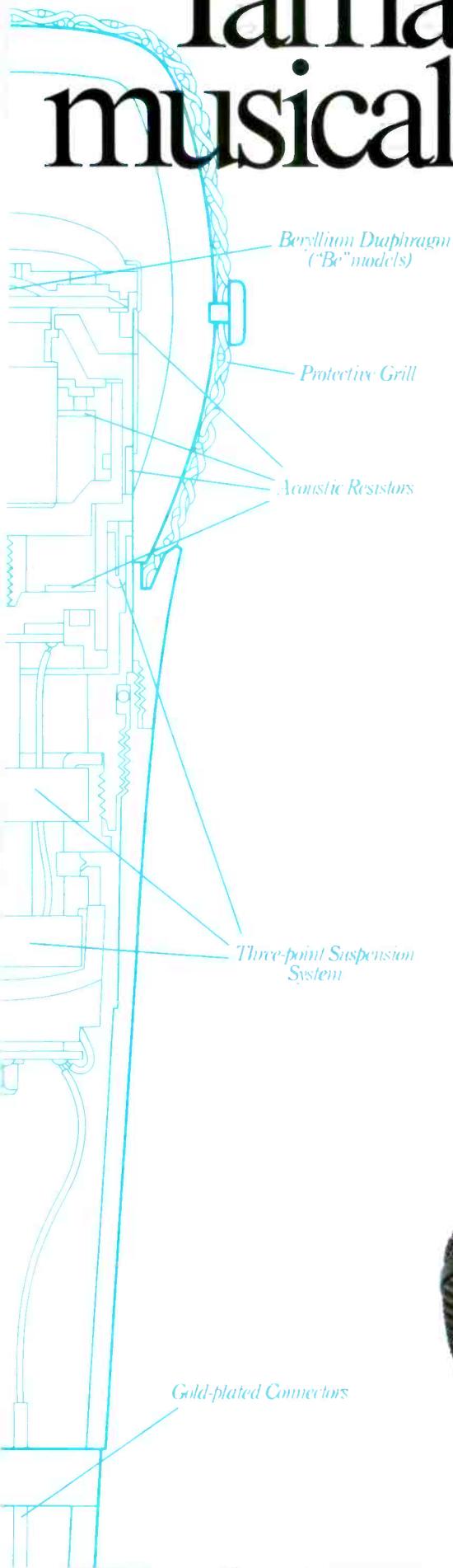
Comrex also makes frequency extenders to turn raw dial lines into broadcast quality. For more information on any Comrex product, call toll-free 1-800-237-1776. Or write Comrex Corporation, 65 Nonset Path, Acton, MA 01720. Tel. (617) 263-1800. TWX 710-347-1049.



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Throughout the entire line, a superior acoustic damping system makes use of a mesh screen and photo-silkscreen technology. The benefits are extraordinary long-term stability and absolute uniformity. This uniformity can be especially important when matching pairs of mics for stereo.

A tight cardioid pattern provides excellent off-axis rejection for superior feedback suppression.

To reduce handling noise, all MZ mics have a unique three-point floating suspension system. And a special windscreens with three times the impact resistance of conventional types. So you know it can take a pounding.

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But when you listen to Yamaha MZ mics, you hear more than the result of advanced technology. You hear a one-hundred-year tradition of making music.

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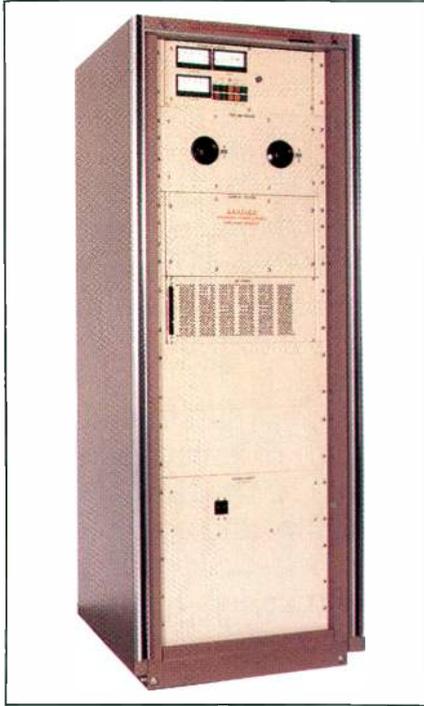
YAMAHA®

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modular design, the major components are mounted on plug-in cards, providing ease in handling and maintenance. Each MOSFET module employs on-board protection to prevent device failure due to high temperature, overvoltage or over-current conditions.



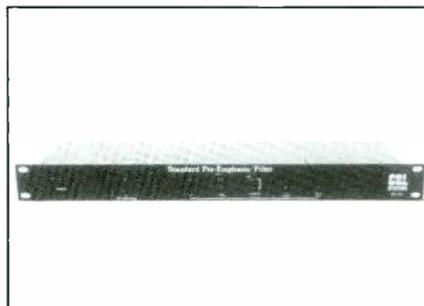
On-board VSWR-sensing circuits protect individual amplifiers and external circuits such as phasers and ATUs. The PA will withstand short circuits at any point in the output or antenna circuits.

The RF and audio circuits use broadband techniques combined with IC technology capable of handling sophisticated audio processing.

• **CRL Systems: pre-emphasis/filter for AM, de-emphasis/filter for AM**

The *SPF-300 pre-emphasis/filter* allows AM broadcasters to meet NRSC (National Radio Systems Committee) voluntary transmission standards. The filter limits the frequency response to 10kHz. The pre-emphasis circuitry is complementary to the de-emphasis curve recommended for receiver manufacturers.

The *SPF-300* adapts virtually any monaural audio-processing system to NRSC standards. It will correct overshoots and



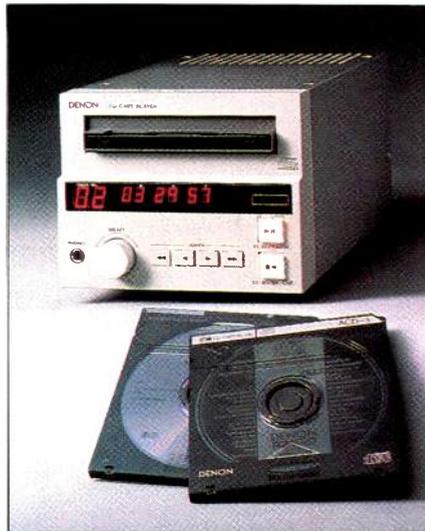
remove out-of-band components. It allows asymmetrical modulation, and has selectable low-frequency tilt correction to improve plate-modulated transmitter performance. Front-panel LED indicators aid the user in initial adjustments.

The *MDF-400 (mono)/MDF-800 (stereo)* provides all functions to update any AM modulation monitor or receiver to the new NRSC standards.

• **Denon America: CD cart player**

The Denon *DN-950F CD cart player* alleviates many of the drawbacks of using CDs for on-air playback. The player provides rapid cueing to audio and contains only two major illuminated buttons: start and stop. Front-panel LEDs indicate track number and remaining time on the selected cut. End-of-message contacts are provided for periods of five to 30 seconds in 0.5-second increments.

Technology was borrowed from CD-ROM design to incorporate CD cart-



ridges. The cartridge replaces the "jewel box dilemma" common to CDs at radio stations. It allows the discs to be stored and used similar to audio cartridges. A shutter, which opens and closes upon loading and unloading, protects CDs from scratches, fingerprints and dust.

The output is active-balanced, suitable for 600Ω systems. The cartridges are available separately.

• **Harris Corporation: 10kW solid-state AM transmitter**

The 100% solid-state Harris model *DX-10 transmitter* marks a revolution in the digital design of AM transmitters. A total of 213 MOSFET transistors are used to generate high-level audio and transmitter modulation.

The major components of this new system are the A/D converter, the digital modulation encoder and the power-multiplying digital-to-analog converter. Input audio is converted to 12-bit digital, summed with a carrier-level control and



applied to the modulation encoder. This provides dc control to 48 RF amplifiers, which are turned on and off at an audio rate with modulation. The output of each of the amplifiers is summed at proportionate power levels in a master RF combiner.

With digital switching technology, overall ac to RF efficiency is typically 80%. PA efficiency is rated at 85% or higher. RF and audio performance appear to be outstanding.

• **International Tapetronics/3M: Audio Switcher**

ITC's new *Audio Switcher* provides programmable switching functions that can replace patchbays, distribution amplifiers and mults. The Audio Switcher is a single-matrix routing device that can route virtually any source to one or more destinations, such as studios or other devices. It is expandable from 16 x 16 mono channels (8 x 8 stereo) to 256 x 256 mono (128 x 128 stereo).

In addition to switching, the Audio Switcher provides self-documentation



with a keyboard and a printer, which produces a hard copy of the system status and a log. Stored data is automatically protected through a redundant memory. A secondary memory is contained within

Continued on page 68

Overcome Capital Budget Restrictions

*Moseley now provides financing
for qualified customers throughout the world.*

The Moseley Corporate Finance/Lease Program provides 100% financing of their equipment and systems, with flexible terms up to 60 months. This program permits customers to make purchases and, at the same time, conserve their working capital thereby leaving existing credit undisturbed. In addition, quick approval and an extended maintenance contract makes this program one of the most desirable financing plans available.

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ONE FOR ALL

BROADCASTING

"This industry needs companies like Crown, that pay attention and design products to help solve our problems."

The broadcast industry shares many common needs with others in the audio business, but the special needs outweigh the commonalities. For ENG, studio news, broadcast variety and entertainment, broadcasters have special problems, special needs.

Crown spends a great deal of time working with professional broadcasters at both network and local levels to develop specific products that solve the problems, meet the needs, make sense. That's why top audio pros like Ron Estes of NBC's Tonight Show enjoys his relationship with Crown for developing and testing new products that are specifically aimed at

helping him get the job done.

"We tested the very first of the new Crown Hand Held mics on the show, and quite frankly they were astounding.

"All the sonic excellence you expect from Crown is there, the new **CM**™ Series will definitely put Crown at the forefront of the hand held market."



Ron Estes, NBC
Burbank, California

CONTRACTING

"If I can pick only one mike supplier it will be Crown — they just always work."

Over the last 38 years, Crown has become known for high-technology, high quality, reliable products. Crown microphones have been used all over the world by demanding professionals in the kinds of conditions that really test a product's ability to perform, Crown continues to pass the test with flying colors. That's why a professional like Tom Durell, with the experience of 14 years in the Disney organization, independent credits such as the audio for the opening and closing ceremonies of the 1984 Olympic Games and full audio project coordination, 1986 Liberty Weekend, chooses Crown.

"When you live by the motto 'no go, no show', you have to depend on reliability as well as quality. Crown puts those two attributes together better than any manufacturer I have seen. I can depend on consistent, reliable, quality performance from Crown every time."



Tom Durell,
Tom Durell Enterprises, Inc.
North Hollywood, California



CROWN® INTERNATIONAL, INC.

ALL FOR ONE.

FILM SOUND

"I've always enjoyed using Crown products because of their reliability. In the motion picture industry, down-time is very expensive and Crown helps us keep that to a minimum."

In the motion picture industry Crown has been a fixture ever since the introduction of the legendary **DC-300**. From powering the speakers behind the screen to providing **GLMs®**, **PZMs®** and other mics, Crown has been involved in this field for years. As in many other businesses, there is a direct correlation between a company's success and its ability to listen to the pros for designing products that meet their needs.

"Crown's accuracy and reliability make it the natural choice where down-time is so costly. In my job I have used Crown in many wide-ranging applications and have never had cause for disappointment."



Ken Wilson,
Sound Engineer/
Film Production
Hollywood, California

LIVE SOUND

"Crown's commitment to putting new technology to practical use has given me products that make a real difference."

At Crown the philosophy is the product must be specifically designed to meet the rigorous demands of the end user.

Achieving this design philosophy is a matter of being innovative in putting new technologies to work. Always searching for new ways to gain efficiency of performance results in products such as **PZM®**, **PCC®** and **GLM®**. Unique and well developed to satisfy discriminating professionals like David Andrews.

David's success and reputation in the audio business is widely known, his live sound productions are a standard that others look to and his choice of mic is Crown.

"Live sound has to be intimate and real yet deal with the realities of gain before feedback, temporary set-ups, less than optimum placement, etc.

"If a microphone cannot perform correctly I don't need it — I can't use it. I have tested and utilized every mic in the Crown line and have always been extremely satisfied with the consistency and accuracy of reproduction."



David Andrews,
Andrews Audio
Consultants
New York, New York.

1718 W. MISHAWAKA ROAD, ELKHART, INDIANA 46517

Circle (42) on Reply Card

Continued from page 64

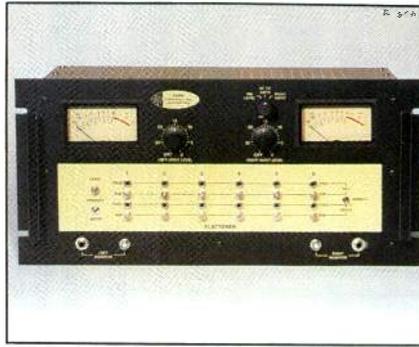
a removable cartridge containing low-power RAM and internal batteries. Built-in intelligence automatically reconfigures the source audio (mono or stereo) to match the selected destination (mono or stereo), by combining stereo sources or converting mono sources to dual feeds. Remote controls may be used in addition to the master control keyboard.

• **Kahn Communications: antenna broadbanding system**

Many old antenna systems must be broadbanded to obtain maximum performance from the transmitter. Typically, a station's antenna is the weak link that limits overall fidelity by attenuating high-frequency components of the sidebands.

The *Flattener* allows an antenna system to be broadbanded without costly and time-consuming work. The Flattener's six network sections are adjusted to produce a mirror image of the antenna's asymmetrical frequency characteristics, which corrects both phase modulation and envelope modulation components.

Because an antenna's bandwidth may be affected by weather and other environmental conditions, the Flattener allows the user to compensate for these factors with touch-up adjustments in as



fast as 15 minutes.

The Flattener is available for both mono and stereo applications.

• **Leader Instruments: digital multimeter/storage oscilloscope**

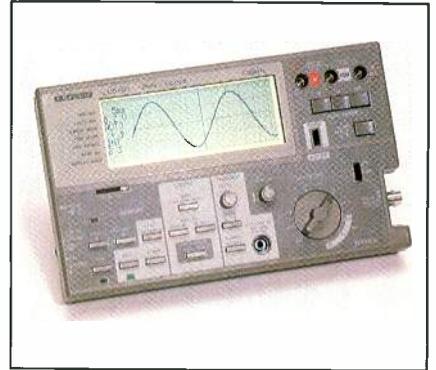
The *LCD-100 storage oscilloscope* is a combination autoranging digital multimeter and 200kHz storage oscilloscope with the advantages of being lightweight and battery-powered. It measures only 8 7/8" x 1 1/2" x 5 1/4". It provides a recessed, BNC connector for scope input and standard banana jacks for DMM leads.

The instrument performs the functions of a 3 1/2-digit DMM and a DSO, with imaging capabilities of 160 horizontal points by 64 vertical points. It features

on-screen readout of range-setting conditions. The pretrigger mode of the DSO allows storage of up to eight screens before trigger. The LCD-100 also has the capability to store up to three waveforms for one month.

Four nicad batteries provide approximately three hours of scope operation. Two AA cells power the DMM section.

Judges on both the radio and TV pan-



els thought this product should qualify as a pick hit for either classification.

• **SECK mixing console (distributed in the United States by Connectronics Corporation)**

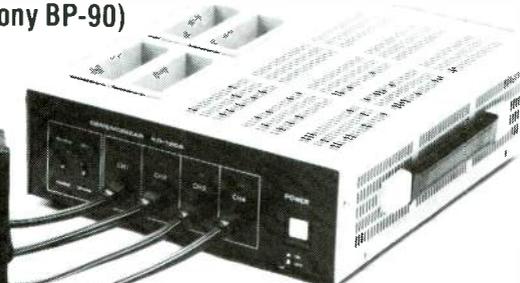
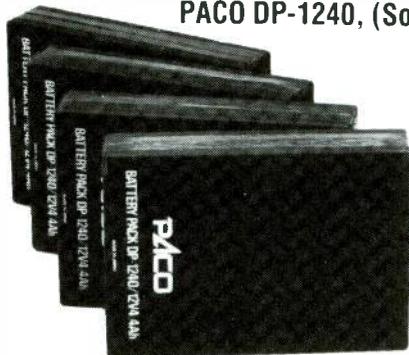
The model *SECK 1282 8-track audio-*

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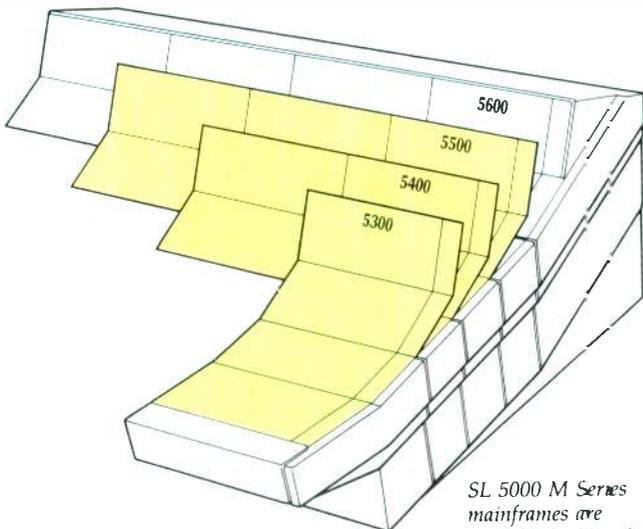
The SL 5000 M Series

The World's Most Advanced Stereo Broadcast Consoles

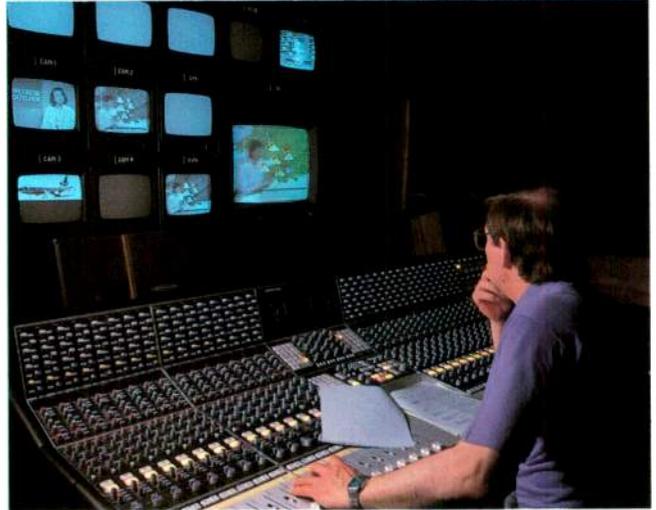
The SL 5000 M Series is designed to meet the demands of today's broadcasters – offering a new level of operational and creative flexibility in a practical format.

Built from a wide range of audio and control cassettes housed in a variety of mainframe sizes, the SL 5000 M Series offers all the advantages of customised functions and layouts, even for the smallest consoles. Larger organisations will also benefit from common operating procedures, parts stock and maintenance routines.

The SL 5000 M Series is designed for a wide diversity of applications – live radio, continuity, outside broadcasts, film and video post. It will satisfy your requirements for many years to come.



SL 5000 M Series mainframes are available in 4 depths and from 8 to 72 channels wide, allowing consoles of almost any size and capacity.



HTV – Bristol Δ

Film Australia – New South Wales ∇



Whether you are looking for an eight input on-air console, or a 72 input multitrack desk, call us now and join the growing number of broadcasters equipped for the 1990s.

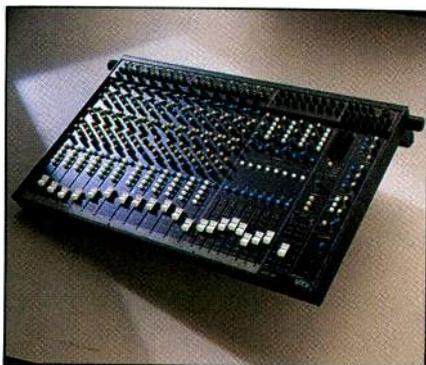
Solid State Logic

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6255 Sunset Boulevard • Los Angeles, California 90028 • (213) 463-4444

mixing console is manufactured in England by Bandive. It is designed for use in the recording studio, and in the field for remotes and production.

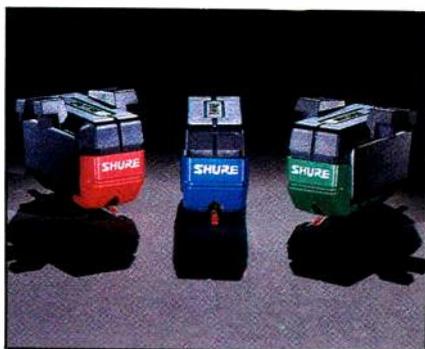
The SECK 1282 weighs a little more than six pounds, and stands less than 2 inches high. Metering is solid-state. All input and output connectors are an integral part of the control-panel layout, and are mounted at the top of the horizontal



control surface. Judges agreed that this concept is attractive for work in tight quarters, such as small studios and at remotes. Its electronic design allows for all control and switching of signals to occur at the mixer.

• **Shure Brothers: broadcast phonograph cartridges**

The constant rigors of backcuing have been addressed by Shure Brothers professional products with the new series of "BC" phonograph cartridges. These new cartridges were designed specifically for radio station use. They employ a unique internal cue guard that stabilizes the stylus shank and prevents the shank from bending or snapping when backcuing. Lateral stylus movement is limited by a wraparound stylus grip. This device prevents accidental damage if the tone arm is dropped or slides across a record.

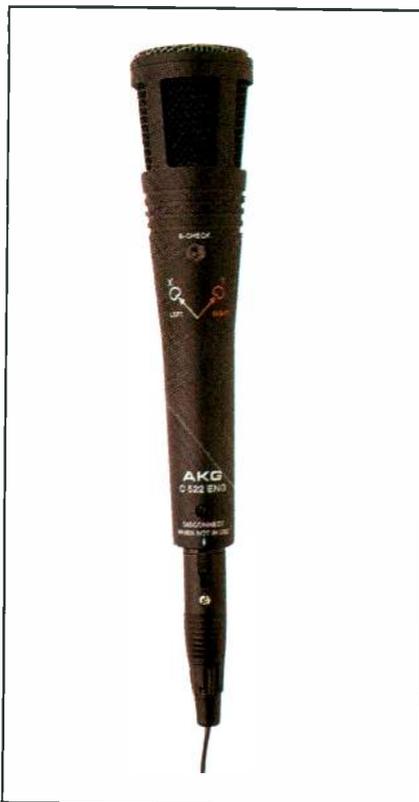


Cartridges are available in several choices of tracking forces, stylus geometries and mounting styles to match most tone arms. Each cartridge is shipped with two replacement styli.

TV pick hits

• **AKG Acoustics: stereo ENG microphone**

The model C 522 ENG 1-piece stereo-*phonic ENG microphone* was seen by the judges as a solution to the problem of recording stereo in the field. A single handheld microphone housing contains two cardioid condenser capsules oriented toward the front at an off-axis angle of $\pm 45^\circ$, resulting in a 90° opening angle. Its outputs are flat within 1dB to 5kHz,



with a smooth 5dB peak centered at 8kHz. Response extends beyond 15kHz before rolloff.

The microphone operates on phantom power of 9Vdc to 52Vdc, or it may be powered by a built-in rechargeable battery. An LED is provided for battery check, which is activated during insertion of the cable connector. The microphone is powered only when the connector is installed. A single cable connects to the mic, and splits to a pair at the output end.

• **Ampex Corporation: video production switcher**

A new product from Ampex was the



AVC-Vista switcher. BE's judges thought the electroluminescent display, on-board diagnostics and switcher ergonomics simplified the sometimes-intimidating operation of switchers with similar power. The 19-inch-rackwidth control panel, 4-wire serial communications, and the small space required for the electronics and power supply make the Vista suitable for installation in tight spaces, such as mobile vans, control rooms and edit suites.

The power of the AVC-Vista concentrates on multilayering capabilities for editing and live switching. The M/E system is capable of any combination of transitions involving two keys and two backgrounds, and two more levels of downstream keys. Luminance, ISO (external), composite chroma and RGB chroma-keys are standard. Digital up/down control of effects parameters allows accurate recall of setups.

A complete ADO interface allows control of an ADO system from the switcher's control panel.

The AVC-Vista may be ordered in 10- and 18-input versions, with most features included as standard equipment. The basic 10-input Vista is upgradable to 18 inputs.

• **Grass Valley Group: video production switcher**

Grass Valley Group's introduction of the model GVG-200, a 20-input, full-featured switcher, fills the void between the low-priced model 100, and the high-end model 1680 and 300 switchers. BE's judges were impressed by a product that took the best of both worlds (the simplicity of the model 100 and the power of the model 300), and made their features affordable to users on tight budgets.

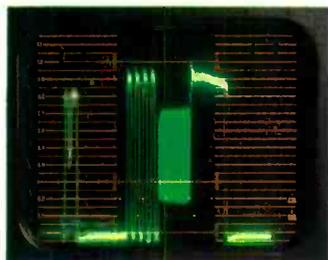
The model 200 follows model 100 ar-



Why discriminating customers specify Leddicons when buying their new cameras.

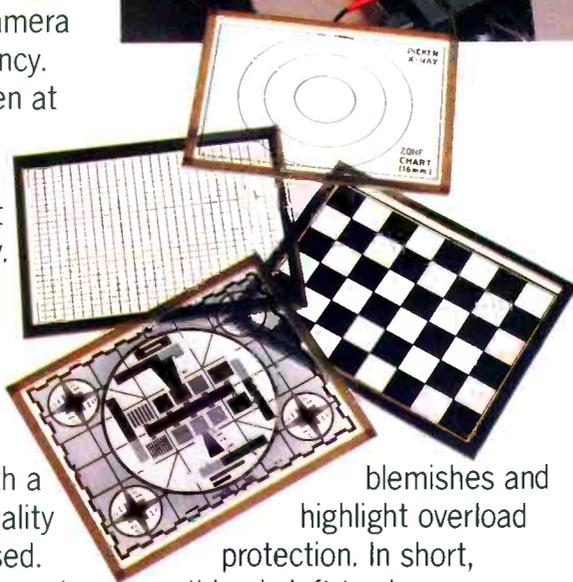
EEV Leddicons are respected by broadcasters the world over for superb color image performance. Many even insist on Leddicons when specifying their cameras - with good reason too!

No other company takes



greater care to ensure camera tube quality and consistency. Meticulous control is taken at every stage of Leddicon production, from raw materials inspection right through to final assembly. Every Leddicon, without exception, undergoes at least 28 separate checks during manufacture.

And final testing is very thorough indeed, with a further eight stringent quality control stages to be passed. These include sensitivity, resolution, signal uniformity, geometry, lag, beam characteristics,



blemishes and highlight overload protection. In short, nothing is left to chance.

Even then, the job is not finished as far as EEV is con-

cerned. That's because we believe in offering our customers a delivery and after-sales service which is the finest in the industry.

Regardless of what your color camera tube requirements may be - for new equipment or fully-interchangeable replacement - talk to the one company that really knows how to meet all your needs.



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EEV Camera Tubes

chitecture, and uses the same RS-232/422 remote-control editor protocol as model 100/300 switchers.

Five keys are provided on this mix/effects switcher—two in each M/E and one downstream.

A total of nine matte generators (in addition to color black) are standard. One matte generator is dedicated for each keyer—one for each wipe system, and two for background generators. A basic memory system and linear, luminance and chroma-keys also are standard.

The model 200 has 20 standard wipe patterns, which can be modified by the user. A variety of options allow the switcher to be upgraded to perform many functions usually found only in more expensive switchers.

• **Gentner Engineering: Digital Hybrid**

The digital signal-processing technology used in the *Digital Hybrid*, and its simplicity of operation, were praised by both radio and TV panels.

This new unit automatically nulls to a telephone line on connection and continuously fine-tunes the hybrid null during the call. Digital and analog filters are used to remove line hiss and hum. Advanced send-and-receive processors maintain consistent levels from call to call without AGC "pumping."

The product uses standard modular



jacks for telephone interface, and XLR connectors for audio in and out. A DB-37 connector brings out all audio, control and telephone connections. One-time level adjustments and dip switches for option setups are located behind a removable front panel.

• **Imageering Laser Disk Systems: PaintStore**

Imageering has developed software and black boxes that interface with several highly respected individual products from Apple, Dubner, Sony Computer Products and Tektronix to form new products.

The *ICMS (image composition and management system) PaintStore* was chosen as a pick hit because of its ability to fulfill a number of requirements. Judges thought broadcasters were ready for a single, affordable system that could capture, paint, compose, database and reproduce thousands of high-resolution (up to 6MHz) color images on perma-

nent, non-volatile, digital optical discs. Up to 8,000 images may be stored on one single-sided 12-inch optical disc.

NTSC component or composite images



are captured, manipulated and restored using real-time dual-frame buffers. Access time is less than 1.9 seconds for on-line discs, or nine seconds to change discs. The system can be expanded to up to five on-line disc changers for on-line recall of up to two million images.

• **NEC America: Digital Video Recorder**

NEC opened the doors to the future with the *model SR-10, the first all-solid-state digital video recorder*. The virtual elimination of "go-rounds" (spinning disks, heads or other moving parts) captured the attention of each judge.

Using 1,000 1Mb chips in its memory, the NEC model SR-10 stores 34 seconds (1,020 frames) of video for instant frame-by-frame random access and real-time slow-motion recording and playback. Up to 136 seconds of storage expansion is optional. Audio signal-processing for "scratch track" editing also is optional.

The SR-10 lends itself to a variety of teleproduction applications. It is a digital production tool with real-time random access, virtually unlimited layering and a built-in digital mix-keyer. For live programming, the elimination of mechanical systems could redefine the limitations of live instant replays and slo-mo. Its all-solid-state design enables transportability without the risk of disk crash.

Up to four channels of inputs and outputs may be controlled simultaneously in any desired sequence. An optional hard disk or tape may be used for external data storage.

• **Panasonic Broadcast Systems: automated cassette system**

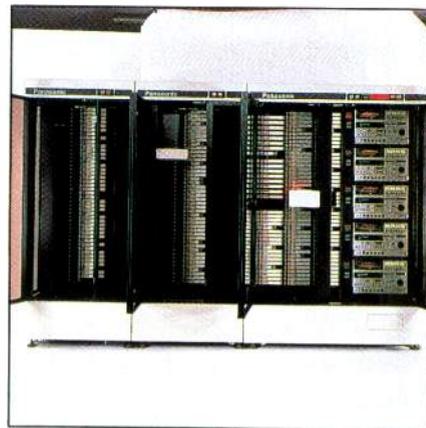
The mechanical and robotic design of the *M.A.R.C. II automated cassette system* provided what our judges were looking for in a cassette/library automation system. Although judges didn't think endorsement of any particular 1/2-inch format was in order, they observed that the overall design of the system addressed many of the unique requirements of broadcast automation. Upgrad-

ability, efficiency, flexibility, simple robotics and mechanics, and convenient interface to the outside world were seen as major steps forward in system design.

The capability to play programming from four seconds to 90 minutes, integrating either size cassettes without adapters, adds to the versatility of the system. The support of multi-event/1-cassette operation, combined with a 1,000-cassette library, promises a self-contained, automated on-air playback center.

The M.A.R.C. II can be connected to a station's automation system for uploading and downloading and can be integrated into an automatic billing system.

The system also can be used as the recorder for component editing, using external inputs for sources, with the finished cassette included in the database.



• **Pinnacle Systems: Video Workstation**

A major departure from traditional broadcast digital hardware design made its NAB debut in the Pinnacle Systems booth. Judges agreed that Pinnacle's *Video Workstation* offered an affordable and upgradable high-quality effects and/or graphics system. Clever hardware design holds power requirements under 175W, while software and expansion modules offer features ranging from simple X-Y digital effects to sophisticated color 3-D capture, paint and animation functions.

The Video Workstation provides composite and component inputs and outputs. Internally, the device uses a digital 4:2:2 real-time video bus that operates in



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Circle (46) on Reply Card

parallel with a general-purpose computer bus. This allows multiple, simultaneous software-based functions to coexist in a single serial system.

Pinnacle Systems' Video Workstations are available in a variety of configurations, all of which are upgradable to the fully loaded system. The model 2010 is a basic digital effects system. It can be upgraded to include still storage (model 2020), graphics (model 2020-2), 3-D (model 2030) and animation (model 2040).

• **Townsend Broadcast Systems: 10kW UHF transmitter**

An internally air-cooled Amperex YK1270 klystron is the heart of Townsend's model *TB-10TM 10kW TV transmitter*. Judges thought the self-contained cooling system, compact packaging and affordable price made it attractive for use as a primary, standby or remote transmitter.

A 47kW unitized beam power supply provides the beam voltage to operate the klystron. Vacuum contactors are used to switch the 220Vac required to operate the beam supply. Two high-voltage drawers in the klystron cabinet hold high-voltage resistors, heater supply, ion pump supply and the HEP pulser. All high-voltage components except the vacuum contactor and the beam supply are mounted inside the klystron cabinet.

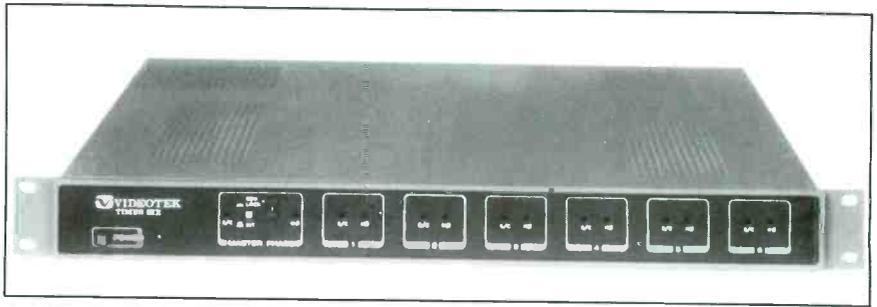
Control and monitoring is all digital. Status of each amplifier and other components are shown in a pictorial system block diagram with LED fault lights.



• **Videotek: adjustable blackburst generators**

Judges agreed Videotek's new *gen-lockable, adjustable blackburst generator, model Times Six*, is a product that has been needed by studios and remote trucks for years. The Times Six replaces the delay lines and precision lengths of coaxial cables typically necessary for video system timing. With the Times Six, six video sources can be timed from a central location to a system using only a screwdriver and a waveform monitor.

The Times Six contains six RS-170A-type blackburst generators, internally or externally referenced, each with individual horizontal and subcarrier phase correction. Controls provide for H-phase ad-



justment from 1 μ s advanced, 2 μ s delay.

Subcarrier is adjustable throughout the entire 360° range. Each blackburst output can be used as reference input to cameras, switchers, effects units, character generators, remote sync generators or other gen-lockable sources that must be timed with the system.

The Times Six occupies only 1 $\frac{3}{4}$ " of rack space and draws less than 25W.

The Judges

We selected a panel of 10 well-known and respected independent industry experts to comprise our panel of judges. Five judges participated in

the selection of radio products, and five participated in the selection of TV products. Our panel was composed of the following individuals:

For Radio:

John Battison
BE's consultant on antennas/radiation
Owner, Battison and Associates
Columbus, OH

Sam Caputa
Chief engineer, KEZK-FM/WRTH-AM
St. Louis

Andy Laird
Chief engineer, KDAY-AM
Los Angeles

David Obergoenner
Chief engineer, KUSA-AM/KSD-FM
St. Louis

Ed Treese
Contract radio engineer
Merriam, KS

For Television:

Robert Hess
Chief engineer, KVOR-TV
Sacramento, CA

Rich Lehtinen
Video engineer, KSL-TV
Salt Lake City

Karl Renwanz
Vice president of engineering and
operations, WNEV-TV
Boston

Elmer Smalling
BE's consultant on
cable/satellite systems
Jenel Systems and Design
Dallas

Steven A. Smith
President of Broadcast
Technology Consultants
Mission, KS

New products

Hundreds of new products were introduced at the NAB convention in Dallas. The BE "Show of Shows" feature (see page 76) provides a comprehensive summary of all the new products unveiled at the convention. Reader service numbers are provided so that you may receive additional information on the products of a particular company.

Because the NAB convention is the major new product showcase for the

broadcast industry, keep this reference issue on hand as a guide to the latest information on new equipment and engineering trends. Whether or not you attended the convention, the BE "Show of Shows" summary should be an important element in any new product purchase decision.

With a show as large as the NAB, you can't tell the players without a scorecard. Use ours.

[:?=>]]]]

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DYNASTY. The only switches that make obsolescence a thing of the past. Now, ask yourself, "Why"?

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- Why can DYNASTY upgrade my existing system to 100 MHz?
- Why can you field upgrade DYNASTY without special tools?
- Why does DYNASTY use custom PCB Baluns?
- Why can DYNASTY expand to 1000 x 1000?
- Why does DYNASTY use proprietary Laser Trimmed Hybrids?
- Why does DYNASTY require no special ventilation?
- Why can DYNASTY switch Computer Graphics signals?
- Why does DYNASTY reduce maintenance costs and system down-time?
- Why does DYNASTY grow with my future switching needs?
- Why can DYNASTY offer 100 MHz performance at about only twice the price of 10 MHz switches?
- Why is DYNASTY the only switch for you?

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will decide your switching future. DYNASTY meets your switching needs, for today AND tomorrow. Take the DYNAIR challenge and get the answers that you need to hear. Only from DYNAIR.

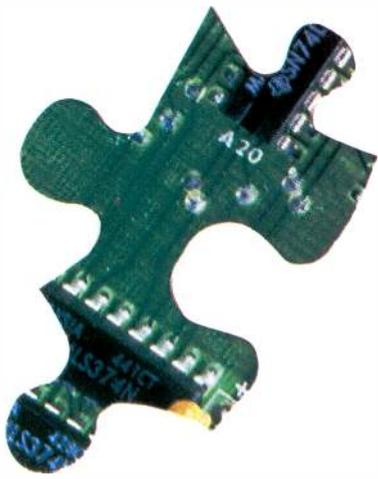
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Show of shows

By Carl Bentz, special projects editor

The 1987 NAB convention brought together nearly 700 exhibitors, more than 40,000 attendees and thousands of new products.

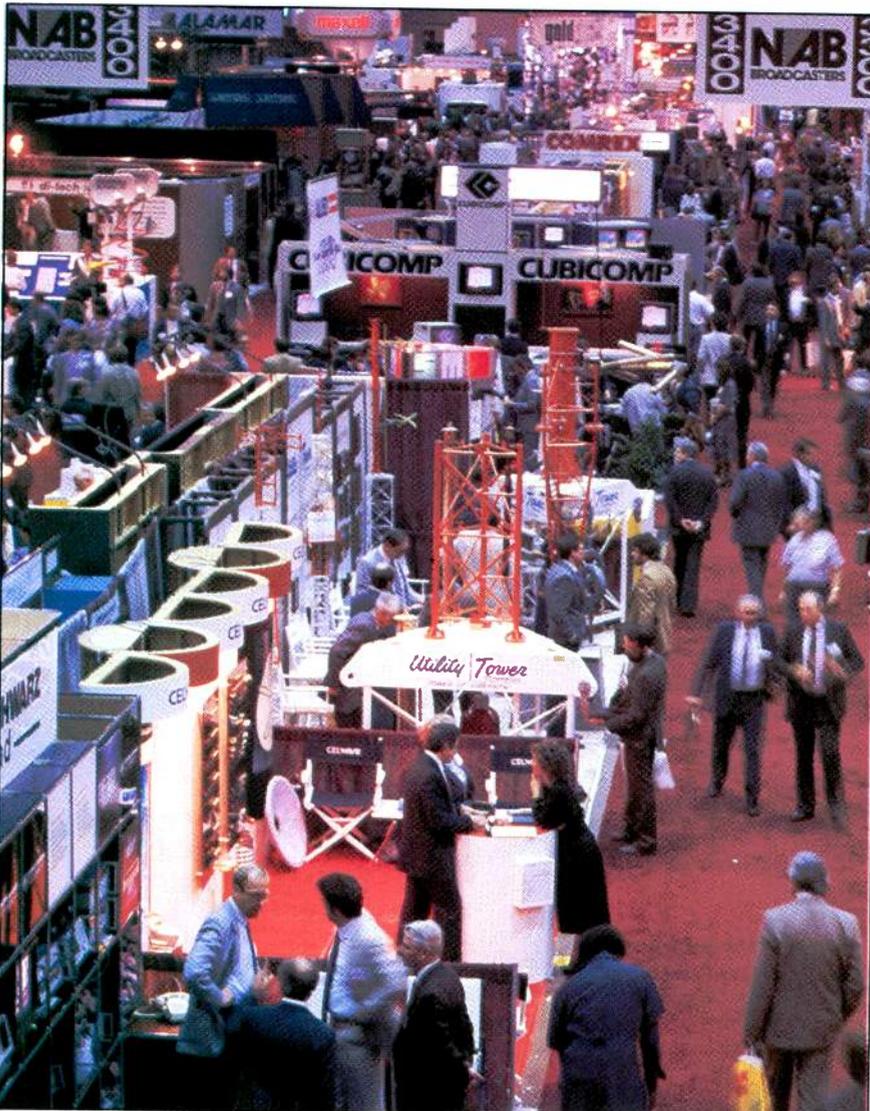


Photo by Douglas Schwartz, Flightspeed Graphics

With the number of new products introduced at this year's NAB convention, you can't tell the players without a scorecard. Use ours.

If you went to the NAB convention in Dallas this year hoping to see everything that was new, you no doubt found it a difficult—if not impossible—project. The **BE** "Show of Shows" feature provides coverage of new product introductions that were announced at the convention.

Our summary is divided into four basic categories: audio products, video products, RF/tower products and support products. Within each major grouping, information is listed alphabetically by company, with a short description of the new product. At the beginning of each entry is a reader service number. To receive more information from a particular company, circle the appropriate number on the reader service card that is bound into the back of this issue.

If an exhibitor is advertising in this issue of **BE**, the page number of the advertisement is indicated by a blue "See ad on page ____." You may get more information about the company and its products by referring to the ads.

In the interest of space, some commonly used phrases have been abbreviated in the listings. The following are a few of the short forms in use.

NRS - noise reduction system
 SNR - signal-to-noise ratio
 μ P - microprocessor
 μ C - microcontroller
 EDL - edit decision list
 LTC - longitudinal time code
 VITC - vertical interval time code
 OS - (computer) operating system
 EQ - equalization

In case you didn't get to Dallas this year, this issue is for you. And if you did attend the convention, perhaps **BE** found some of the products you missed.

9-BIT VERSION
NOW AVAILABLE



UNWANTED FRAME GRABBING STOPS HERE



DFS-3000N Digital Frame Synchronizer

If your video synchronizer lets you down on a noisy feed, you need the new Leitch DFS-3000N. This digital frame synchronizer incorporates input processing circuitry that uses the latest in digital auto-correlation techniques to prevent intermittent frame grabbing or switching to black. Only Leitch offers this capability.

Now you know one of the features of the Leitch DFS-3000N. But the advantages don't stop there. Neither should you. Write or call (toll free) for further information.

In U.S.A. 1-800-231-9673
In Canada 1-800-387-0233

LEITCH

Progressive Concepts in Television Technology

Leitch Video of America, Inc.
825k Greenbrier Circle
Chesapeake, VA 23320
(804) 424-7920

Leitch Video International Inc.
10 Dyas Road, Don Mills
Ontario, Canada M3B 1V5
(416) 445-9640

Circle (48) on Reply Card

Product Directory

Audio Products78

- Audio amplifiers/processors: compressors, limiters, noise reduction, delays, effects, telephone hybrids.
- Audio mixer systems.
- Audio recorders: analog, digital, synchronizers, recording accessories.
- Audio sources, monitoring: microphones, wireless mics, audio remote pickup equipment, phono players, CD players, intercoms, headphones and headsets.

Video Products94

- Batteries, chargers, lighting, grip

equipment.

- Cameras.
- Camera support products.
- Digital video equipment.
- Editing equipment: controllers, machine synchronizers, animation.
- Monitors, TV receivers, projectors.
- Processing equipment.
- Production, master control switchers.
- Prompting systems.
- Telecine, film products.
- Time code, timers, counters.
- Videotape recorders.
- Weather graphics, data systems.

RF/Tower Products138

- AM, FM radio transmitters.
- ITFS, MDS/MMDS, STL, microwave

equipment.

- Power amplifier tubes, klystrons.
- Receivers/demodulators.
- RF amplifiers.
- RF generators (SCA, stereo, MTS).
- Satellite antennas, electronics.
- Towers.
- Hazard lighting.

Support Products152

- Automation equipment: program, newsroom, business.
- Cable, connectors, fiber optics, power equipment wire.
- Cases, racks, carts, studio furnishings, machinery.
- Recording tape, degaussers, reconditioners.
- Signal distribution: routing switchers, distribution amplifiers.
- Test/monitoring equipment, tools; filters, delay lines.
- Vehicles.

SLIM & POWERFUL.

A FULL FEATURE BROADCAST PERFORMANCE TBC

FEATURES

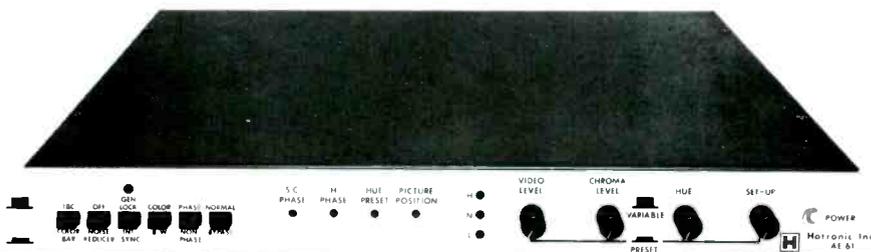
- Time base correction for Heterodyne VTRs.
- Constant H phase for matched frame edit.
- 4 times sub-carrier sampling, 8 bit resolution.
- 16 line window.
- Absolutely transparent.
- Operates with or without VTR 3.58 MHz sub-carrier feedback.
- Adjustable horizontal and vertical blanking.
- Handle high speed search.
- Full processing amplifier control.
- 1 3/4 inches height, less than 15 lb.

OPTIONS

- Noise reducer.
- Digital SMPTE Color Bar
- Station Identification.
- Digital pixel by pixel Drop out compensator.

The HOTRONIC AE61 upholds the standards of performance and easy operation that so many TBC users demand. While paring size and weight to the barest possible minimum, it does not sacrifice the rigid Hotronic standards of reliability and longevity. This product is not merely transparently respectable. It is transparently superb! The AE61 is custom-designed for the increasingly quality-conscious world of the 80s. The demand for quality in the 80s has sharpened the character of the AE61 — the standards of Hotronic have formed it!

THE HOTRONIC AE61.



HOTRONIC, INC.

1875 S. Winchester Blvd.
Campbell, CA 95008
408/292-1176 or 408/378-3883

Circle (49) on Reply Card

Because of the size of the convention and the large number of new products introduced, it is possible that information on some product introductions was not available at the time of the convention, or was not delivered to **BE**. For any products that may not be included in our summary, stay tuned to the New Products section of **BE** in coming issues.

Audio Products

Audio amplifiers, processors, compressors, limiters, noise reduction, delays, effects, telephone hybrids

AKG Acoustics Circle (515)
ADR68K reverb: combined effects, reverb; digital 16-bit sampling; 15kHz bandwidth; configures as 8s delay or four 2s segments; various programs for spatial volumes.
Version 3.0: software for ADR-68K; dual digital delay line; multitape stereo processing; multi-effects; poly-chorus; stereo sampling.

See ad on page 165

Aphex Systems Circle (545)
70S processor: multiband peak limiter, conforms to NRSC AM stereo; Transient Enhancement Circuit (TEC) restores psychoacoustic effects lost in processing; auto limit threshold manages output summing without distortion.

Audio Broadcast Group Circle (562)
MTR-4.5 monitor: for audio/video production facility; stereo inputs; magnetic

Anything less than a Neve is just a lot of...

Bells and whistles may be all you need for New Year's Eve...or a birthday celebration. But is a desk full of bells and whistles enough for the demanding art and science of broadcast production? You need the Neve difference.

At Neve, the first name in audio mixing control and distribution systems, we offer you all the bells and whistles your creativity demands...as well as the sonic quality, reliability, and ease of operation that sets Neve apart from the rest.

Neve's versatile 51 Series, for example, gives you the full range of advanced facilities you want, plus the virtually unlimited versatility you require...to let your creativity soar. With features that include:

- 16-to-60 inputs
- Custom configurations

- Stereo or mono modules
- A choice of 4 standard consoles
- Up to 8 auxiliary outputs
- Multitrack recording capability
- 4-band Neve Formant Spectrum Equalization

Hear the Neve quality difference for yourself. Find out firsthand how Neve advanced engineering gives you "a touch of the future."

Circle the bingo card for a literature pack. Or call (203) 744-6230 for a demonstration of Neve sound at your location.



- Nothing sounds as good as a Neve... because nothing else is.

Rupert Neve Incorporated

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Bethel, Connecticut 06801
Telex 969638
Facsimile (203) 792-7863
(203) 744-6230

7533 Sunset Blvd.
Hollywood, California 90046
(213) 874-8124
Facsimile (213) 874-1406

P.O. Box 40033
Nashville, Tennessee 37204
Telex 786569
(615) 385-2727

Neve Electronics Int'l Ltd.

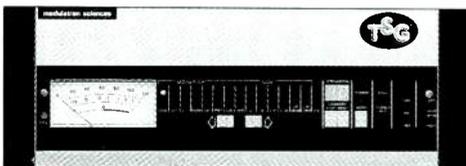
Cambridge House, Melbourn, Royston
Hertfordshire SG8 6AU, England
ph (0763) 60776 fax (0763) 61886
telex 81381

Circle (50) on Reply Card

 **Neve**
A Siemens Company

NOISE

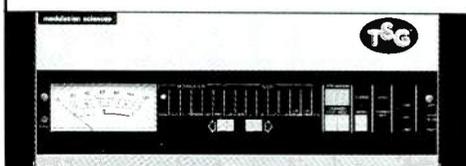
Get The Proven "Second Generation" TV Stereo Generator... Modulation Sciences TSG.



What makes a great "Second Generation" TV stereo generator? Everyone (even our competitors) seems to agree:

- **Digital Stereo Encoding-** Like Modulation Sciences TSG. Only TSG's digital generator design has a 2+ year proven record of rock-solid stability & trouble-free dependability.
- **Exceptional Specifications-** Like Modulation Sciences TSG. Our TSG has always been the choice of those who test and measure. Only TSG's performance specs are independently certified by a licensed PE.
- **Superb Separation-** Like Modulation Sciences TSG. We're the one company that recognized the need for maximum separation, right from the start.
- **Outstanding Audio-** Like Modulation Sciences TSG. TSG delivers the best stereo sound on television.
- **Comprehensive Metering & Full Remote Capability-** You guessed it.
- **Easy, Hassle-Free Installation & Setup, Plus The Best Manual-** Just call (800) 826-2603. We'll be glad to lend you a copy, so you can see for yourself.

And TSG comes with one thing more: A track record. Because Modulation Sciences' one and only TSG—with all the "Second Generation" features and performance you need—is already performing flawlessly at station-after-station. And that's important. Because you want more than promises; you want proven performance.



modulation sciences

115 Myrtle Avenue • Brooklyn, New York 11201
(718) 625-7333 • Toll Free (800) 826-2603

Circle (27) on Reply Card

shielded, 1/2-rack cabinet; 55Wrms amp; 50Hz-17kHz; +22dB without distortion; by Acoustech.

Benchmark Media Systems Circle (587)
MIA-4x4: quad microphone preamplifier system.

SPM-2/3: stereo metering system.

RGC-02: remote gain control daughter board for System-1000.

MTX-02: remote matrix switch board for System-1000.

OSC-1: precision oscillator daughter board for System-1000.

See ad on page 204

Bradley Broadcast Sales Circle (596)
Telos-10: digital telephone hybrid for talk show use.

Broadcast Audio Circle (598)
Headphone EQ: circuit option for Series II, IV mixers; 3-band EQ functions.
Advanced audio processor.

Broadcast Automation/BAI Circle (599)
CRL AM-4 processor: combines audio signal preparation, spectral energy processing and peak modulation control.

Comrex Circle (662)
PLXmicro: 1-line encoder for frequency extender; battery operated; for news applications; fits in briefcase or attaches to portable cellular phone; integral coupler; monitor jack; mic, tape inputs.

TH-2 extender, hybrid: complete 1-line phone interface; integral encoder, decoder; auto level, diverts coupling, auto answer, counts rings, provides remote start.

TH-1 hybrid: multifrequency hybrid balance; manual, auto answering, remote relay for cart start, selectable ring count, de-clicking; removable.

LX-Rplus/LX-Tplus: frequency extender decoder and encoder units; integral Telco coupler; balanced input, output; half-rack cases.

See ad on page 62

CRL Systems Circle (676)
FM processor: upgraded; includes *SGC-800* stereo gain controller; *SEC-800* spectral energy compressor; *SMP-850* stereo modulation processor; *SG-800A* FM stereo generator; maintains maximum stereo modulation, retains tonal characteristics of program source.

AM processor: upgraded; includes *AGC-400/SGC-800* audio gain controllers, *SEC-400/SEC-800* spectral energy processors; *PMC-400A* peak modulation limiter; *SMP-900A* AM stereo matrix processor; selectable NRSC pre-emphasis and bandwidth filtering standards.

SPF-300: pre-emphasis/filter; converts mono processing chain to meet NRSC transmission standards; overshoot corrected; asymmetrical modulation possible; improved modulation on plate-modulated transmitters.

MDF-400/800: de-emphasis/filter; NRSC characteristics; high-Q notch filter; 9.5kHz or 11kHz steep low-pass filter; interfaces to AM modulation monitor, monitor receiver.

See ad on page 13

Delta Electronics Circle (698)
AMP-1 processor: 3-band AM stereo processor; complements stereo exciter ASE-1,

C-Quam transmission systems; processes in L+R/L-R matrix mode; digital AGC without pumping; pre-emphasis per NRSC; no in/out transformers; adjustable attack/release times.

Dolby Laboratories Circle (709)
XP24SR: production package; 24-channel Spectral Recording technology.

365SR: 2-channel Spectral Recording production package.

Model-390: 2-channel noise reduction device, type C; for STL and VCR applications.

Electronic Systems Lab Circle (729)
PEIA Tube-Tech: audio equalizer unit; 84dB SNR, 0.054% IMD; designed with vacuum tube for richer sound; adds warmth to drum, other musical synthesizer devices; from Lydkraft, Sweden.

Eventide Circle (739)
PD860 delay: multipurpose audio delay; 2-channel; delay increments of 1s to 0.52s; for use with AM synchronous stereo transmission; 80dB separation at 1kHz; 5Hz-20kHz; <0.02% THD 1kHz.

Fostex of America Circle (754)
Model 3180: 2-channel reverb; multiple spring design.
Model 3070: gated compressor/limiter; VCA circuitry with pulse width modulation control.

Gentner Engineering Circle (764)
Digital Hybrid: telephone interface; auto null to telephone line on connection; continuous tuning of hybrid null during call; modular phone jacks; XLR audio connections; DB-37 remote control facility.
Telemix X: multiple line on-air hybrid; modular; includes operator controls; Call Director for direction, control of Telco lines from 1A2 key service unit.

See ad on page 56, 196

Gotham Audio Circle (770)
EMT-258 noise filter: EMT-Franz dynamic noise reduction system; cleans up audio recordings and sound tracks.

Inovonics Circle (805)
Model 222: AM pre-emphasis/low-pass audio processor for NRSC; connects between existing processors and AM transmitter without modifications; pre-emphasis protection limiting; integral AM peak limiting; 5kHz version available for shortwave.
Model 255: 3-band stereo processor; pulse width modulation (PWM) feed-forward soft-knee circuit; compression, limiting, slow AGC, gated; 50μs, 75μs pre-emphasis.
Model 390: magnetic film recording electronics package.

Kahn Communications Circle (823)
GNL-86 processor: allows +125% modulation without clipping distortion; no introduction of odd harmonics; increased effective dynamic range; stereo available.

Kintek Circle (833)
KT-904PP: dedicated mono to stereo converter; targeted for post production studio use.
KT-9045: mono to stereo converter for TV.

Miwltronic Circle (1192)
API, API/C: multi-line coordinating auto-

Continued on page 84

Maxell Broadcast Quality Tapes.
They reached for the top. And made it.

A STANDARD IS BORN

*1/2", 3/4" and 1"
In the performances
of a lifetime!*

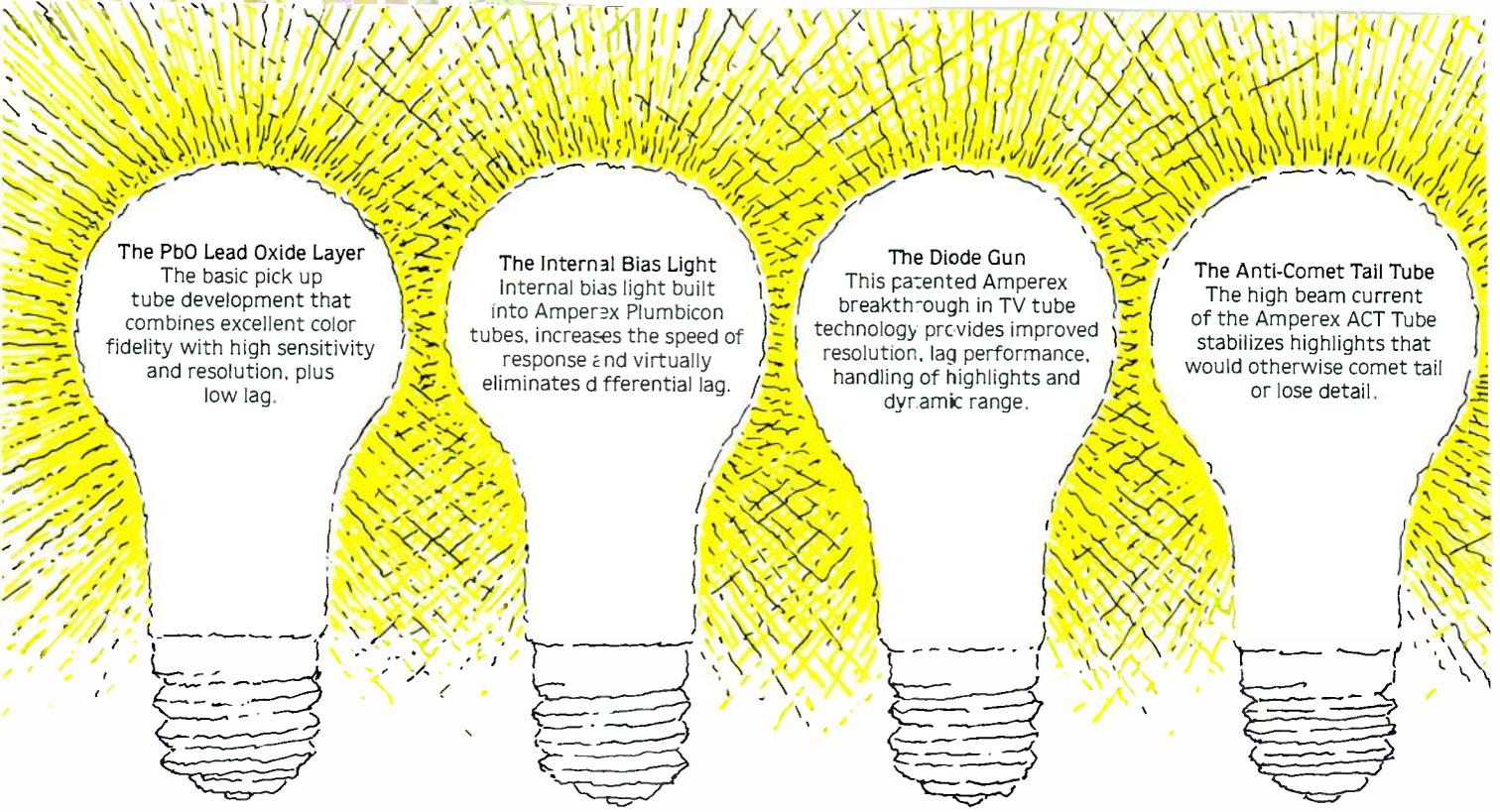
STARRING A FULL LINE OF **PROFESSIONAL AUDIO** AND **VIDEO TAPE FORMATS**
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DAT, **PCM** AUDIO TAPE, **S-VHS** VIDEO TAPE, **8MM** VIDEO TAPE, AND **BETACAM** TAPES!

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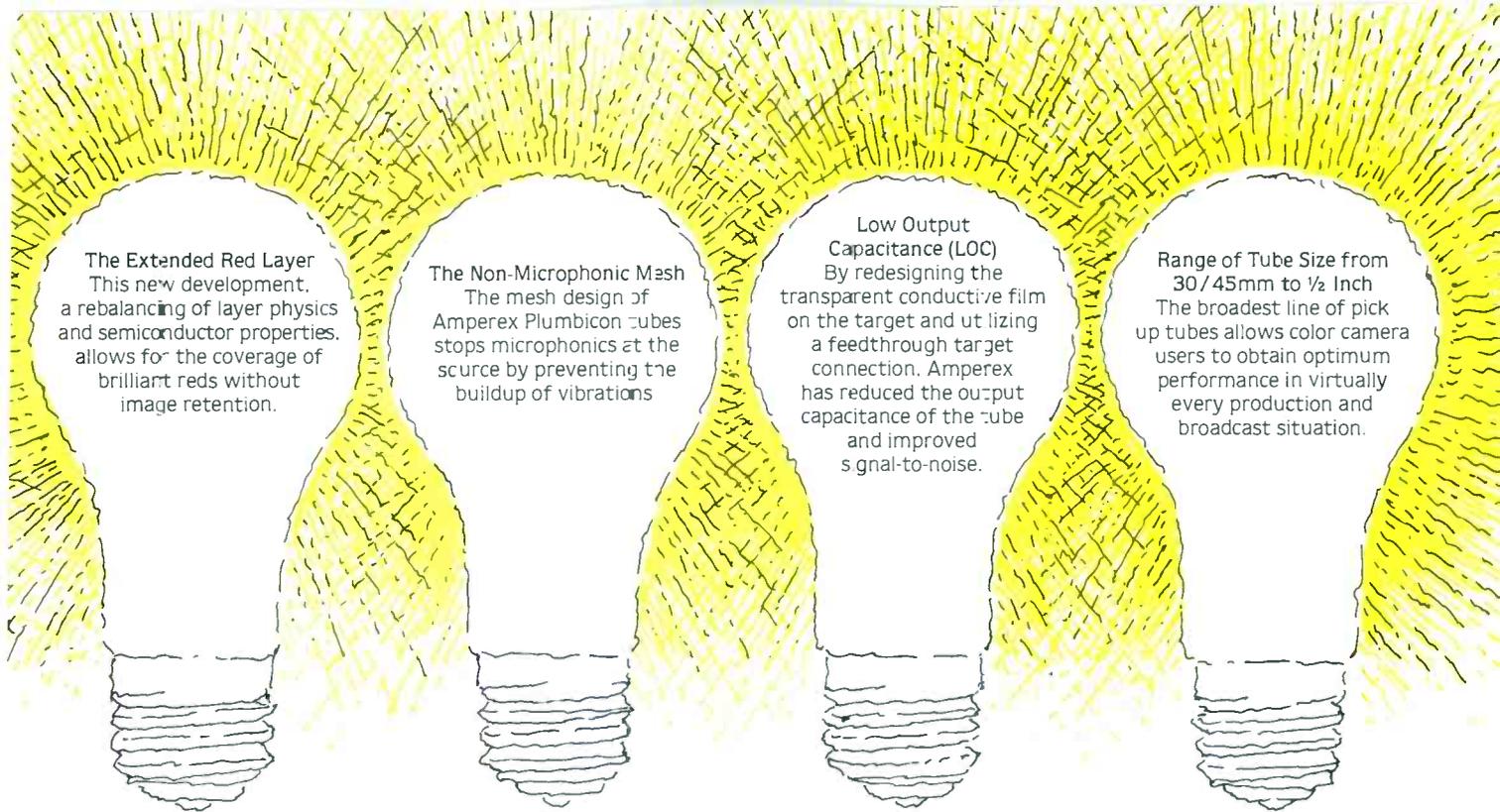
The PbO Lead Oxide Layer
The basic pick up tube development that combines excellent color fidelity with high sensitivity and resolution, plus low lag.

The Internal Bias Light
Internal bias light built into Amperex Plumbicon tubes, increases the speed of response and virtually eliminates differential lag.

The Diode Gun
This patented Amperex breakthrough in TV tube technology provides improved resolution, lag performance, handling of highlights and dynamic range.

The Anti-Comet Tail Tube
The high beam current of the Amperex ACT Tube stabilizes highlights that would otherwise comet tail or lose detail.

Eight brilliant ideas in TV



The Extended Red Layer
This new development, a rebalancing of layer physics and semiconductor properties, allows for the coverage of brilliant reds without image retention.

The Non-Microphonic Mesh
The mesh design of Amperex Plumbicon tubes stops microphonics at the source by preventing the buildup of vibrations.

Low Output Capacitance (LOC)
By redesigning the transparent conductive film on the target and utilizing a feedthrough target connection, Amperex has reduced the output capacitance of the tube and improved signal-to-noise.

Range of Tube Size from 30/45mm to 1/2 Inch
The broadest line of pick up tubes allows color camera users to obtain optimum performance in virtually every production and broadcast situation.

technology and what they mean to you.



The current high state-of-the-art of TV color cameras owes a great deal to the ideas and insights generated by Amperex and Philips. In fact, our corporate family has developed more innovations and refinements in pick up tube technology than anyone else.

Behind each flash of brilliance is a deep understanding of the broadcasting industry. We know, for example, how competitive pressures have created a need for cameras that deliver increasingly better performance in a variety of difficult situations.

We've responded... with one innovation after another until today, we offer the broadest line of extended performance Plumbicon® TV Camera Tubes. No matter what cameras you use—domestic or imported—we have the tube that can optimize their performance. Which makes the specifying of Amperex Plumbicon tubes a pretty bright idea in itself.

Made in Rhode Island, U.S.A. Delivered to you in twenty-four hours or less.

For more information call or write Imaging Products Group, Amperex Electronic Corporation, Slatersville, Rhode Island 02876. (401) 762-3800. A North American Philips Company. Outside the U.S.A. contact: Philips Electronic Components and Materials Division, 5600 MD Eindhoven, The Netherlands.

Amperex®

*Amperex Imaging Products
... we see things your way.*

Continued from page 80

answer phone interfaces; powered by Telco line; compatible with most studio and record/play equipment. /C version includes LCD call counter.

Orban Associates Circle (936)

Model 787A mic processor: multifunctional, programmable 32-memory setup; 3-band parametric EQ, compressor, noise gate, effects send/return; mic preamp, auto-ducker optional.

464A Co-Operator: 4-stage level control; gated AGC, fast attack compressor; high frequency limiter, selectable pre-emphasis; peak clipper.

See ad on page 7, 17

ROH/Anchor Audio Circle (990)

191X-16: expansion panel for existing or

new ROH line monitors; 16-input; selectable input 1-5 powered monitor; full width or half-width rack-mountable.

See ad on page 190

Russco Electronics Circle (1179)

T212: telephone equalizer-coupler; interface standard dial Telco line to studio console; two separately adjustable 600Ω balanced outputs; 2W headphone amp; 3-band EQ.

T1000: telephone interface; lets talk show announcer converse with caller while on air; mute caller function activated by raising voice level.

MA325: stereo power amplifier; 25W/channel rms; peak indicators on panel; accessory to Russco 505-S mixer; 9kΩ unbalanced input; 8Ω output; >80dB SNR, >60dB separation 20Hz-20kHz.

SESCOM Circle (1008)

SAT-2: audio leveler, rack-mounted, for satellite programming.

MDL-6: dual mic/line driver, rack-mounted.

TR-IL series: hi-Z to lo-Z interconnection equipment; transformers; pads; mini-compressor.

Straight Wire Audio Circle (1042)

EZ-Wider expanders: stereo, stereo spatial expansion processors.

Distributor: Audio Design/Recording Scamp audio processor.

Studio Technologies Circle (1046)

ISS Integrated Simulator System: converts mono to simulated stereo; manual or auto conversion; phase reversal correction.

Symetrix Circle (1053)

Symetrix-108 telephone interface: μP-controlled 8-incoming call system; optional second controller for second person to act as call director; profanity button; JH-11 modular Telco phone connections; seize, release, transfer to hold, cue, air modes.

Texar Circle (1076)

Phoenix: all-in-one audio processing system for monophonic AM broadcast; meets the NRSC specification; includes phase rotation.

AMC-2: clipper card for existing Texar Audio Prism units; replaces AMC-1 card to upgrade unit to NRSC spec.

Super Eagle: clipper module from Phoenix system; operates separately to allow clipper, tilt correction, asymmetry functions at transmitter with other parts of processor at the studio; allows second set of parameters for backup transmitter.

Titus Technological Labs Circle (1089)

MLW-1: multichannel audio controller; μP-controlled.

TOA America Circle (1091)

Digital signal processing: demonstrations with mixer, EQ, effects.

Valley People Circle (1115)

Model-816: 800 series leveler module; single channel control device.

Model-817: 800 series single channel level compressor, expander.

Autogate: 2-channel frequency selective noise gate and expander device.

Video Associates Labs Circle (1124)

Streamline music scoring: software by Off-beat Systems; for PC and compatibles; synchronizes music with film, video.

Audio mixers

ADM Technology Circle (509)

RM-1168 matrix: mix-minus system; each output a mix of inputs minus undesired inputs; push-button input selections; for news, field production, teleconferencing; 8-out from 16, 24, 32, 48 in.

RM-1083 mixer: rack-mount; for mobile or fixed installations; 8-input mic/line each with phase reversal, 3-band EQ, aux send, pan, high pass filter; left/right, aux, monitor, headphone output.

Model-1602: editor interface for STV-series production consoles.

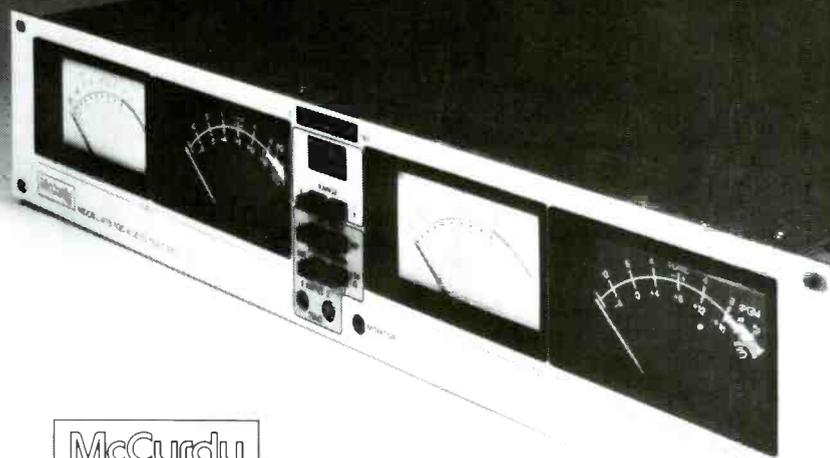
See ad on inside front cover

EXTEND YOUR LEVEL OF SUCCESS

The ATS-100 Stereo (dual channel) Extended Range Audio Meter is a self-contained audio measuring system. Dual "VU" meters provide precision visual monitoring. Peak Program Meters offer simultaneous level and peak monitoring.

The ATS-100 input sensitiv-

ity allows for a wide range of levels, from -60 to +30 dBm, and a visual indicator is provided for accurate phase measurement. The reliable, fully solid state amplifier and power supply, coupled with advanced micro-processor control, is assembled in a compact 3 1/2" rack mount frame.



McCurdy

McCurdy Radio Industries

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Canada M4A 2L4 Tel: (416) 751-6262
Telex: 06-963533 Telefax: (416) 751-6455
1051 Clinton Street, Buffalo, New York 14206
Tel: (212) 772-0719

Circle (52) on Reply Card



"And now, live from the scene..."

It's happening now, and it's news. Though it may not be a catastrophe to some, for you it's a disaster of unbelievable proportions. While your tape is trapped in traffic, in a helicopter on its way in, or racing to get into microwave range, your competition is on the air live. And, it hurts.

There's a simple solution and it's not as expensive as you think it is. The NETWORKER from Centro, or its 4x4 cousin the NEWSBREAKER, may just be the piece of production equipment you need to get the job done. And, to take back a few critical rating points.

Ku-band satellites, like electronic news gathering and microwave transmission, is helping redefine "local news." Whether you're

looking for no-frills basic uplinking, a middle of the road truck with a little production gear or a full blown SNV, Centro has just the truck you're looking for.

You know Centro, the systems people

who've been building top-notch mobile broadcast and production vehicles since the industry first discovered wheels. Everything from compact ENG vans to the big 48 footers.

So it should come as no surprise to find out that the most

rugged, most versatile, most valued SNV on the market comes from Centro. Why not take a minute right now, while you're thinking about it, and give us a call. Before the next big story breaks and they're on the air again, first.



The new 4x4 Newsbreaker.

Centro is a subsidiary of Skaggs
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- Modern 7,000 ft. test range facilities
- Innovative Engineering Careful construction
- Two Year Warranty on Product and Workmanship



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Sacramento, CA 95828
(916) 383-1177 TELEX 377321

Circle (29) on Reply Card

AEG **Circle (512)**
Tore Seem PLUTO mixer: 3-mic or 2-mic/1-line ENG, switchable low cut filter, low-Z balanced output, aux return input, commentator feed, stereo headphone output; weight 4.5 lbs with batteries.
[See ad on page 143](#)

AF Associates **Circle (513)**
Audix AAT-3000: assignable audio production mixing desk.

AKG Acoustics **Circle (515)**
Soundtracs FME: modular stereo mixer for on-air; production; reinforcement; multi-track recording.
[See ad on page 165](#)

AMEK Consoles **Circle (529)**
BCII mixer: drop-through audio console; to 29 mono/stereo inputs; 32-position system fits into OB vans, mobile production vehicles.

G2520 mixer: multi-track console; 24-/48-track formats from 40- to 56-input; balanced buses; on-board or external jackfields.

Classic mixer: extends BCII design for stereo TV; eight stereo subgroups; multi-track monitor; 4-band parametric EQ; 4-, 8-track aux sends; balanced buses; 32-, 48-, 64-input frame sizes.

TAC-Scorpion enhancement: S1200 stereo line, S1100 mono mic/line inputs; SFB2100 foldback output module; enlarged chassis to 53 positions; output VU metering; XLF configures for 40-8-2, 32-16-2 formats; XPB uses eight positions for on-board jackfield.
[See ad on page 179](#)

AMS/Advanced Music Systems **Circle (535)**
Assignable Calrec console: mixer with computer control and Total Instant Reset of channel controls, routing, faders for 128 channels, 12 stereo groups; floppy disk memory backup.

Arrakis Systems **Circle (549)**
10,000 series: console for on-air or production applications.
250SC console: 6-channel, rack-mount mixer; for studio, mobile.
[See ad on page 21](#)

ATI Audio Technologies **Circle (557)**
BC12DSL mixer: Vanguard audio console; 12-mixer, 24-input dual stereo; VCA level control; digitally scanned switching matrix controls all functions.

Audio Developments **Circle (563)**
ADO62-M console: studio version of portable mixer; 5-meter monitor bridge with speaker adjusts for convenient viewing; 10 monitor select switches call up eight sources; 3-band EQ, high pass filter; +24dB 600Ω output.

Audio Kinetics **Circle (565)**
MasterMix: audio console automation.

Audio-Technica US **Circle (567)**
AT4462 field mixer: stereo production system includes two mono and two stereo inputs; line/mic switching; stereo limiting, Lev-Alert alarm; Modu-Comm feedback system sends program audio on mic line to talent using AT4452 decoder; phantom power; uses two 9V batteries.
[See ad on page 120, 121](#)

Auditroneics **Circle (569)**
Series-400 mixer: desktop or drop-in production audio console; 12-, 18, 24-input configurations with 4- or 8-output models; EQ available; 2 aux buses, VCA control, 16-track monitor, patch-point switching; optional 2-line Telco hybrid interface.

Audix **Circle (570)**
AAT-3000: production mixing desk; assignable through digital control; memory recall of settings.

Autogram **Circle (572)**
R/TV-12 console: on-air mixer; eight dedicated pots, four 4-inputs each; VCA control with P&G faders; all channels remotely controllable; eight patchable mic preamps; stereo program, audition outputs, dual mix-minus, one mono.

Broadcast Audio **Circle (598)**
Rack-mount: 6-mixer audio console; front panel cue speaker; metered level preselections.
Series-V: broadcast console; integral digital timer; headphone EQ in control room monitor panel.

Connectronics **Circle (667)**
SECK-63B mixer: broadcast configuration of the Bandive SECK-62 recording and PA portable audio system.

Dorrrough Electronics **Circle (710)**
Model 700 console: dual channel, mono mixer; three external monitor inputs; three mic inputs, 15 line inputs; 7-position mixing with Shallco attenuators; two VU meters; cue speaker; 10W amp.

Harrison Systems **Circle (782)**
Air-7 prototype: on-air broadcast audio console; error-free audition switching logic; remote start/stop controls; auto monitor muting; mainframe configurations from 8-28 channels; modular construction.

Ikegami Electronics **Circle (798)**
AXB-160A audio mixer: 16-channel portable; four stereo line inputs; five AUX channels for input/group modules; FET switching; master, aux, group metering.
[See ad on page 146-147, 169](#)

International Music Company/IMC **Circle (810)**
AKAI MPX820: 8-channel audio mixer; programmable, full MIDI control of faders, pans, effects sends/returns, EQ, monitor, aux input levels, master fader, event fade time; 99-event.

Logitek **Circle (859)**
Stereorack: rack-mounted, 6-mixer, stereo audio console; 11 inputs; L/R VU meters; VCA control; 1-in/4-out DA on each output channel; separate headphone feeds for operator, three guest/crew positions; Hall-effect switching.
[See ad on page 153](#)

LPB **Circle (861)**
Signature-III series: audio consoles in 6-, 8-, 10-mixer dual mono, stereo configurations; three inputs per mixer; integral cue, headphone amps; VU meters; rotary faders.

McCurdy Radio Industries **Circle (878)**
S-console: audio mixer; desktop, drop-in; redundant power supplies; largest main-

frame to 26 input mixing modules; telephone bus; VCA controlled monitor.

See ad on page 84

Mitsubishi International Circle (894)
Westar 8300: film re-recording console; 8-, 16-, 24-mix bus, 10 aux send bus; plug-in EQ, dynamics control, mic preamps; fader options for audio VCAs with subgroup, tape, computer automation.

Neotek Circle (920)
MIDI Direct: console automation on MIDI bus; works only with Neotek elite, elan, esprit consoles.

elan series: 28-, 36-input recording consoles; second input of each module doubles capacity; 30 aux buses; mic/line levels, 4-band EQ, six aux sends, 24-track assignments; bargraph meters.

Production console: modular; transformerless audio path; instrumentation preamps; 4-band parametric EQ; 4-8 subgroups, four aux sends; patched, direct outputs.

elite consoles: recording mixer; frame for 28-, 32-, 36-, 40-, 48-, 56-, 64-input modules; metered stereo input module replaces mic/line input modules; automation available; 10Hz-25kHz bandwidth at full level is 0.2dB.

Orion Research Circle (937)
AMY consoles: production models, software-based audio mixer; 32-input, full stereo processing; reMem system recalls complete mixer setup.

Pacific Recorders/Engineering

Circle (940)
STEREOMIXER: modular audio control; 19" 8-module mainframe; input module types for mic, stereo line, tape in/out, Telco in/out; EQ, voice processor options; self-powered; headphone monitor.

Panasonic Industrial Company

Circle (945)
RAMSA WR-8428: 28-input post-production console; simultaneously mixes and monitors two 24-track tape machines, plus mic and stereo sound sources; 10-bus system - 4 group, 2 master, 2 send and 2 echo buses; 100mm-stroke faders, 3-band EQ with high, mid and low ranges.

See ad on page 91, 93, 95

PKE International Circle (958)

CSC-1 audio console: stereo on-air mixer; modular design in custom configurations; available features include auto delay catch-up; cart-fill delay control logic; telephone connector hybrid; tone generator module.

Quantum Audio Labs Circle (970)

QS-22 series: audio production, broadcast consoles; 8-28 input, modular designs; mono, stereo configurations.

Sennheiser Electric Circle (1007)

M-8 ENG/EPF mixer: 8-input modules (6, 12 available); talkback, pan, PFL, EQ, low-pass filter; switchable aux output; P&G faders; phantom mic power; operates from 110Vac, 12-24Vdc, D-cells.

Shure Brothers Circle (1015)

FP51 mixer: gated compressor, mixer combination; 120/240Vac or three 9V cells; 8:1 minimum ratio from 10-20dB compression; gated; adjustable attack, recovery.

See ad on page 42

"No more halftime headaches..."

"This new Telex headset is so light and comfortable I can finally leave my aspirin home. And, my engineer says I sound great!"

Charlie Jones

The newest Telex "Sportscaster" boom mic headset has the pros in the broadcast booth talking. Good news about the model PH-24 is spreading quickly among veteran sports announcers like network television sports announcer Charlie Jones. Imagine, a professional broadcast headset with full studio-quality, electret condenser microphone and optimum earphone receiver performance weighing a mere 2½ oz. (less cord).



Includes effective windscreen and push-to-cough switch. For complete information about this and other professional headsets from Telex, write to Telex Communications, Inc., 9600 Aldrich Avenue South, Minneapolis, MN 55420. For quick information, call toll free

800-328-3771

or in Minnesota call (612) 887-5550.



Charlie Jones, nationally known network television sports announcer.

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<p>High-capacity Battery Belts power lights cameras, & recorders</p> 	<p>12-oz. "Mini-Fill" Camera Lights Accessories & Kits</p>  <p>12 volts. 20 to 100 Watts</p> <p>Used by all 3 major networks.</p>	<p>FBP-90FC Exclusive: extra output connector for portable lights</p>  <p>power lights, cameras, recorders</p> <p>1-hour re-charge</p>

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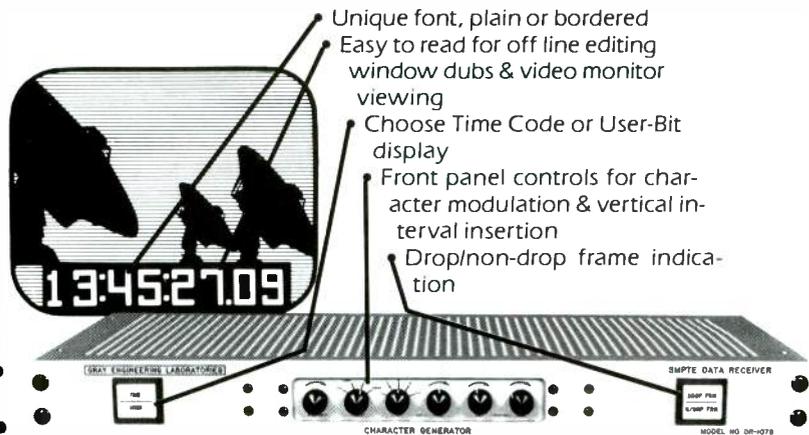


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SMPTE/EBU Time Code Reader & Character Generator

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- Front panel controls for character modulation & vertical interval insertion
- Drop/non-drop frame indication

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- Parallel BCD output
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714-997-4151

Circle (56) on Reply Card

Solid State Logic Circle (1020)
G-series computer: console automation device; fast processors, expanded on-board memory; 20MByte data cartridges; compatible with previous E-series console computer system.

See ad on page 69

Sony Professional Audio Circle (1151)
MXP-2036 console: 32-channel audio board; for stereo TV, radio, audio-for-video; modular; four audio groups, four VCA groups; 3-band EQ; optional dynamics processor, editor interface.

See ad on page 24-25, 98-99

Soundcraft Electronics Circle (1027)
TS12 mixer: 102-input, 36-channel main-frame audio control desk; dual mix/channel signal paths, six stereo FX returns, 4-band EQ, aux sends, main reverb return, 16 optional FX returns; routing matrix for 12 subgroups or aux sends; two mute groups; disc-based automation option.

Series-600 patchbay: 336-point patch access to line signal connections; 56-way Var-elco connectors for tape interface.

SAC-2000 console: integral sequencer; remote from-the-field music/commercial start control; Air-Control module with profanity delay; universal interfaces for CD, turntable, ATR, cart decks; three program buses with RF immunity, phase meter, dual timers.

Soundtracs PLC Circle (1030)
Model FMX: stereo recording, production desk; 8-4-2 configuration.

Model FME: modular 22-, 30-position main frame, broadcast version of FMX mixer; remote starts, subgroups, master modules; options for transformer balancing.

PC-MIDI: 16-, 24-input mixing console for MIDI intelligent in-line audio; various configurations through MIDI control keyboard.

Model MRX: modular 24-, 32-input audio production.

CP6800-series: stereo console with automation; split design; digital routing system; optional MIDI/SMPTE/EBU time code to synchronize keyboards and other music devices for mixdown.

Southern Broadcasting Systems Ltd Circle (1182)

Alldesign on-air mixer: standard 16-input mainframe; program, audition, cue stereo buses; mono, mix-minus, mono audition outputs; sequencing for carts; CMOS switching, VCA, conductive plastic controls; dual timer clock; full metering.

Studer Revox America Circle (1045)

C279 compact mixer: 6-input; for balanced mic, mono, unbalanced stereo line; 48V phantom power, lo-cut filter, shelving, mono pan/stereo balance, PFL aux level, VCAs, long-throw faders.

See ad on page 34-35

Studio Master Systems Circle (1183)

Studio Master Plus w/CCL: Macintosh Plus software logs position of mixing console controls; 16-channel spectrum/level analyzer.

TASCAM Circle (1058)

M-600 series: 16-bus mixer; stereo, mono input strips; 16-/32-channel monitoring; eight aux mixes; balanced connections, EQ;

NEW. HERE. NOW.



NEW A14x9ERM

NEW A18x8.5ERM

Offering you higher performance, reliability and value, Fujinon's newest and finest ENG lenses are available now.

The new A18x8.5ERM gets you in closer and takes you out farther. It gives you two focal ranges — 8.5mm to 153mm and 17mm to 306mm — by flipping the built-in 2X extender lever. The F1.7 maximum aperture is flat to 116mm and only drops to F2.3 at the full 153mm tele position. About half an inch longer than ordinary ENG lenses, the new A18x8.5ERM's combination of range, features, and performance are making it the new world standard for electronic news gathering.

The new A14x9ERM, lighter and more compact, outperforms its predecessors and the competition. It's less than 1.4kg with the flexibility of a built-in 2X extender. MOD is 0.8m. And it provides an F1.7 maximum aper-

ture from 9mm to 103mm (F2.0 at 126mm).

Both new lenses offer performance improvements including higher MTF with significant reductions in distortion and longitudinal chromatic aberration. Images are sharper and brighter throughout the zoom ranges. Color and focus tracking are right on. Both lenses also offer macro focusing, weatherized construction, and such Fujinon options as miniaturized, built-in pattern projectors, front-mounted wide and tele adapters, manual and servo hand controls for studio use, and push-button shot boxes for programming multiple focal positions and zoom speed.

They're new. They're here. And they're available now. To learn more about Fujinon's new ENG lenses, you'll get more information or a demonstration by calling the Fujinon location nearest you.

Circle (57) on Reply Card

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(214) 385-8902
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 **FUJINON**

monitor channels double for inputs, effects returns.

[See ad on page 45](#)

VCL Audio **Circle (1178)**
S.D.S.V. Sorcerer: audio mixer and command console: SDSV electromagnetic beam detection finds position of operator's finger in guide slots to set levels; 4-channel modules, each with CRT display of settings.

Ward Beck Systems **Circle (1134)**
Series-ST(M500) consoles: 24-/36-channel stereo consoles; 12 channels for mono mic/line, 12 for stereo line (if 36-channel model, additional 12 mono); four stereo submaster outputs; two stereo master outputs; two independent mono master outputs.

[See ad on back cover](#)

Wheatstone Broadcast Group **Circle (1137)**
SP-6 console: radio production board; mono, stereo inputs; machine control; remote on/off; control room, studio speaker muting, tally.

A-500a: on-air console; two stereo program active combining buses for music, speech; TTL logic.

Audio recorders: analog, digital, synchronizers, recording accessories

AMS/Advanced Music Systems **Circle (535)**
AudioFile: hard disk digital audio recorder; software updates allow sync recording, punch in/out; remote machine control; digital interface to other PCM audio equipment.

ASACA ShibaSoku **Circle (553)**
ADS-5000 still/audio file: magneto-optical recorder for still picture and sound; 2,250 events/disc include two fields of video with 15s of sound; multiple drives give maximum 18,000 events.

Audio Broadcast Group **Circle (562)**
PhaseTrak-90: audio cart recorder/player from Broadcast Electronics; dc servo; Phase Lok V head block; auto phase correction; Dynafex NRS.

Audio Kinetics **Circle (565)**
Pacer: 2-deck chase synchronizer.
Eclipse/Q-Lock: A/V synchronizer, off-line storage for loop, event, Q-key, offset.

Broadcast Automation/BAI **Circle (599)**
Studer PR99: stereo reel playback decks.
Otari ARS-100: stereo reel playback decks.

Broadcast Electronics **Circle (602)**
DV-2 digital voice system: solid-state voice recorder, reproducer; storage of 99 individual messages in 6:29 memory; 20Hz-6.5kHz; message repeat, sequence; internal battery backup; 256k dynamic RAM; Dynafex NRS.
Phase Trak 90: audio cartridge deck; inte-

gral, non-encoding phase correction; continuous phase check during play; FSK data decoder; noise reduction; digital cue detection; auto 'hot tape' sensor; dc servo; optional timer.

5000-series enhancements: Phase Lok V head assembly; cartridge guidance system; improved air-damped solenoid; toroidal power transformer; applies to 5300C, 5400C, 5500C.

2100C enhancement: improved air-damped solenoid; improved cartridge guidance design; Phase Lok V head.

3000A enhancement: improved head alignment with Phase Lok V head; more powerful air-damped solenoid; improved cart locator.

CompuSonics **Circle (659)**
DSP-1500 recorder: digital audio cart system; enhanced with 30MByte hard disk for 7.5 minutes hi-fi stereo, 38 minutes mono; RS-232 remote control; 32kHz sampling with 16-bit resolution; balanced stereo line levels.

DSP-1200 playonly: digital playback unit; warranted 5,000 plays.

DSP-1000 computer: edits on 5" optical disk media; CSX digital processing records 72 minutes of stereo per disk; 512 minutes mono; 44.1kHz, 16-bit standard sampling; full-screen editing support software for IBM, Macintosh.

Evertz Microsystems **Circle (740)**
Model 7000RCT: audio for video chase synchronizer; time code driven; reads time code from two transports, maintains a predetermined time relationship between them.

7100 emulator: audio transport interface; integrates audio deck into video suite without extra VTRs and external synchronizers; same transport interface, control as 7000RCT.

Fidelipac **Circle (746)**
CTR-30 series: production models of 3-deck audio cart player; bottom deck records; dual LED bar graph VU level indicators; decks individually removable; head bridge assembly with precision reference surfaces; repeatable 4-point cartridge hold-down.

For-A of America **Circle (751)**
Sirius-100 enhancements: digital audio memory; 16-bit sampling; auto sequencer for playback; editor; capacity for 1,000 minutes of eight simultaneous audio channels, eight hard disk drives and eight simultaneous operating remotes.

[See ad on page 111](#)

Image Video **Circle (800)**
AES-1000: digital audio editing system; 48kHz sampling to 16-bit accuracy; stores image of digitized analog input; real time edit and output; storage capacity of hard disk is 30 minutes.

International Tapetronics/3M **Circle (811)**
Omega upgrade: high-speed cue version of cartridge machine.

HCDA-3000: digital audio recorder; tape-based cartridge; 44.1kHz, 48kHz sampling to 16-bit; 20 minutes per cartridge without companding; auto sample rate detection at playback.

Lexicon **Circle (855)**
Opus audio: complete digital production system; random access to material on hard disk memory; recording, overdubs, non-destructive edits, time alignment, mix, pan, signal processing, all in digital domain.

Merlin Engineering **Circle (883)**
ME-358: audio editor kit, fits space on AU-21 board frame; upgrades VO-5850 to BVU-800 audio system.

Microprobe Electronics/MEI **Circle (887)**
Digitound: random access audio storage; for automation, live assist, recording studios; CRT shows current library on command; hard disk memory for 65 minute mono; expandable with additional Winchester drives; aux keyboard and CRT monitors optional.

Mitsubishi International **Circle (894)**
Series X-86: 2-channel digital audio recorder; fixed head PD format; 44.1kHz, 48kHz sampling to 16-bits, 20-bit possible; SMPTE/EBU time code available for compatibility with video equipment; 4-memory autolocator; variable pitch $\pm 10\%$.
X-400 recorder: 1/2" 16-channel digital audio deck; PD format; RS-422, RS-232C control; BCD code output; locks to 59.94Hz for use with video; time code generator; auto punch-in/out; 44.1kHz, 48kHz sampling to 16-bits.
XE-2 editor: digital-digital editing; selective crossfade times; autolocation with SMPTE time code; full screen edit data display.

New England Digital **Circle (923)**
Synclavier Direct-to-Disk: hard disk recording system; 4-16 digital audio tracks sampled at rates to 100kHz; SMPTE-based editing syncs to pictures in post production.

[See ad on page 43](#)

Otari **Circle (939)**
AF-200: digital audio recorder; 33kHz or 44.1kHz sampling to 16-bit PCM; 33M/disk, expandable; random access to 999 files; 98 program sequence capability; simultaneous on-air output; RS-232C, optional remote control.
TC-50 processor: center-track time code accessory; records, reproduces time code, demodulates FM pilot signal; for 5050-BII, 5050 MkIII-2 or other 4-head position recorders with TC head in 3rd position.
Software editing system.

[See ad on page 15](#)

Pacific Recorders/Engineering **Circle (940)**
MICROMAX: stereo cart recorder with MAXTRAX 1/2-track format; higher tape output with less tape noise; optional 1/4-track head; dc servo capstan; phase compensation; CMOS logic; replay lockout.

Sony Pro Audio **Circle (1151)**
PCM-3402 recorder: 2-channel, 1/4" digital; DASH-S, 7.5ips or DASH-M, 15ips; electronic editing within 1ms aided with 12s RAM storage; time code, control, reference tracks; 44.1kHz, 48kHz sampling to 16-bit; $\pm 12.5\%$ speed variation.

[See ad on page 24-25, 98-99](#)

Soundcraft Electronics **Circle (1027)**
Saturn multitrack: digital-controlled analog

recorder; μ P total remote console commands audio alignments, record functions, tape motion, autolocator; store, recall 32-keystroke complex sequences; bi-directional high-torque motors; dc-capstan servo, auto tension error sensing.

Soundmaster International Circle (1028)
SMART Sync: varispeed machine synchronizer; interlocks transports at non-standard speeds.

SYNCHRO: programmable machine synchronizer; edit system component with IBM PC/compatible software; machine-mounted interfaces for universal cabling; multi-tasking, expands to 16 plus transports.

Southern Broadcasting Systems Ltd Circle (1182)

DAMS system: digital audio mass storage emulates four stereo cart decks; two users may access the system simultaneously; four selections can be preloaded for sequential auto playback; RS-422 communications; storage to 388 minutes, full bandwidth stereo.

ADM-1065: meter/monitor facility with 13-line selector, precision PPM meters, 60W/channel power amp.

Studer Revox America Circle (1045)

D820X recorder: PDM digital audio format; integral A/D, D/A converters; bargraph meters; compatible with DASH.

A807 audio recorder: reel-type on die-cast chassis; 2 ac 3-switching spooling, brushless dc capstan motors; tape locator, loop play, backspace, thumbwheel shuttle control; Dolby HX Pro; three VU meters with peak LED.

A820 audio recorder: 24-track transport converts for 14" diameter 1" or 2" tape; 50ft/s spooling speeds; Dolby SR; 3-speed with reverse; digital control with auto alignment; two tape format memories; 8-, 16- or 24-track headblocks.

See ad on page 34-35

TASCAM Circle (1058)

122mkII cassette deck: 3-head audio system; TEAC cobalt amorphous heads; integral Dolby HX Pro, B, C; FG servo 3-motor drive, hysteresis tension servo; pitch control $\pm 12\%$; balanced XLR and unbalanced RCA jacks in and out.

ES-50 synchronizer: flexible, fast lockup for audio, video tape transports; SMPTE time code with subframe accuracy, offset of 0.01 frame steps based on time code or vertical sync; digital servo accuracy $\pm 50\mu$ s.

ATR-80/24 recorder: 24-track, 2" format; seamless, noiseless punch in/out, contourless sync, repro heads; 14" reel, fast wind to 380ips; samarium cobalt reel and PLL capstan motors.

See ad on page 45

Telex Communications Circle (1073)

6120-XLP: audio tape duplicator; operates at 8:1 speed ratio; 50Hz-13kHz response; low distortion, crosstalk; XL-Life head for longer life, high efficiency, reduced oxide build-up, maintenance.

See ad on page 87, 96

UPGRADE YOUR ENG SYSTEM WITH MII



If you use 1/2", 3/4" or any combination, switch to MII and get high performance and overall cost reductions.

The MII Broadcast System is designed to enhance your ENG operations. With product like the AU-400 Camera Recorder that offers a combination of performance and capabilities never before available on 1/2".

Like multi-generation capability, playback through the view-finder, 4-channel audio, on-board time code generator/reader with selectable user bits and over 20 minutes of recording time on a compatible compact cassette. Even 90 minutes of operation with the MII Field Recorder, Field Editing and Studio VTR's. Plus performance of such high quality it can be used as an alternative to 1" C.

And with MII you have low maintenance and training costs. Tape consumption is dramatically reduced. Units are small and lightweight. Cassettes and parts inventory are interchangeable. And MII equipment is 100 percent compatible, so you can interface MII with your present system.

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Find out how you can improve your production quality and cut your overall costs with the Panasonic MII Broadcast System.

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Broadcast Systems

Circle (58) on Reply Card

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One, two, three o'clock, four o'clock log. The Dictaphone 5600 Veritrac® logger lets you log . . . log . . . log around the clock.

It's a complete broadcast recording retrieval system that lets your radio station keep its entire broadcast day on the record. In one dependable unit you get around-the-clock verification that you're running your advertisers' spots on schedule and meeting all your FCC requirements. Should you require proof, just play back your log around the clock. And it's all there on tape.

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Dictaphone

A Pitney Bowes Company
Circle (59) on Reply Card

- microphones, wireless mics
- remote pickup equipment
- phono, CD equipment
- intercoms, headphones, headsets

AEA/Audio Engineering Associates Circle (1177)

MS-38 matrix: dual mode MS and LR line level active matrix.
MS-380 preamp/matrix: dual channel; provides both MS and LR modes for stereo.

AKG Acoustics Circle (515)

C-522 ENG mic: dual cardioid condenser capsules oriented with off-axis angle of $\pm 45^\circ$ for 1-hand XY stereo; 600 Ω balanced, unbalanced per channel; integral battery or phantom power; 2dB max. sensitivity variation between channels.
Model D-112: large diaphragm broadcast microphone.
Model Q-15: communications headset with monitor.
Model C-410: vocal headset, no monitor.

[See ad on page 165](#)

Allied Broadcast Equipment Circle (521)

Finial Technology phono: laser pickup for standard LP playback.
Media Touch 2000: CD multiplay system; touch-sensitive color CRT, Audio-Metrics 100 CD units; IBM PC/compatible RS-232 interface.

Audio-Technica US Circle (567)

AT857AML/AT857QML: unidirectional condenser mics; 19" gooseneck assembly for podium use; -QML quick-mounts to surface-mount XLR connector; -AML plugs to accompanying power module; both accept 9-52Vdc phantom power.

[See ad on page 120-121](#)

Beyer Dynamic Circle (589)

DT-770/-990: studio, EFP monitoring headphones.
MC736-PV/737-PV: short, long shotgun microphones, condenser designs; 12-48V phantom power.
MCE-10: miniature cardioid condenser microphone.
MCE-80: cardioid condenser microphone.
M-700: cardioid dynamic microphone.
MPC-40: acoustical boundary layer electret condenser mic; 2 3/4" diameter; phase balancing of direct and reflected sound waves.
MC-740: double membrane condenser element; switch selected polar patterns; withstands SPLs to 144dB without distortion.
DT-108/109: single and double sided headphones in gray or black with high output; noise cancelling element.
CV-720PV: condenser mic capsule, power supply; 12-48V phantom power supply; 10dB attenuator; 12dB/octave LF filter eliminates boom noise, interference.
MSB48 N(C): belt-pack condenser power supply; provides 12-48Vdc power for phantom-powered microphones.

[See ad on page 150](#)

Broadcast Automation/BAI Circle (599)

Audio-Technica AT-802/-813: microphones.

BAI-EC monitor: speaker, cue amplifier.

Broadcast Supply West Circle (606)

TP500: Radix phono preamplifier.
ProBase-III: isolation unit for Technics turntables.

[See ad on page 152](#)

Bryston Limited Circle (609)

2B-LP-DAC amplifier: audio power amplifiers with digital gain control; XLR and 1/2" TPS balanced inputs; by Studio Consultants.
Model 6B: audio power amplifier; operates at 500W/2 Ω or 800W/1 Ω ; from Studio Consultants; XLR balanced inputs.

Cetec Vega Circle (634)

R-33 Pro Plus: wireless mic receiver; miniature, portable.
T-86 Pro Plus: hand-held wireless mic transmitter; omnidirectional characteristics, for interview work.
Q-Plus: wireless intercom; single-package wireless remote units.
XRS-15: miniature lavalier mic; electret type.
Reporter system: portable wireless mic; for budget-minded users.
M-117B: antenna multicoupler; improves IMD performance of wireless mic systems.

Clear Com Intercoms Circle (645)

500-series belt packs: intercom systems using digital logic control of all audio and signaling switching; 501, single channel; 502, 2-channel, selectable listen; 522, 2-channel, dual listen.

Station-ISO system: establishes private communications between selected stations with push-button control; ISO-4000 central control unit; ICP-4 rack-mount 4-button control panel; ISO-4 plug-in module for MS-808 mainframe.

WTR-1/WBS-6 intercom: for six belt-pack remotes; communicate in full duplex with one another and wired system; modular base unit is field expandable; belt-packs include transmitter, receiver.

Crown International Circle (678)

GLM 100-D: lavalier omnidirectional condenser microphone.
GLM 200-D: lavalier omnidirectional condenser microphone.
GLM 100ENG: miniature, omnidirectional electret condenser microphone; phantom or battery powered.

[See ad on page 66-67](#)

Denon America Circle (1187)

DN-950F system: CD Cart Player, emulates the audio cart system; CD housed in plastic cart for protection; shutter opens when placed in player; deck includes track set knob, search, standby-cue, play buttons; remote control.

Gotham Audio Circle (770)

Neumann RSM-190: mic, for sports, ENG; stereo condenser shotgun type.

HM Electronics Circle (788)

FR200: field pack receiver case; houses four HME RX752 wireless mic flatpac receivers; contains electronics for AD-10A diversity antenna, requires only three AN-10 dipoles; internal battery for 12 hour operation or ac adapter.
TX-555: hand-held wireless mic.

HM58: unidirectional dynamic mic, with mic mute switch.

RM77: unidirectional reverb electret mic; switch selects mute to echo modes.

See ad on page 157

HoweTech

Circle (793)

HDP-1000: stereo headphone amp; two 200Ω headphone outputs; two separate headphone amps; separate volume controls; switched 6-signal matrix.

See ad on page 175

Lectrosonics

Circle (850)

Pro-185: M-185 wireless microphone; R-185D diversity receiver; single, multichannel systems available.

Wireless PA: portable systems; audio monitors; for set-directors, lip-sync playback.

McCurdy Radio Industries

Circle (878)

CS-9400 Plus: digital intercom; maximum matrix 640x640; configurations saved to disk; instant retrieval.

CS-9500: digital intercom; single-frame 50x50 matrix.

See ad on page 84

Media General Broadcast

Circle (882)

RAD formats: Digital Director production tracks on CD, 8mm cassette, compatible with Systemation automation systems.

Merlin Engineering

Circle (883)

ME-158S: stereo audio monitor; 3-input, balanced XLR connectors; 4" woofer, acoustic-suspension soft dome tweeter; inputs 1, 2 summed for stereo phase check; ½-rack package.

Nady Systems

Circle (911)

501-VR wireless: VHF mic system; for ENG, EFP; 120dB dynamic range; dual conversion receiver; 100dB image, spurious rejection; -VR, receiver; -HT, hand-held mic, transmitter; -LT, transmitter for lavalier mic, includes phantom power; 170-216MHz service.

PESA Electronica

Circle (953)

SIM-4000 intercom: μP-based system, constructed of smart terminals with matrix core.

See ad on page 198

R-Columbia Products

Circle (972)

Model-52/700: ultra-light replacement for carbon mic headphones for TV camera; phantom-power amp, noise-cancelling condenser mic; standard PJ-051 plug.

Series-900: special purpose headsets; can be worn with various helmet types; 8 oz with attached mic boom; flat response from 100Hz-16kHz; 8Ω or 600Ω.

TR-50/B: wireless-to-wired base station interface; full or partial duplex between producer, director, camera, lighting, sound operators on hard-wired system.

Model 6058P/T: pulse and tone type dialing telephone; hands-free for ENG/IFB applications; operates with modular telephone jack; clips to belt; uses UL-85/M, ULH-85/M, ULH-700/M headphone/mics.

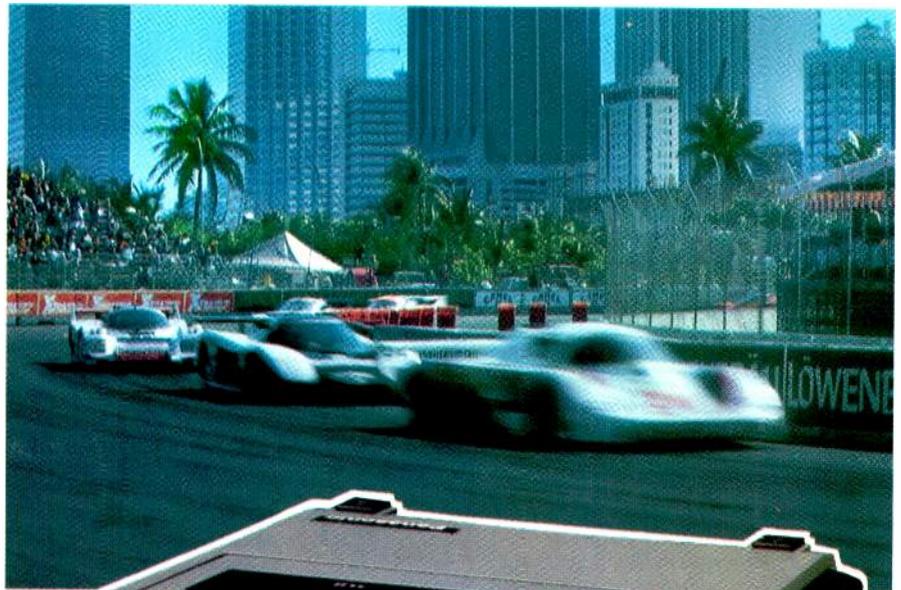
RTS Systems

Circle (998)

MSA325: modular loudspeaker; fits 19" rack, 1RU high, ½-rack width; rated 10W; for RTS 810 master station or other monitor use.

Model 927: reference tone generator;

STANDARDIZE YOUR EFP SYSTEM WITH MII



If you use ½", 1" or any combination, switch to MII and get high performance and overall cost reductions.

The MII Broadcast System was designed to enhance your EFP operations. With product like the AU-500 Field Recorder that offers a combination of performance and capabilities never before available on ½".

Like over 90 minutes of recording time even in the field, multi-generation capability, field color playback, 4-channel audio, on-board time code generator/reader with selectable user bits and TBC connection. The Field Recorder also accepts compact cassettes from the MII Camera Recorder. Plus MII's performance is of such high quality it can be used as an alternative to 1" C.

And with MII you have low maintenance and training costs. Tape consumption is dramatically reduced. Units are small and lightweight. Cassettes and parts inventory are interchangeable. And MII equipment is 100 percent compatible, so you can interface MII with your present system.

What's more, product is available now.

Find out how you can improve your production quality and cut your overall costs with the Panasonic MII Broadcast System.

For more information call (201) 348-7671.

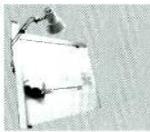


Panasonic
Broadcast Systems

Circle (60) on Reply Card

The Two Sides Of The Jem-Fab Group:

ENGINEERING



The Franklyn R. Beemish & Co.'s staff is experienced in consultation,

design and engineering for the foremost companies in the video post & production, broadcasting and motion picture and recording industries. Our staff is uniquely qualified to create a facility that will meet your demanding requirements. We analyze all phases of your business—budget, client needs, operational requirements, space considerations, growth potential—and design a suite or entire facility for you.

CONSTRUCTION



The Jem-Fab Corporation has the necessary in-house facilities and personnel to build,

install and test your turn-key facility. Our custom manufactured equipment enables your company to operate to its maximum potential and realize its greatest profits.

Whether the Jem-Fab Group designs, constructs or retrofits your studio, there are two things you can count on: A) our uncompromising commitment to quality, and B) our dedication to service for our clients in every aspect of our business.

The Jem-Fab Group

Franklyn R. Beemish & Co.

"Engineering for the Video, Motion Picture and Recording Industries"

Jem-Fab Corporation

"The Electronics Construction Company"

574 Sunrise Hwy. • Baldwin, N.Y. 11510
(516) 867-8510 • (516) 867-8511

Circle (61) on Reply Card

source for discrete tones on master or duplication tapes; white/pink noise colorations; noise reduction tones; stereo mode, channel ID available; for testing any audio chain.

Model 2524: 8x1 summing amplifier; 16-input/2-output, active, balanced; subsystem component for series 2500 amplifier system.

See ad on page 166

Russco Electronics Circle (1179)

CD100: CD adapter, amplifier; 2-channel impedance converter; RCA inputs; 600Ω balanced outputs to +20dBm.

Samson Products Circle (1000)

Broadcast STD: wireless microphone; 10-channel PLL tuning of transmitters and receivers; integral dbx Type I or II NRS; 115dB dynamic range; true diversity receivers; *BR-3* receivers; *BH-3* handheld, *BT-3* belt-pack transmitters.

Sanken Microphone Circle (1180)

CMS-7 microphone: portable stereo condenser type; controllable stereo image width; push-pull capsule design; 108dB dynamic range; 50Hz-20kHz; titanium membrane diaphragm; for 600Ω load: *CU-41 microphone:* unidirectional double condenser; for digital recording.

CU-31/CU-32: unidirectional condenser mics for high pressure sound sources.

Sennheiser Electric Circle (1007)

RS-2012 Six Pack: portable wireless system; case contains six SK2012 VHF body-pac transmitters, houses six EK2012 receivers with common power supply, antenna diplexer; operate as multichannel receiver for complex wireless productions.

Shure Brothers Circle (1015)

BC-series: phono cartridges; *BC-70* spherical, -80/-90 elliptical styli; rugged design for broadcast; 1-1.5g tracking force on elliptical, 2.5-3.5g for spherical; 20dB separation at 1kHz.

SM-89 shotgun: condenser mic; Accu-Port interference tube reduces coloration from off-axis sources; phantom voltage range 11-52V; foam windscreen; carrying case.

Smart Mic: automatic mic system; *AMS22* low-profile; *AMS24* gooseneck mount, *AMS26* probe/stand, *AMS28* lavalier mic; *AMS8000* mixer with control circuitry.

W10BT/W20R/W25DR: 150-216MHz wireless mic/receiver systems; 50mW RF power; 54F3 ± 12kHz modulation, internal compressor; simple and Diversiphase diversity receivers; dc operation.

See ad on page 42

Sony Pro Audio Circle (1151)

ECM-672 mic: electret shotgun camera type; super-cardioid, uni-directional; low-cut filter reduces ambient, wind, vibration noise; 50Hz-16kHz; 72dB SNR; maximum 114dB sound pressure input.

See ad on page 24-25, 98-99

Stanton Magnetics Circle (1035)

Dynaphase 30M/SR: disco headphones; 20Hz-22kHz; 3.8oz less cord, plug; 0.25W RMS power; 110dB SPL at 0.2V input with ¼% distortion.

SlipMat: turntable cover for disco applications.

35m/HB: headphones.

Studer Revox America Circle (1045)

A727 pro CD player: 16-bit resolution, oversampling, digital filtering, dual D/A conversion, adaptive error correction; cue-to-music feature; display of elapsed, remaining times for track or entire disc.

See ad on page 34-35

Studio Technologies Circle (1046)

Mic-PreEminence: dedicated 2-channel mic preamp; minimize signal flow through a console during original recording and over-dubbing; transformerless; switchable phantom power.

Swintek Enterprises Circle (1048)

SL-170 SoundLink: VHF wireless communications; receiver provides variable audio output for camcorder, mounts on portable camera or worn on body; db-S audio processing; operates above 170MHz.

MK-20-OD/CC-s: radio intercom; compatible with RTS, Clear-Com hardwired intercom systems.

MKQDC-A: low cost video camera radio mic.

MK21HiFi: switching diversity receiver unit.

TASCAM Circle (1058)

CD-501 player: broadcast CD system; balanced XLR connectors; remote fader start; fast search; direct access to 99 tracks; track skip to next selection up or down disc; repeat; ZD zero distortion circuit; 3-beam laser; 88.2kHz double oversampling.

See ad on page 45

Telex Communications Circle (1073)

PH-24 headset: for studio announcing, sports casting; electret mic; custom polar patterns; balanced audio output; mic switches from battery to phantom power.

PH-91/PH-92 headphones: binaural, 600Ω and 2000Ω impedance.

PH-81/PH-85 headsets: camera operator units; carbon mic, dual-sided binaural configurations.

LM-300 mic: unidirectional lapel-pin mic; cardioid pattern (WLM-60), PS-10 in-line phantom power supply; full natural sound with control of background noise, feedback.

FMR-4 receiver: 4-channel, diversity system for 165-216MHz; operates on any one of four fixed frequencies; two ¼-wave antennas with Pos-i-Phase for minimum SNR, phase related problems.

WT-400 mic transmitter: 2-channel, selectable transmitter; used with WLM-200 or equivalent.

See ad on page 87, 96

Video Products Batteries, chargers, lighting, grip equipment

Alexander Mfg Circle (518)

Double Buckle belt: polypropylene battery containers with leather exterior; adjustable

for fit; shoulder strap.

Anton/Bauer Circle (542)
Battery Mount: compatible with existing cameras, batteries, chargers; 10A output for portable camera lights; 6-pin connector with gold-plated low-Z power pins; hardened cam action latch.

Lifesaver MP-8: 8-channel charger, μ P control for 12-14V Anton/Bauer, ProPac90 and BP-90 VTR batteries; three independent charge systems; equalizing; red, green LED status indicators; 24-LCD data display about batteries.

Mobile Fast Charger: powered from vehicle with 12V negative ground; charges 12-14.4V 4AH batteries in one hour; system disabled if vehicle battery drops below 10.5Vdc.

Arriflex Circle (550)
Arri Fresnels: rugged design lighting instruments; 300W, 650W, 1kW, 2kW and 5kW; optimized optics for greatest light output; improved cooling; all manual operation; 1kW, 2kW and 5kW also available as pole-operated.

Bardwell-McAlister Circle (898)
Heavy-duty stage plugs
KEG retrofit: for 1kW Baby KEG light; new lamp carrier and lens; wider flood-to-spot range.
Barndoor: 8-leaf unit for 1kW Baby light.
Hydralift stand: for heavy lighting instruments.
C-type stand: grip heads.

Belden Communications Circle (584)
Lee filter materials:
• Tough Spun flame resistant light diffusers, five grades.
• White diffusion, two grades.
• Hampshire Frost, light frost effect.
• Lee Scrim perforated filter.
• Silver reflector, two grades.
• Soft gold reflector.
• Additional colors for standard line of light coloring, effects filters.

Cine 60 Circle (641)
Hitch-Hiker charger: master, overnight system; for 4AH, 6-30V Nicad batteries; includes dememorizing, reconditioning.
Hitch-Hiking dememorizer: three switch-selected preset discharge cut-off points; 3-digit run time display, LED status.
Power-Miser belt: battery power belt; simultaneously delivers 13.2V and 14.4V 14AH for operation of light and Betacam camera or recorder.
Wun cable: single cable interconnects a camera and low voltage light to one battery; in-line switch selector for one of three voltage combinations.

Cinemills Circle (643)
DAYMAX lamps: 12kW rugged rental house HMI lamp; from ILC Technology.

Comprehensive Video Supply Circle (656)
Softouch lighting: softlight fixtures; indirect light for broad illumination without harsh shadows or hot spots; easily relamped; one to four lamps for 500W to 8kW.

Dedo Welgert Film GmbH Circle (694)
Dedolight: small lighting instrument; 12V halogen lamp in 20W, 50W, 100W ratings; lens optical system replaces Fresnel for more efficient, smooth field of light.

SUBSTITUTE YOUR STUDIO VTR'S WITH MII



If you use 1", switch to MII and get high performance and overall cost reductions.

The MII Broadcast System was designed to enhance your studio production. With product like the MII AU-650 Studio VTR that offers a combination of performance and capabilities never before available on 1/2".

Like over 90 minutes of recording time, multi-generation capability, on-board TBC and time code generator/reader with selectable user bits, editing functions, variable speed playback including slow and still, Dolby-C noise reduction, and 4-channel audio. The Studio VTR also accepts compact cassettes from the MII Camera Recorder. Plus MII's performance is of such high quality it can be used as an alternative to 1" C.

And with MII you have low maintenance and training costs. Tape consumption is dramatically reduced. Units are small and lightweight. Cassettes and parts inventory are interchangeable. And MII equipment is 100 percent compatible, so you can interface MII with your present system.

What's more, product is available now.

Find out how you can improve your production quality and cut your overall costs with the Panasonic MII Broadcast System.

For more information call (201) 348-7671.



Panasonic
Broadcast Systems

*Dolby is a trademark of Dolby Laboratories, Inc.

Circle (62) on Reply Card

Professional VHF Wireless UNDER \$1000.



Many big names in the entertainment field have been using the Telex dual diversity version of this fine wireless. Shown above is two-time Country Music FEMALE VOCALIST OF THE YEAR, Janie Fricke.



Rock and Roll or Rock of Ages—the pulpit or the Palladium... Whether you need a dynamic handheld for the stage or a miniature lapel mike for your church, Telex has an affordable single antenna wireless mike system that will fit your needs. Telex FMR-50 systems have most of the high performance features of the more expensive top-of-the-line wireless microphones and provide a much clearer, stronger and better-sounding signal than competitive units. All-important dynamic range is greatly enhanced because of the system's unique COMPANDER circuit. A special circuit

at the transmitter takes the full dynamic range of the audio, compresses it to RF transmission limits, then restores it to its full strength at the receiver. The result is a full dynamic range with greatly improved signal-to-noise ratio.

Because it operates on high band VHF frequencies there is no danger of picking up interference from low band channels such as CB, cordless telephones, garage door openers and electric toys. And, Telex offers a FREE computerized service to assure the selection of an interference-free frequency based on known channel allocations in each operating area.

To read more about why this improved technology transmits a high quality signal over longer distances, write to: Telex Communications, Inc., 9600 Aldrich Ave. So., Minneapolis, MN 55420.

TELEX®

TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A., Telephone: 612-887-5550

Circle (63) on Reply Card

Desisti Lighting/Desmar Circle (699)
Piccolo 370-series: lightweight Fresnel instruments; 2kW, 5kW, 10kW ratings; pole, manual operation; for studio, location.
Giotto cyclorama lighting system.
Telestage studio rigging system.
Mini-Pantograph: 30-lb maximum, for studio rigging.
Monitor hangers: motorized, for video monitors in studio.
HMI electronic ballast fixtures.
Venture stage, studio lamps.

Frezzolini Electronics Circle (755)
PowerUPS series:
 • UP-14R: slim-line camera uninterruptible power system for mounting on the camera with remote cable activation.
 • UP-14P: like UP-14R, but with an on-unit activation control.
Frezzi-Max: FNP-1HC NiCad batteries for Betacam; 12V, 1.8AH.
Frezzi-Max FTC-1NP: μ P-controlled chargers; lightweight design.
FMP-C2A: dual, simultaneous 2-channel fast charger system.
FBP-90P: premium-grade direct replacement battery for BP-90; fully protected, unfused.
Mini-Fill light: 2"x4½" size; multimirror design; for 12-14.4Vdc, 30Vdc; mounts on camera, pistol grip, lightstand.

See ad on page 88

General Electric/Lighting Circle (762)
GEMI-series: multivapor TV, stage lamps; from 200W to 2.5kW; 5600°K color temperature; compact arc length; cool seal design; fit standard fixtures.

G&M Power Products Circle (759)
GM140B: on-board battery pack; furnished with Anton-Bauer mounting plates, solid metal case; pack charger optional.
GM12BP: replacement battery; BP-90, 4AH; hard case with Sony connector, pull strap; BP holder available for on-board use with 12V cameras.

Great American Market Circle (775)
LineLite: flexible, self-extinguishing, fire-retardant colored PVC tubing; glows in color when exposed to UV-light source; easily shaped into patterns.
ColorWiz color changer: self-contained, fits gel frame holder; gel-string of desired materials taped together may have 11 sections for 6"-8" fixtures; 0-10Vdc control for speed.

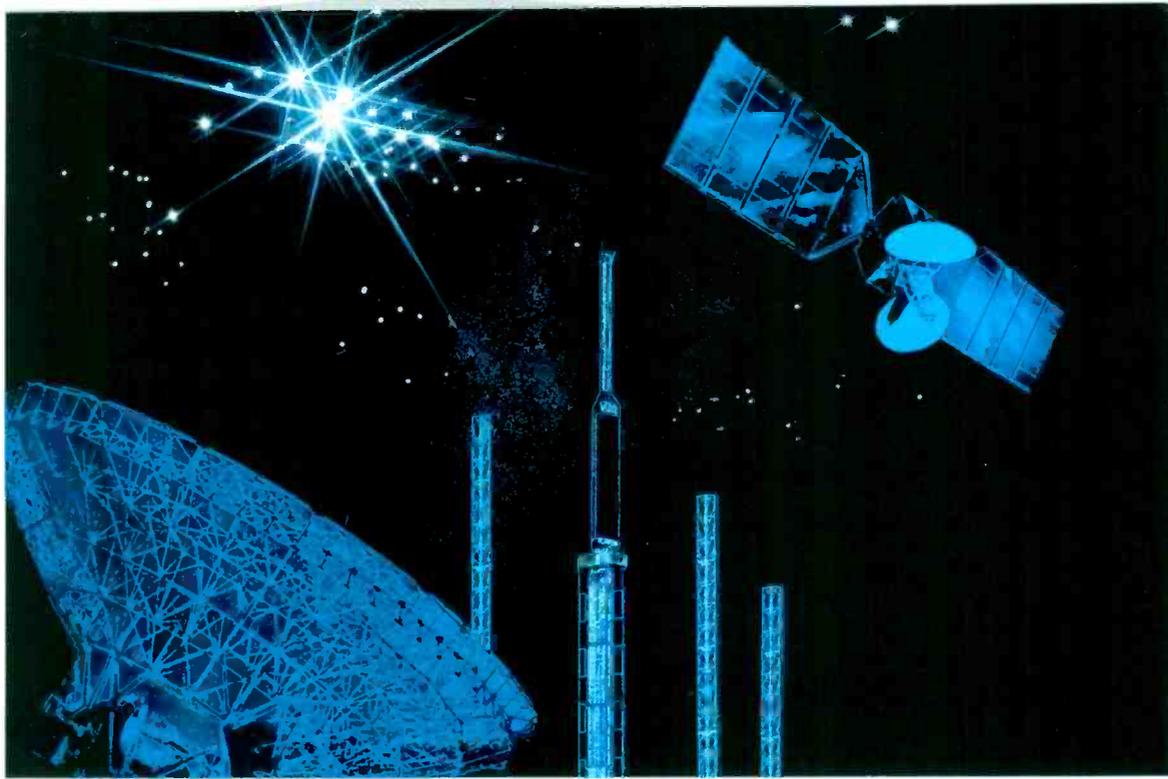
Hoffend & Sons Circle (789)
OMNI winch: motorized batten for ceiling mounting; no grid counterweight or loading galleries.

Keylite PSI Circle (830)
Crossovers: modular, 3-ft section cable protectors; 4- or 5-slot versions fit over cables, avoiding foot or vehicular traffic wear on cable jackets, wiring.

Lee Colortran Circle (851)
MICROPRO: ENG, location and lighting equipment with 6 and 8-lamp instruments.
ReporterLight: hand-held, stand-mounted light instrument; interchangeable optical systems for beam angle, light output control.
Baby Fresnel: 2kW (6"), 5kW (12") ratings; steel-spun lens door, hinged access; acces-

Continued on page 100

THOMSON-CSF



THE FURTHER WE GO, THE FURTHER YOU GO.

At Thomson-CSF we've been pioneers in developing the use of high-power tetrodes in transmitters for more than 70 years.

Over the years we've stayed ahead with such developments as Pyrobloc[®] grids and the Hypervapotron[®] cooling system.

We offer: A complete line of tubes for radio broadcasting applications from FM to the most powerful SW and LW transmitters – the quality of our 500-600 kW tubes has been amply demonstrated in 15 years of service in over forty transmitters worldwide.

A complete line of power grid tubes and their associated cavities for UHF/VHF TV transmitters. Thanks to their efficiency, reliability and tight tolerances, systems makers can offer their customers substantially more cost-effective products.



High power radio broadcasting tetrodes up to 1.2 MW.



Earth station tubes up to 18 GHz (1.5 kW) or to 3.35 kW @ 6 GHz.



High efficiency space TWTs (including 50 W and 100 W Ku-band for next generation DBS Satellites).

A complete line of klystrons and TWTs for ground stations and space TWTs for direct broadcasting satellites (DBS) designed to last for at least a decade.

And we also produce high-resolution image pick-up tubes and devices (CCDs), and high-luminosity CRTs for top range professional applications.

In radio and television, telecommunications, military and civil aviation, as well as in a wide range of scientific and medical applications, Thomson-CSF know-how gets your systems moving. Fast.

The world's most powerful tubes for radio and TV broadcasting.



UHF and VHF tetrodes up to 50 kW. FM tetrodes up to 100 kW.



Matched cavities for best results.



THOMSON-CSF
ELECTRON TUBES

Circle (64) on Reply Card

THOMSON ELECTRON TUBES
AND DEVICES CORPORATION
550 Mount Pleasant Avenue
P.O. Box 6500
DOVER, NEW JERSEY 07801
Tel.: (201) 328-1400. TWX: 710987 7901.

Belgique - BRUXELLES
Tel: (32 2) 648 64 85
Tx 23 113 THDKL B

Brazil - SAO PAULO
Tel: (55 11) 542 41 72
Tx (011) 24 276 TCSF BR

Canada - MONTREAL QUEBEC
Tel: (1 514) 288 41 48
Tx 5 560 248 TESAFI MTL

Deutschland - MUNCHEN
Tel: (49 89) 78 79 0
Tx 5 27 916 CSF D

España - MADRID
Tel: (34 1) 405 16 15
Tx 46 033 TCEE E

France - BOULOGNE BILLANCOURT
Tel: (33 1) 46 04 81 75
Tx THOMTUB 200 772 F

Italia - ROMA
Tel: (39 6) 639 02 48
Tx 620 683 THOMIE I

Japan - TOKYO
Tel: (81 3) 264 63 46
Tx 2 324 741 THCSF J

Sverige - TYRESÖ
Tel: (46 8) 742 02 10

United Kingdom - BASINGSTOKE
Tel: (44 256) 29 155
Tx 858 865 TESAFI G

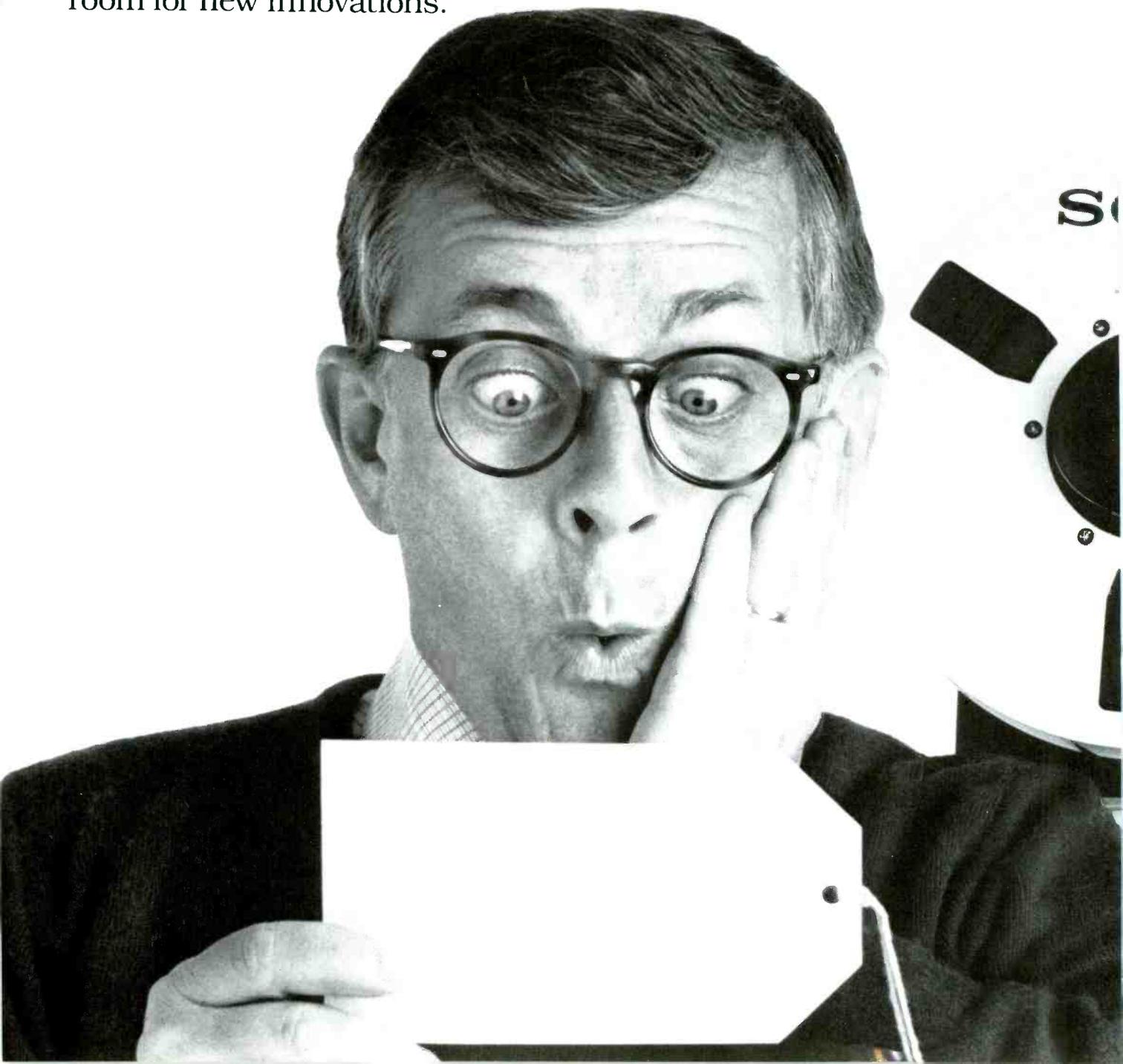
U.S.A. - DOVER
Tel: (1 201) 328 1400
TWX 710987 7901

Gotcha.

If the price doesn't grab you the features will. But first, let's talk price.

The new Sony BVH-3000 costs about a third less than its predecessor, the BVH-2000. So now you can get true one-inch quality without breaking the bank.

One of the ways we did it was by using Sony-developed LSIs. A breakthrough that not only cuts the number of parts but helps make room for new innovations.





Like a revolutionary air threading system that automatically takes the @#!\$#! out of tape handling. An easy to use color framer. And a built-in TBC with a choice of two low-cost, high-performance processor boards.

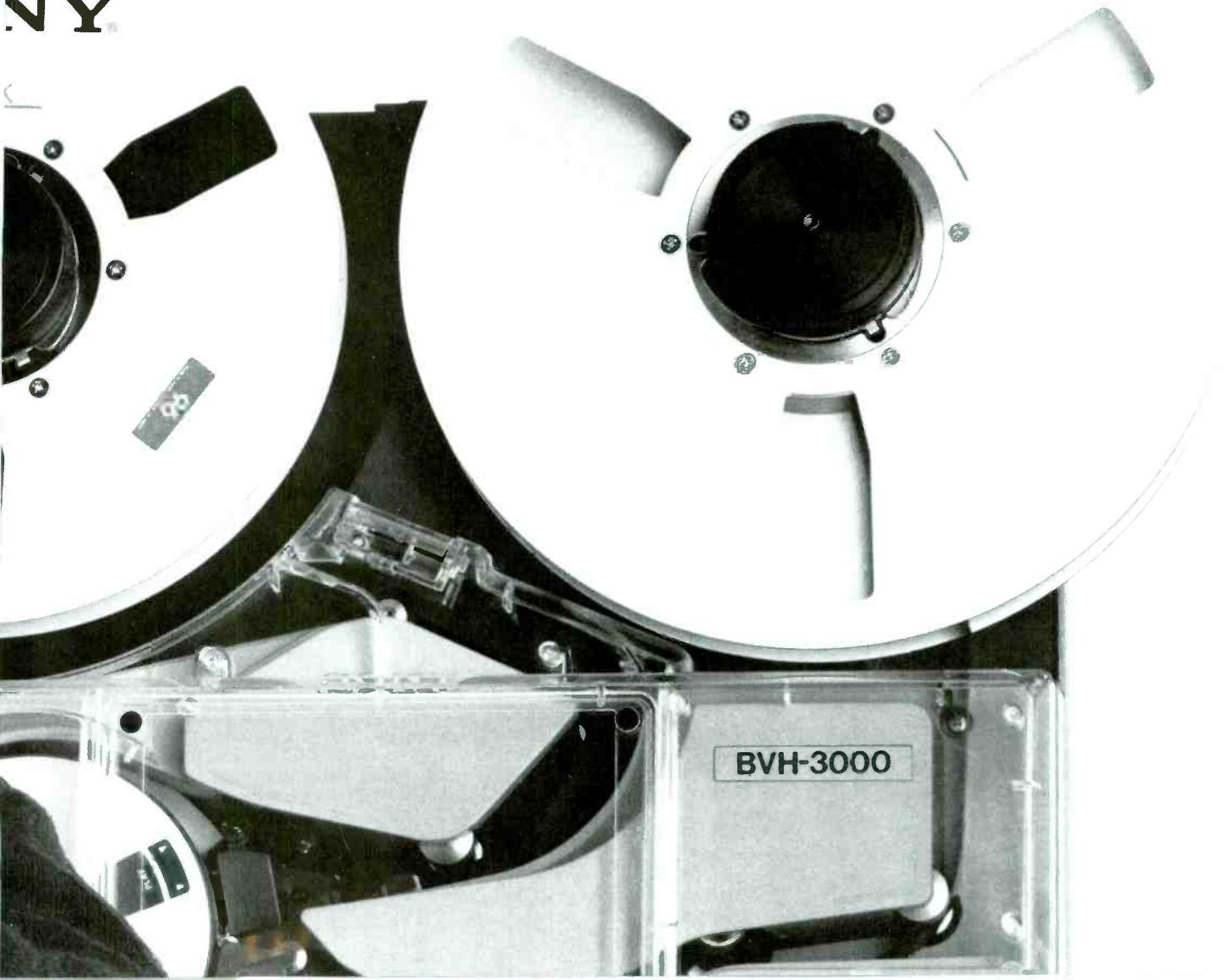
Of course there's more, but the big news is that you pay less. For the full story, get a hold of your Sony Broadcast representative. Or call Sony at (201) 833-5231.

SONY
BROADCAST

Circle (65) on Reply Card

SONY

NY



Continued from page 96

sory mounting clips; T-handle focus adjustment requires one turn for full travel from spot to flood.

12kW flicker-free: ballast and 12kW HMI light without flicker, regardless of film camera speed and shutter angle.

IDS: intelligent modular dimming system; may control 54-module dimmer rack of 108 2.5kW, 5kW or 10kW dimmers; diagnostic and mimic information displayed on optional VDU.

Scene Master 60: array of 60 controllers may handle channels or submasters; cross-faders, effects fader, grand master fader adjust intensity levels; control keypad enters commands and data for memory operation; system status shown on amber or color CRT.

Lighting Methods Circle (856)

Series L-86: dimmer racks for fixed, portable applications; portable units on wheels with LMI digital protocol; 1.2kW, 2.4kW, 6kW, 12kW rated dimmers.

Lowel Light Circle (860)

ViP system: 3-instrument kit; V-light, 55W halogen; i-light, 12V, 55W-100W halogen lamp, hand-held for fill, highlight; Pro-light, 100-250W, 12V-120V; interchangeable reflectors, barndoors, parts.

LightArray: 6-lamp fluorescent fixture; 4-foot tubes, boom, ballast, barndoors, stand; with fluorescents for fill, modeling illumination.

LTM of America Circle (862)

Mark-III SoftLights: 575W, 1.2kW HMI type; operate horizontally or vertically; more efficient than Mark II line.

SunGun: 270W HMI light; battery powered. **Multipar lights:** 4-, 6-, 8-lamp instruments; 200W HMI BriteBeam lamps; operate from household outlet; lamps can be used in pairs; individually rotatable lens for focus, variable beam patterns.

Mic Poles: carbon fiber construction; five sizes range from 15"-3'7" to 5'2"-16'7"; 4'8" extender makes largest 21' long.

HMI Ballast: 19" 6kW.

Ballast: 12kW.

Matthews Studio Equipment Circle (874)

Griptruk: grip department on wheels; telescoping side mounts for flags, reflectors, ladders, C-stands; 14" pneumatic tires.

Kit Stands: additions to equipment, lighting stand series.

Floppy Flag: 48"x48" conventional flag material with second layer of duvetyne attached, held on with Velcro.

[See ad on page 127](#)

Maxell of America Circle (876)

NiCad batteries: replacement batteries for camera, VCR, other dc-operated products.

[See ad on page 81](#)

Mole-Richardson Circle (899)

Type-5281: 8" junior mirrorless Redhead Solarspot; 2kW lamp; more airflow for cooler operation, increased lamp life.

Mole Solar-ARC: 12kW Fresnel HMI light.

Molelectronic: flicker-free, solid-state ballast.

L.E. Nelson/Thorn EMI Lighting Circle (919)

Type-DSF: 1.5kW scoop lamp.

FGM/FGN/FGP lamps: 1kW PAR64 type;

dichroic coated; 5200°K, 800-hour rated; spot, medium, wide flood designs.

Osram/Siemens Circle (938)

HMI-270: studio light for video, film, still photography; modular and portable for ENG or location work; HMI-250W/SE lamp, daylight spectral distribution; 5600°K.

Paco Electronics USA Circle (941)

KD120A dememorizer: NiCad charger with integral discharger; auto sense of 110-240Vac; 4-channel unit; dememorizer may be disabled.

KD240 charger: portable for four batteries; auto ac sensing 110-240Vac; trickle charge after complete quick charge; typical time for DP1240 battery, 2½ hours.

KD11: portable quick charger; consecutively charges two or four batteries, switch selectable; 50mA trickle charge after 1.6A fast charge.

[See ad on page 68](#)

PAG America Circle (942)

PAG-Lock series: expanded line of batteries, chargers, brackets, clips, camera-mounted lights.

PEP Circle (950)

DT1/DCR1: displays length of discharge time by battery discharge system; determines the charge and run-time capability of batteries; by Electronic Applications.

Perrott Engineering Labs Circle (952)

PE-383 minicharger: overnight NiCad charging system; accepts all major 4AH, 12V, 13.2V, 14.4V on-board and BP-90 VTR batteries; 115/230Vac, 50/60Hz power; weighs 1½ lbs.

Perrott 441: discharger/charger for 1-4 mix of NP-1, NP-1A batteries; precision discharge/charge process eliminates memory characteristic; <2hr discharge cycle, followed by overnight saturation charge.

Strand Lighting Circle (1043)

LiteScan: auto follow spot; pan/tilt 340°; µP control; iris, douser, focus control; interchangeable 32-color changers.

Task Master: 99-channel control for any number of fixtures; module for LiteScan functions; use alone or with Lightboard M series consoles; for pan, tilt, color, speed, iris, douser, gobo functions; 32 groups, 12 chases.

PanScan ShowChangers: 340° pan, 220° tilt; remote color and movement control; 3-16 scrolling color changer; variable speed.

DC-90: modular dimming system.

Teatronics Circle (1059)

DPI-1212 dimmer: 12-channel, 1.2kW/channel; SCR-pair lighting circuit control.

DPI-624 dimmer: 6-channel, 2.4kW/channel; SCR devices.

Genesis-660 dimmer: 6-channel system; 50A (6kW) channel capacity; SCR-pair modules withstand hot-patching, overloads, miswiring without functional damage; single- or 3-phase 120/240Vac.

Genesis-1224: 12-channel, 2.4kW/channel dimmer system; SCR-pair modules; 0-10Vdc control through AMX-192 analog multiplex control or standard 12-channel cable.

Producer II console: computer-aided lighting desk; 24-crossfade submasters; LEDs show bar graph X-, Y-, Grand Master-scene settings; 24, 36, 48 channel 2-scene configura-

tions; 192-dimmer proportional patch; timed crossfades.

TEKNO Circle (1061)

VU-1000: video head lighting instrument; locking accessories clamps for reflectors, barn-door systems; Galaxy-Box light boxes; by Balcar SA, France.

Telepak San Diego Circle (1066)

Modular Power Pak: 12V, 5AH modular pack, gangable for multiple amp/hour capacity; lead-acid; dc coil extension; 800mA charger.

Union Connector Circle (1103)

Power system: 400A at 120V/240V; electrical distribution service; rainproofed; for 48kW of incandescent, HMI lighting.

TV Cameras

Ampex AVSD Circle (533)

CVC-5 camera: 3-chip CCD Betacam camera with dynamic contrast control.

[See ad on page 39](#)

BTS Broadcast TV Systems Circle (611)

LDK-90 CCD camera: frame-transfer sensor; ENG design; mechanical shutter for high sensitivity, no lag, no burn, no comet-tail, no smear; EFP, ENG VTR interfaces.

KCB-590: 3-CCD camera for film-style shooting; spot measurement sets iris; Betacam-SP outputs for BCB-5 VCR.

KCM-125 camera: studio unit; computer control with auto functions to simplify lineup; RGB, CCVS, component signals; close tolerance picture geometry, convergence; dynamic lens error correction.

KCF-1 camera: ENG/EFP unit, weighs approximately 15 lbs; switchable knee for film-style picture contrasts to 250%; operates with BCN-21 VTR; remote control to 160 ft; base station, KA64 multicore cable extends distance to more than 1,800 ft for OB vehicle use.

[See ad on page 59](#)

Hitachi Denshi America Circle (787)

SK-1200 HDTV camera: shading-free digital registration, <0.025% error; dynamic registration compensation ROM for lens data; 1" DIS (diode-operation impregnated Saticon), 1,400TVL resolution; 5:3 aspect ratio, 2:1 interlace; 30MHz bandwidth.

SK-97D camera: ENG/EFP Computacam auto setup; ⅜" DG Plumbicon; µP control; auto or manual setup from camera head or remote base station; data files for auto, normal, lens, temperature, scene.

SK-970D camera: studio/OB chain; f/1.2 prism, 3-tube ⅜" LOC DG Plumbicon; 60dB SNR; auto setup as SK-97D, SK-110D, SK-120D; auto iris NAM circuit senses highest video among RGB channels; multicore or 10,000ft triax cable.

FP-C1 camera: 3-chip CCD, 280,000 pixel capability; auto, self-diagnostic functions, µP control; dual white balance memory; 56dB SNR NTSC; available in NTSC, PAL; RGB and encoded outputs.

FP-Z31A camera: auto set-up ENG system; ⅜" twist field, LOC, MS Saticon; 60dB SNR, 800TVL resolution; µP-control registration error correction; studio accessory kit; 15:1 zoom lens.

[See ad on page 3](#)



WHY ARE MORE STATIONS BUYING TFT STL'S?

HIGHER RELIABILITY

We love to see the surprised expression on a seasoned engineer's face when he looks inside our STL's:

"Where's all the complicated daisy-chained modules like other STL's?"

Because TFT's patent pending STL design achieves high performance with much fewer components (doing lots of very clever things), it also provides higher reliability too. Our low component count means a higher MTBF. Our extensive 9-step Quality Control and lengthy, 144 hour burn-in is an additional guarantee you're getting the most reliable STL's made.

We back this claim with a two year warranty.

COMPREHENSIVE SELECTION

We have the largest selection of high-performance aural STL systems. . . . including the Model 8300 & 7700B Composites, discrete versions, the economical new 8600, exclusive IF repeaters and On-Channel boosters, and all the accessory gear you need for a complete, state-of-the-art, aural microwave system.

If we don't have it, you don't need it!

ON-CALL SUPPORT, 24 HOURS-A-DAY.

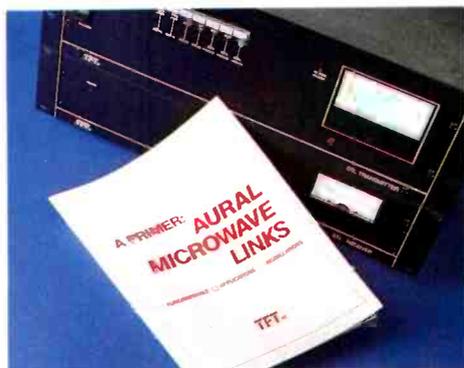
Behind all our STL's is a responsive support and service team you may never need—but it's nice to know the factory has technically knowledgeable people to help you—24 hours a day, 7 days a week.

PERFORMANCE & FEATURES.

Our higher reliability, comprehensive selection and responsive support system is meaningless if our STL's didn't give you the performance you demand. Compare our spec's and features with our competitors'.

A TFT STL is equal or better—in every critical parameter, at a very competitive price!

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FAX: (408) 727-5942

Ikegami Electronics **Circle (798)**

HL-379 CCD: ENG Unicam camera; compatible with HL-95 accessories; auto iris for backlit scenes; external remote control with digital commands; 13W consumption; 650TVL H-/380TVL V-resolution; VBS, RGB, component outputs.

HL-479PC: EFP camera, suited for docking VCR, fiber, triax, multicore cable adapters; 3/8" tubes; 61dB SNR; improved corner resolution; full white shading; auto highlight compression, knee aperture correction.

HL-791S low light camera: 1" SIT (silicon intensifier target) tubes; operates with HL-79 equipment; 58dB SNR; minimum sensitivity 2 lux, f/2.8, 0dB gain; registration 0.1%, 0.3%, 0.5%.

CCD-770 ENG camera: 3-chip design; 600% contrast range; shutter timing at 1/100s, 1/125s, 1/250s, 1/500s; registration 0.05% over entire picture; auto white/black balance, memory

and level, iris, highlight compression.

[See ad on page 146-147, 169](#)

JVC of America **Circle (821)**

KY-20U: 3-CCD camera for ENG, M-II docking VCR or remote camera control; IQ encoding; RS-170A sync; 2H vertical contours; 56dB SNR; 2fc minimum lighting with +18dB gain; provision for stereo audio channels to associated VCR.

KY-80U camera: 3-tube PROCAM with LOC diode-gun M-S Plumbicons; 59dB SNR; adapters for docking M-II VCR, CCU or triaxial cable; auto-iris, -shift registration, -black, -white; viewfinder diagnostics.

KA-3 adapter: converts output of KY-950U and KY-320B cameras to Y/R-Y/B-Y or YIQ signals.

TK-S130U: TSL device camera; 460TVL CCTV applications.

TK-850/-860: CCD color cameras for CCTV;

operates from 24Vac, 12Vdc; -850 with TI-U850U CCU, 12Vdc only.

RS-T900: triax adapter; extends reach of lightweight cameras to 4,920 feet from base station; separate producer, engineer intercoms; auto phase control.

KY-950B camera: PRO-CAM upgrade with three 3/8" LOC DG Plumbicons; 700TVL resolution; 59dB SNR; electronic rotation of R/B channels; improved registration; SMD technology circuitry; longer yokes for more accurate sweep.

TK-870 camera: color CCD system; applications include computer graphic scanning; picture databases; medical applications; separate RGB outputs.

[See ad on page 19](#)

Landy Associates **Circle (840)**
Ikegami CCD camera.

NEC America/Broadcast **Circle (918)**
SP-3A CCD: ENG camera; interline-frame transfer CCD devices with electronic shutter from 1/60 to 1/2000 speeds; NTSC, component, direct RGB compatible with all VTR/VCR systems.

[See ad on page 107](#)

PAG America **Circle (942)**
Nitecam: production models of low-light camera; IR laser source and image intensifier tube; sensitivity to 10⁻⁵ foot candles; looks like normal ENG unit; compatible with standard VTRs.

Panasonic Industrial Company **Circle (945)**

WV-D5000 camera: for studio or location; easy attachment to various optical instruments for scientific, technical, medical use; accessory kits for standard TV.

N3 NiteHawk: 3-Newvicon color camera for low-light applications; nearly burn-free tubes allow high contrast, 57dB SNR, 600TVL resolution in green; RF protective construction.

[See ad on page 91, 93, 95](#)

Sharp Electronics/Broadcast **Circle (1010)**

XC-B20P camera: mixed-field Plumbicons; eliminates adapters for Betacam, M-II, other camera-to-VTR interfaces; viewfinder graphics show camera, lens, recorder status; auto white knee highlight compression.

XC-B10 camera: Saticon version of XC-B20P.

XC-B10TRX: triax adapter for XC-B20P/-B10 cameras; transmits dc power, video, audio, control signals between camera, base station; over 1-mile separation with Belden 9232 triax or equivalent.

[See ad on page 130-131](#)

(Note: Sharp did not appear at NAB due to technicalities in space arrangements; BE feels they should be included in this listing for the sake of completeness.)

Sony Broadcast Products **Circle (1023)**

BVP-350 camera: 3/8" MS Plumbicon; portable version of BVP-360 studio unit; f/1.2 optics; 2000 lux sensitivity at f/4.5; 60dB SNR; weight <13 lbs.

[See ad on page 24-25, 98-99](#)

Sony Professional Video **Circle (1152)**

DCX-M3A camera: 3-tube 3/8" LOC DG MF Saticons; 58.5dB SNR; FET preamps;

Continued on page 106



It is truly magical the way the dynamic BBE process will restore the harmonic balance, increase intelligibility, and give the total sound image a fresh, sparkling clarity. The BBE 402 and 802 Processors are ready to perform their aural "sleight of hand" the moment you insert them into your recording studio, live sound, or broadcast audio chain. Both units will dramatically improve the overall reproduction of program transients in any audio system.

The BBE processors achieve *time-alignment* of harmonic and fundamental frequencies that were present in the live performance but became re-shuffled in the often convoluted paths of recording, playback, and broadcast of audio.

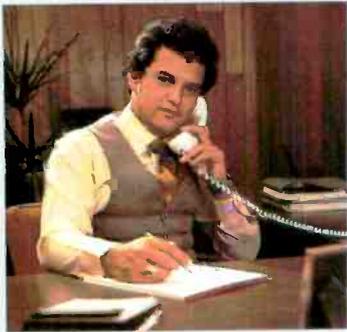
To hear how BBE can work its magic for you, call us toll free at: **1-800-233-8346**.

(In California call **1-800-558-3963**) or **1-714-897-6766**. Or write us at:

BBE Barcus-Berry Electronics, Inc.

5500 Bolsa Ave., Suite 245, Huntington Beach, California 92649

Circle (67) on Reply Card



**Hector Munoz,
Distribution Services
Manager**

“Our purpose is to keep you on the air.”

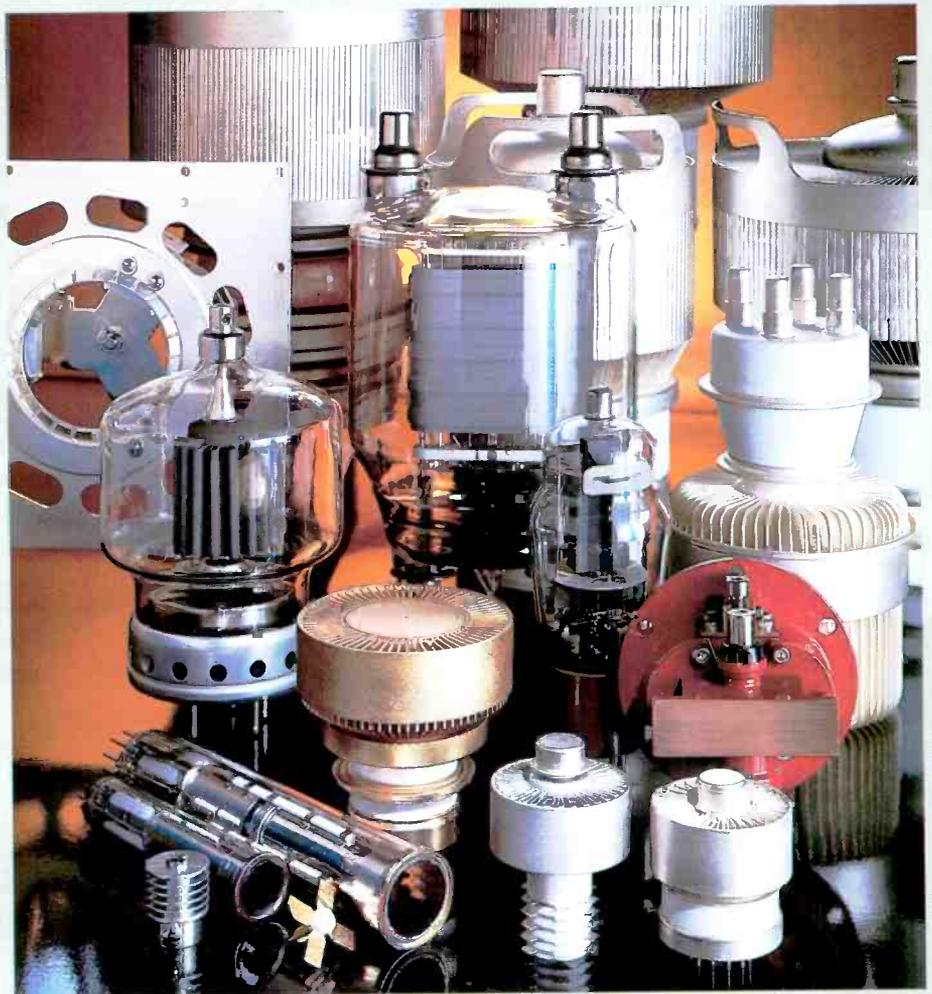
Our extensive inventory of broadcast tubes, RF transistors and related components ensures delivery of the product to you on time — even if I have to run the package to the airport myself. Last year our company made over 7500 overnight deliveries, so we take emergencies seriously!”



**\$30 MiHion Inventory—Over
90% Same Day Shipment**



**Technical knowledge to
help you save time and
money by choosing the
right component.**



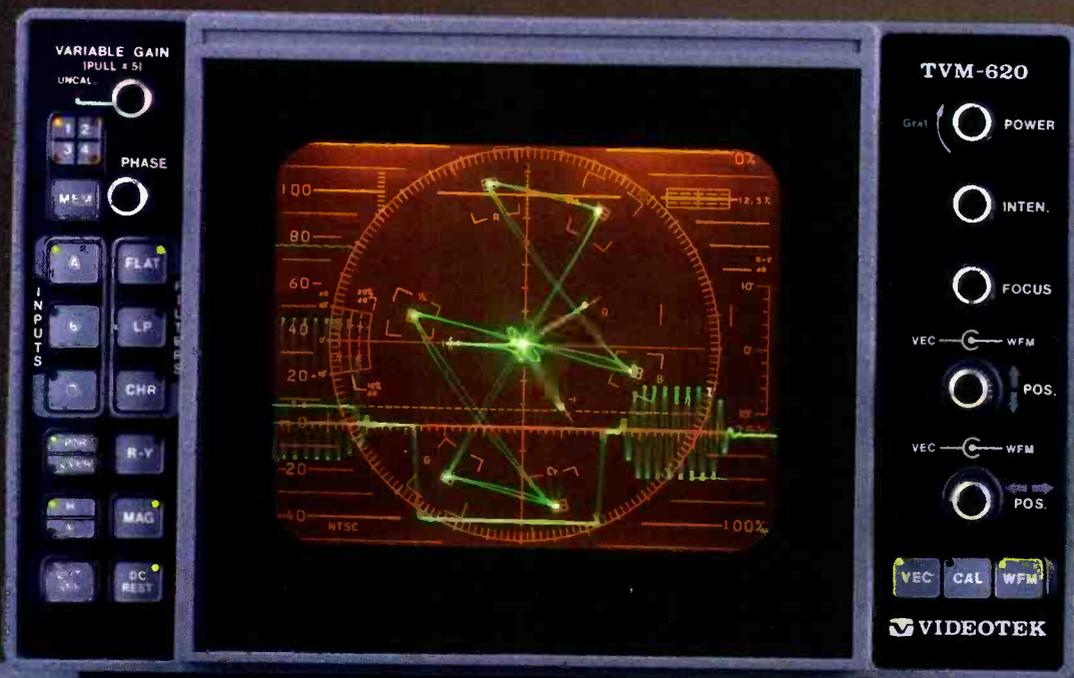
PRODUCTS: Cathode Ray Tubes ■ Diodes ■ Klystrons ■ Monitor Tubes ■
Plumbicon® Tubes ■ Receiving Tubes ■ RF Ceramic Capacitors ■ RF Transistors ■
Saticons ■ Solid State Replacements ■ Transmitter/Power Tubes ■ Tube Sockets ■
Accessories ■ TV Linear Devices ■ Vacuum Capacitors ■ Vidicons ■ Vistacons
MANUFACTURERS: Acrian ■ Amperex ■ Cetron ■ EEV ■ Eimac ■ GE ■ Hitachi ■
ITT ■ Jennings ■ Machlett ■ National ■ Philips ■ RCA ■ Raytheon ■ Thomson CSF ■
Varian ■ Westinghouse



800-323-1770

Richardson Electronics, Ltd.

Convenient Sales Offices: La Fox, IL ■ Woodland Hills, CA ■ Belmont, CA ■ Dallas, TX ■
Norwell, MA ■ Rockville Centre, NY ■ Brooklyn, NY ■ Winter Park, FL ■ Brampton, Ontario,
Canada ■ Lincoln, England ■ Gennevilliers, France



TVM-620

- 15 MHz Bandwidth
- AC or DC (optional) operation
- Flat, Low Pass, Chroma, R-Y display modes
- Multiple display combinations for signal comparisons
- Storage/recall of 4 user-programmed set-ups

VPH-360

- Generates SCH phase markers on any vectorscope
- Absolute SCH phase monitoring
- Normal/bypass modes
- Rack-mountable in optional DAT-1 or DAT-3 tray

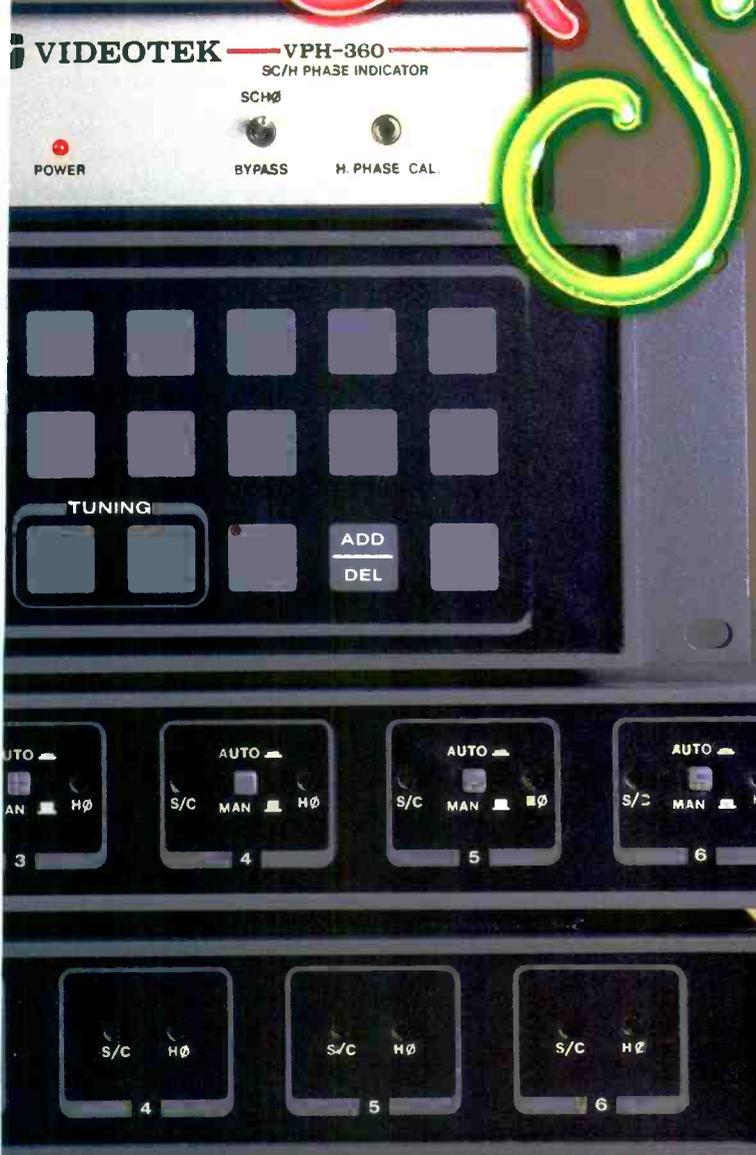
DM-140S

- 140-channels (UHF/VHF/Cable)
- Frequency-synthesized varactor tuning
- MTS stereo or SAP audio outputs
- Stereo amplifier w/ext. speakers
- Unlimited favored channel programming
- Int. 3" speaker on front panel

TIMES SIX AND TIMES SIX PLUS

- Centralized control of system timing
- 6 adjustable black burst outputs
- 6 horiz./subcarrier timing adjustments
- Stand-alone or gen lock operation
- Automatically compensates for cable length/equip. drift (TIMES SIX PLUS)

Hot Stuff!



Videotek introduces a new breed of value-engineered products.

Extraordinary engineering and unusual economy... A rare combination—and Videotek's got it, with a unique line-up of feature-loaded new equipment for '87.

Take our new microprocessor-based TVM-620 waveform monitor/vectorscope, which boasts user-defined memory recall plus three selectable inputs. View any waveform combination simultaneously in parade mode. Or overlay waveform and/or vector displays at the gentle touch of a membrane push button.

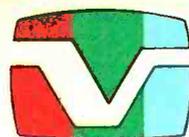
Our new DM-140S demodulator provides 140-channel tuning capability, with balanced or unbalanced MTS stereo or SAP audio outputs and a separate mon-

aural output. Unit comes with volume-adjustable internal speaker, external stereo speakers and tactile membrane control panel.

Get in sync with our new TIMES SIX black burst generator with individual horizontal and sub-carrier timing correction for up to six video sources. Better yet, the

TIMES SIX PLUS with digital horizontal lock lets you choose manual or fully automatic operation for quick set-up.

And there's more—like our VPH-360 sub-carrier phase indicator, which interfaces with any vectorscope for inexpensive absolute SCH phase monitoring. They're all designed for ease of operation and built for reliability. Discover a new breed of video products at your Videotek dealer today.



VIDEOTEK INC.

Designed for real needs.
Priced for real budgets.

243 Shoemaker Road, Pottstown, Pennsylvania 19464
(215) 327-2292 TWX 710-653-0125 FAX (215) 327-9295

Continued from page 102
750TVL resolution; lens has macro focus; diagnostics; auto center, black/white balance, iris; integral character generator.

See ad on page 40-41

Thomson-CSF Video Equipment

Circle (1083)

TTV-1630 camera: production model of compact camera; full auto setup; 2/3" optical format; light-weight for ENG, EFP.

TTV-1640 CCD: 3-chip camera design; large contrast range with white compression and knee optimized for CCD characteristics; μ P control, status; optically compatible with existing lenses and with TTV1623/1624 cameras, accessories; 7.7 lbs with viewfinder; CA-83 module interface to TTV1530 CCU through RGB triax.

See ad on page 177

Toshiba America/OEM Div Circle (1093)

CCD-ENG camera: prototype shown.

IK-M10B/IK-C20A cameras: microminiature 1/2"-CCD color systems; 200,000-pixel inter-line CCD chip; 4.2mm cable, control unit 1.5"x4"x6"; camera 3/8" diameter, 2" long.

Camera support products

- Camera control systems
- Pickup tubes, CCDs
- Pan/tilt heads
- Pedestals, tripods
- Zoom lenses

AF Associates Circle (513)

Radamac-EPO: remote camera control systems.

Amperex Electronic Circle (532)

Frame-transfer CCD image sensors:

- for CCIR/PAL 610x576-pixel structure; NXA1011 for 1-chip b/w or 3-chip color cameras; NXA1012 for 1-chip color cameras with stripe filter separation.

- for EIA/NTSC 610x492-pixel structure; NXA1013 for 1-chip b/w or 3-chip color cameras; NXA1014 for 1-chip color cameras with stripe filter separation.

See ad on page 82-83, 113

Angenieux Circle (540)

40x9.5 lens: μ P-controlled 40x OB; 2/3" tube, CCD format; 2.1x, optional 1.4x extenders; MOD, 0m; f/1.3 to 195mm, f/1.4 to 255mm, f/2.1 to 380mm; 1.3° angle at tele position; weight 43 lbs.

14x7 lens: 2/3" format ENG; 7-98mm range with f/1.6 to 80mm, f/2 beyond; MOD, 0m; 5.5 lbs; 5° minimum horizontal angle; 2x extender.

14x7 CCD: for 1/2" format optics; MOD 0.8m; f/1.4 to 85mm, f/1.6 at 98mm; 3.3-lb lens with 2x extender; optional super wide angle, f/3.2 tele attachments, retro zoom and tripod kit.

14x6 CCD: f/1.4 to 73mm, f/1.6 at 84mm; 2 1/4° horizontal angle at tele position; 2x extender; non-rotating front element for

polarizers and effects filters; 4.2 lbs; tripod kit, 0.64x wide angle attachment option.

Bencher Circle (586)

M2 Illuma: camera stand; counterbalanced for 35mm equipment to 15 lbs; 14"x17" illuminator area in base color-matched to Kelvin temperature of side lights.

Copymate camera stand: smaller version of M2 for roll and lightweight video cameras.

M3 Illuma: bench model for view cameras; 4.5ft column; 14"x17" illuminator in base-board for backlighting uses quartz lamps, 3200°K.

Bogen Photo Circle (1185)

Bogen-XL: fluid head for cameras to 9 lbs; quick release plate.

BTS Broadcast TV Systems Circle (611)

COACH controller: remote control unit for multiple LDK-6 camera systems; interface to IBM, compatible PCs with RS-232 asynchronous data; window/menu operation with keyboard/mouse.

See ad on page 59

Canon USA Circle (621)

Tele-Com lenses: J12x10BKTS, J15x9.5KTS; teleconferencing applications; will meet broadcast requirements; servo focus, zoom; auto, remote iris.

Controllers: TCR-10, push-button control of zoom, focus, iris; speed control; remote, auto iris selector; TCR-20; positional servos for zoom, focus and iris control.

Ci-10 CCD camera: 1-chip camera design; 780x490-pixel presentation; RGB stripe filter spatial sampling; NTSC signal; 200 lux sensitivity at f/2.8 for >43dB SNR.

Davis & Sanford Circle (692)

Airlift tripods: automatic elevator action places camera at shooting height; for cameras from 1-50 lbs.

Dedo Weigert Film GmbH Circle (694)

Special purpose lens: extreme close-up with special optical design; for medical, industrial and high magnification.

EEV Circle (723)

XQ1410/P8520: 30mm Leddicon; replaces XQ1410/1430 if P8400 coaxial structure is not essential; triode-gun design.

XQ3457/P8474: 2/3" mixed-field Leddicon, for ENG applications.

XQ3427/P8462: 2/3" Leddicon; LOC diode-gun structure.

CQ2170/P8496: 1" Leddicon; long-life barium aluminate cathode.

See ad on page 71

Fujinon Circle (757)

A8.5x5.5ERM lens: f/1.7 TV zoom; 1.7x extender adds 9.3-80mm range; 55° wide angle; aperture drops to f/1.9 at 47mm; MOD 0.3m; weight 3.8 lbs.

A20x7ESM lens: 2/3" zoom covers 7-140mm or 14-280mm with 2x extender; f/1.4 maximum flat to 122mm, then drops to f/1.6 at 140mm; back focus adjustment; manual or servo extender; pattern projector color level and chart position controls.

14x8ERM lens: 2/3" zoom for EFP/studio; integral 2x extender allows 8-112mm and 16-224mm ranges; f/1.7 constant to 91mm; MOD is 0.7m; macro focus feature; available with pattern projector.

See ad on page 89

Karl Heitz Circle (785)

GITZO-480: 100% fluid, counterbalanced head for loads to 30 lbs; pan 360°, tilt 60°; adjustable counterbalance, spirit level; quick release plate; extension handles.

GITZO-6F: levelling ball; 4 1/4" diameter flat base; mounts on GITZO 600/800 tripod to support cameras to 250 lbs.

GITZO-390 dolly: collapsible, lightweight; supports up to 10 lbs.

Alpha 11si: Pin Registration for 35mm SLR cameras with Macro Switar 50mm f/1.9 apochromat.

KIWI Paparazzi bags: for photo, cine, video cameras; tripods, other equipment.

Innovative TV Eqpt/ITE Circle (803)

T55C tripods: lightweight, heavy-wall, tubular leg construction; virtually no radial motion; targeted for ENG; with ball levelling for ITE H-60 fluid head.

T45 tripod: EFP, studio support system; pneumatic column from 24 1/2" to 78" elevations; A-frame design.

T554 tripod: heavy-duty design, lightweight for ENG; integral claw-ball assembly, 4-section legs; supports loads to 60 lbs.

T553 tripod: like T554, with 3-section legs.

D670 dolly: load capacity of 100 lbs; folds to 22"; 41" diameter when extended; 4" wheels.

H80 fluid head: clutch type mechanism, 8-position; for ENG, EFP, studio applications and loads to 40 lbs.

Interactive Motion Control Circle (807)

Camera Mover: 8-axis control, 2 for lens zoom, focus; 3 on cart for E/W, N/S, track; 3 on camera head for pan, tilt, roll; 16-foot track, cart with 10-foot column; N/S rails with E/W movement on column; nodal-point camera head.

2-D animation: 8-channel motion controller; animation stand with continuous rotation, 2-foot X-Y travel; video slide compound, A-frame camera mount; Canon J13x9 lens with zoom, focus.

Nodal-point mover: with gimbaled light box; 16-foot track or on fixed cart; allows perspective work in flat art.

Matthews Studio Equipment Circle (874)

LowBoy Crank: crank and chain-operated elevator; from 37" to 5 1/2'.

Computer-controlled remote pan/tilt head, dolly drives.

See ad on page 127

Miller Fluid Heads Circle (892)

Fluid Heads:

- #20 for CCD cameras to 20 lbs, sliding counterbalance plate, variable fluid tension; 75mm claw-ball levelling; pan/tilt lock.

- #30, #50 for camera/load to 30 lbs, 50 lbs; variable counterbalance, quick release plate; 100mm claw-ball levelling; preset fluid tension pan/tilt; ENG, EFP, industrial, education.

- #80 for cameras to 80 lbs; adjustable counterbalance; sliding camera platform; quick release plate; preset pan/tilt fluid tension; positive locking system; 150mm claw-ball levelling; flat-base option; for EFP, 40x zoom lenses, prompters, 35mm film cameras.

Compact tripod: to 30-lb load; black anodized tubular; locks prevent overtightening; raised spreader.

Midi tripod: to 50-lb load; 4-element tubu-

Dependable VHF Transmitters from a Dependable Source. NEC.

The PCN-1400 Series transmitters feature high performance exciters, high power transmitter amplifiers, superior reliability, excellent stability with power ranges of 1 to 35kW, in band I to band III. 100% solid state to 10kW; only one tube to 35kW. A 30% reduction in exciter parts means you get a 50% increase in MTBF—30,000 hours. It's ready for stereo without modification. NEC is a leader in today's transmitter industry, with over 1400 installations worldwide. Each one carries NEC's commitment to excellence. For today, and tomorrow.

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Phone 312-860-7600

Circle (70) on Reply Card



C&C

Computers and Communications

lar; black anodized; raised spreader; locks prevent overtightening.
Maxi tripod: to 100-lb loads; 4-element, heavy-duty tubular; raised spreader, black anodized; safety locks.

O'Connor Engineering Lab **Circle (930)**
Aeropod: floating column pedestal; supports 120 lbs with 22" travel; 3-way valve adjusts column pressure; self-contained air reservoir; 40" aluminum base diameter.
61A: Lift-Lok Column add-on to any tripod with O'Connor top casting; 16" column with easy adjustment, gravity lock.
Model 35: Top-Lok tripod; top casting interfaces to fluid heads with 100mm, 150mm ball, O'Connor Claw-Ball; 60-lb capacity.

Quickset **Circle (971)**
Rainbow Pro: lightweight tripods; aluminum alloys and other composites; 100-lb capacity; adaptable to most heads of 75mm, 100mm, 120mm size; colors in matte finish; for ENG, EFP, film.
Rainbow: QLH-3, QMH-15, QHH-23 fluid heads; geared elevator column; dolly.

Sachtler of America **Circle (999)**
Combi-Pedestal: portable camera support; with Video 25/30 heads, 88 lbs maximum load.
OB-system: 2-stage tripod, dolly, elevator; for camera, lens combinations to 200 lbs; height range 1.6-4.4ft; fixed foot, 2" elevation unit optional.

See ad on page 171

Schneider Optics **Circle (1003)**
TV-80: Variogon 1.4/8.5-150 lens; 3/8" format; studio/OB use; 2x extender, diascope.
APO-Varon HM 14x: Type TV-56 ENG/EFP lens; apochromatic design for CCD cameras; 3/8" format; low chromatic aberration; independent servo iris in zoom grip; aspherical attachment for superwide fixed focal length.
TV-85: 35x tele/OB zoom lens; no mechanical cams, cam followers; 16-bit μ P controls movement of optical elements for zoom, focus; image plane constant within <0.01mm; diascope optional.

See ad on page 193

Schwem Technology **Circle (1004)**
FP-1 Gyrozoom: image stabilizer lens; pan/tilt rate of 30°/s; eliminates most image vibration; 60-300mm focal length; for 3/8" cameras.

See ad on page 189

Tamron Industries **Circle (1057)**
H14x9B1 lens: 14x zoom covers 9-126mm range; F/1.6-1.9 aperture range; back-focus distance 48mm; MOD 3.28ft; servo or manual zoom, focus control accessories; 3/8".

Telemetrics **Circle (1065)**
TM-8505/-8640: remote control for Ikegami HL-series and Sony BVP-series to 2,500 feet on standard coax; camera video, external video to viewfinder; interphone, mic from camera; genlock to camera.
TM-8600 series: miniature pan/tilt systems; 12Vdc, 200mA power, lens zoom, focus controls; 360° pan, $\pm 20^\circ$ tilt; pedestal, tripod, ceiling mounts.

See ad on page 118

Total Spectrum Mfg **Circle (1094)**
HS-110P head: automated pan/tilt head for ENG, studio use; for loads to 250 lbs; repeatability within 18" of arc; control from newsroom computer via multi-controller on serial port; 90°/s velocity, 180°/s² acceleration.
SportsFocuser: auto focus device, tracks within one foot in 100 yards within 0.1s; for all types lenses.

See ad on page 57

Video Services Unlimited **Circle (1126)**
Jimmy Jim: Stanton camera boom; fits in small vans, wagons, pickups; 3-minute setup; remote pan/tilt, zoom/focus; integrated battery charger.

Vinten Equipment **Circle (1132)**
3286-3/Midiped: ENG/EFP pedestal, lightweight; 28.5-58" height range; demounts.
3322-3/3312-3: Vision 20 system; continuously adjustable EFP pan/tilt head; 2-stage tripod; height range from 18" to 61".

See ad on page 201

Digital video equipment

- Special effects
- Electronic graphics
- Titlers

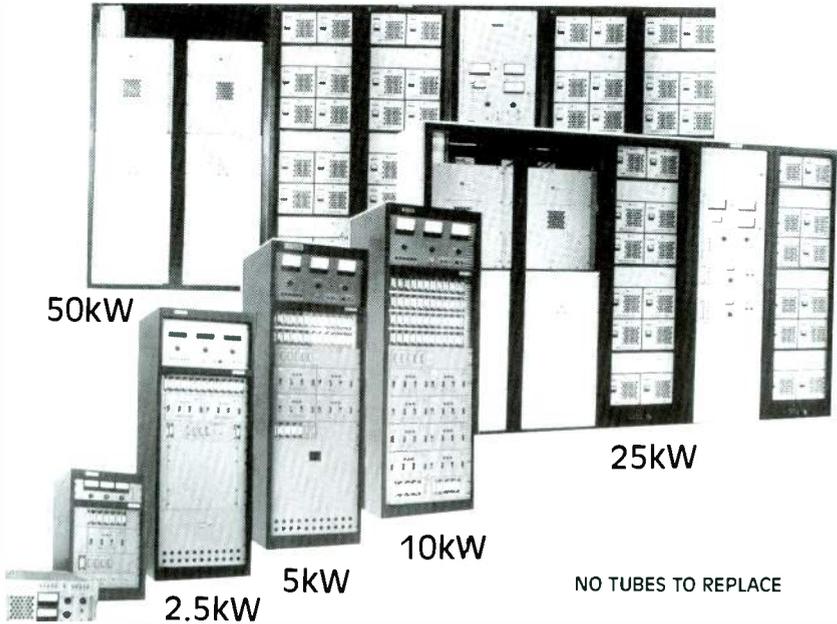


MF Radio



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TOTALLY SOLID STATE **AMPFET** SERIES MODULAR
ALL POWERS



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25KW
10KW
5KW
2.5KW
1KW
400 WATTS

NO TUBES TO REPLACE
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Circle (71) on Reply Card

**NOW!
25 Inputs**

25 x 1 Video/Stereo Audio Switcher



DATATEK

Datatek's new D-4325 Video/Stereo Audio Switcher Features:

- Program line quality video and audio performance
- Two Video and two full performance audio outputs per channel
- Wide Video bandwidth; high audio output level capability
- Video cable equalizing and vertical interval video switching
- Only two rack units utilize optimum space
- Local or remote control panels provide unsurpassed flexibility—remote control over coax line
- RS-232/422 control standard
- Wire per crosspoint and binary parallel port control available
- All control arrangements are fully operable in parallel
- Expansion provisions are included

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Abekas Video **Circle (502)**

A53-D effects: compatible component system; all features of A53 composite system; dual channel; CCIR-601 in/out ports.

WARPS/A53-D option: 3-D digital special effects, bends, curves, page turns, rolls, waves; serial interface for CMX-I², SMPTE protocol; compatible with GVG E-MEN, Abekas T8 switcher; dual-channel or two separate channels.

[See ad on page 47, 195](#)

Alias Research **Circle (519)**

ALIAS/1 graphics: second generation video animation software; improved 3-D modeling, rendering speeds; multiple lights, choreography, multi-camera positions; PIXAR rendering engine; Silicon Graphics IRIS computer, UNIX OS.

Digital interfaces: 4:2:2 link to Quantel Harry and Abekas A62 frame store for digital matte, compositing/keying of 3-D animation on 2-D backgrounds.

Video-in frame grab: from camera, videotape, off-air.

Ameritext **Circle (1176)**

TDC4 data generator: VG Electronics fourth generation teletext unit; for large computer systems; high transmission reliability, reduced cost; local, remote operation.

VGE-1066: VG Electronics editing terminal.

Ampex AVSD **Circle (533)**

PictureMaker enhancements:

- SpeedTrace: software for digitizing of fonts and symbols.
- 3100 System: graphics based on Intel 80386 μ P for approximately 100% increase in speed.
- Rendering station: off-line system for time consuming tasks.
- Memory upgrade: 120Mbyte hard disk system.
- PictureGraph: advanced business graphics software; integrates 3D modeling, animation to popular PC spreadsheets, word processors.

ADO enhancements:

- Digital interface: for ADO systems; inter-machine communication in the CCIR-601 digital domain.
- Digi-Trail software: enhances ADO-1000/-2000; trails, sparkles follow moving images; motion smear in live video.
- Combiner: provides multichannel capability for single channel ADO-1000/-2000 systems.

ESS-5 system: graphic composition, image store, production center; CCIR-601 coding; library cataloguing, management; -5G model includes compose mode and design tools to create composite graphics.

[See ad on page 39](#)

Artronics **Circle (552)**

Paint24 graphics: 24-bitplane twin frame buffers; anti-aliased brushes; 16-level frisket, paint wash; compatible with 3-D Model Shop, 3-D Animator, Paint8/AniMagic, chART software for PGP, VGS graphics.

Aston Electronics **Circle (556)**

LogoMaster: A4 character generator enhancement; create logos, freeze input pictures; includes line draw, fills features.

A4 enhancement: hard disk memory.

AT&T Electronic Photography and Imaging **Circle (558)**

VISTA PC graphics: 32-bit Truevision frame

grab, buffer; 768x485-pixel, NTSC; 768x575-pixel, PAL, SECAM; 4MByte video RAM; custom 32-bit video crosspoint chip adapts memory organization.

DGIS-34010 tools: Direct Graphics Interface Specification for programming of T1-34020, 32-bit graphics processor; drivers communicate between programmer and graphics devices.

TIPS: Truevision image processing software for TARGA M8 graphics board; drawing tools, manipulation, color, anti-aliasing, text handling.

VersaCAD: TARGA 16 computer-aided design/drafting; VersaCAD Design, VersaCAD Advanced; 2-D drafting, 3-D modeling with user-defined light, bill of materials.

Aurora Systems **Circle (571)**

System-AU/280: video graphics system; Sun 68020 μ P-based CPU, 4MByte RAM, 160MByte fixed Winchester drive; 32-bit image processing unit; multiplane animation; extensive brush options; image manipulations; optional 3-D modeling, frame animation, weather, networking.

Broadcast Video Systems/BVS **Circle (608)**

Courtyard VT Clock: electronic clapperboard; antialiased clock face; remote start, compatible RS-422 or 75 Ω serial; integral text editor.

[See ad on page 196](#)

BTS Broadcast TV Systems **Circle (611)**

FGS-4500 Illustrator: 3-D system integrates paint with modeling; upgrades to FGS-4500 Elite, for animation functions; simultaneous user work stations communicate through Ethernet.

Satellite Renderer: Sun computer work station; off-line rendering and variable resolution (64-4000TVL) of video from FGS system; storage on magnetic tape.

FGS-4000 updates: improved resolution to 4000TVL for film, slide and print; off-line feature interface through Ethernet; 9-track mag tape storage for use with slide/print.

Vidifont/Viditext enhancements:

- Font/logo compose: create graphic elements from captured artwork, existing bit-maps or foundry font outlines; manipulate, anti-alias final design, colorize; compatible with Vidifont Graphics V with 20MByte Winchester and 5 $\frac{1}{4}$ " floppy disks.
- Integral disk drives: 5 $\frac{1}{4}$ " floppy drives standard; space available for 20MByte Winchester drive.

Vidifont Graphics V enhancements:

- Optional 5 $\frac{1}{4}$ " floppy drives for compatibility with Viditext II fonts, messages.
- 3rd channel interface: RS-232 link increases number of keyboards to access off-line channels for message updating.

Vidicast/Vidisports: dial-up access to Weather Channel, WSI, Accu-Weather and ESD graphics.

Background Graphics: package includes NFL helmets, AL/NL baseball, NBA, NHL logos; maps, grids, geometrics; textures, metallics, graduated, embossed, color-ramp shaded backgrounds.

Linear DSK: anti-aliased, foundry fonts; 16-level interplane keying between internal text and background planes.

[See ad on page 59](#)

Chisan Unitec/Photron **Circle (637)**

FSC-64000: frame scan converter; NTSC video from 64kHz horizontal scan

1280x1024-pixel RGB computer graphics; composite, separate H/V or on-green sync; 6-bit memory depth; can provide Beta Y/R-Y/B-Y components.

Chyron Telesystems **Circle (639)**

Scribe options: Logo Compose with digitizing tablet; create antialiased graphics; preview channel; mass storage; networking; software for 3-D rotation, texture, shading, banners, dynamic effects optional.

RGU-2 options: video effects with motion; digital spins, tumbles, zooms, linear splits; multiple wipes; called from keyboard, instant display.

Chyron-IV software: additional 100 fonts; interface to election reporting systems; becomes 2-channel system with simultaneous election, titling functions.

Shimatronic Graphic Image: paint, cut/paste, zoom, ray-tracing for 3-D rendering.

[See ad on page 31](#)

Chyron Video Products **Circle (640)**

VP-2 enhancements: multifold option, six typestyles in six sizes on-line; font PROM contains six US or five international fonts.

Chameleon enhancements: composite, RGB displays in NTSC, PAL standards.

TextGrab: for VP-2 and Chameleon; grab text or logos on VP-2, paste on top of Chameleon image; for Chameleon, interface allows camera capture, keying, genlock.

[See ad on page 191](#)

Colorado Video **Circle (650)**

286 transceiver: freeze, send, receive digital still video images on narrowband communication channels; NTSC color frame transmitted in 10.5s (200kbit/s), monochrome in 2s (500kbit/s); RS-232, V.24, V.25 interface; compatible with 285/285C systems; internal modem; select resolution, gray scale levels.

ColorGraphics Systems **Circle (651)**

ArtStar 3D enhancements: improved user interface; wider animation capabilities; 16 light sources in 3-D rendering; fonts with chromes, reflections, rainbow coloring.

ArtStar work station LAN: multiple graphic generation terminals on-line through Ethernet.

Comprehensive Video **Circle (656)**

PC-2 titler upgrade: add-on circuit board for IBM-PC, compatible; CG/titler output; enhanced to include graphics font for standard symbols used in weather and sports.

Cubicomp **Circle (680)**

PictureMaker/30: Model 332, -20 Model 322: based on 80386 μ P for rendering times reduced to 3x over previous models; -20 does not include 3-D animation, True Color Paint or genlock; both have 3-D modeling, advanced imaging, typography software.

SpeedTrace: productivity software; grabs, digitizes artwork, fonts; eliminates manual entry of points for 2-D contour; Video Image Capture for scanning artwork with video camera.

PictureGraph software: advanced business graphics for PictureMaker 3-D systems; expands use of base computer with link to Lotus DIF, Multiplan SYLK, ASCII files.

Del Compu-Cable Systems **Circle (695)**

CG-Plus titler: modified Commodore Amiga; 640x400 resolution, 16 colors/page from 4,096 color palette; shadowing, outline,

Digital Recording Star

The new SIRIUS-100 Digital Audio Memory System puts radio, TV, sound studio and audio post-production studios light years ahead. Instantaneously.

Its 16-bit CD quality digital recording and hard disk technology allow instantaneous access to any recorded segment—over 16 hours of programming. In fact, segments can be replayed and edited, cut, spliced, looped or rearranged a virtually unlimited number of times with no effect on audio quality. Start/stop accuracy to 1/1000 of a second. Compare these capabilities with tape cartridge systems!

Consider also: • Availability of as many as 8 channels simultaneously with up to 8 hours of stereo • DJ mode allows short cuts to be looped and played by the number—superb for background / sound effects • Long-play mode trades bandwidth for up to 4 times greater record / play time.

SIRIUS-100 is configured with two distinct remotes—one for record / playback and the other for playback only—preventing

accidental erasures. And each remote has an RS-232C port to interface with station software packages for scheduling, playlist verification, automated insertion of commercials and more.

Sirius 100™
DIGITAL AUDIO MEMORY



To see and hear a
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Boston (617) 244-3223 / Chicago (312) 250-8833 / Los Angeles (213) 402-5391

Circle (73) on Reply Card

italic, bold, underline; multiple fonts; RGB monitor.

Digital Arts **Circle (704)**

DGS-1.0: PC/AT-based graphic 3-D animation system; shadow, reflection, texture mapping; six light sources of varying color, intensity; multiple simultaneous object movement; animate color, transparency; renders with >20,000 polygons.

DGS-Effects software: for post-processing of DGS-1.0 images; starfield, mosaic, glow, blur, contrast enhancement.

DGS-Render: software; allows users to set-up additional work station for rendering to videotape, film or disc; Definicon DSI-780/4 card, work station performs rendering functions of standard DGS-1.0 station.

Digital Services/DSC **Circle (705)**

Eclipse: production model effects with enhancements; twist, curved effects; page-turns; programmable; cube builder; A/B switch emulates dual channel.

Dubner Computer **Circle (712)**

Model 5K titler: low-cost production unit; full resolution font; eight regular, four anti-aliased fonts in four sizes; 256 colors; floppy disk storage; playback of TEXTA, CBG-2 and Backgrounder program frames.

TB-20 Turbo Paint: features of DPS-1 with 4x processing speed; real-time manipulation on x/y/z axes; expanded memory; key frame animation; VTR interface; laserdisc storage option; input/output in NTSC, storage is digital.

Super TEXTA-500: titling, graphics station, 3-D animation, NTSC paint, full color 4-field picture grab, store; with Turbo Paint, NTSC encoders, sync generator, bit pad, curve-draw.

Grass Valley Group **Circle (772)**

Dubner Model 5K: production titler; full resolution font; playback of TEXTA, CBG-2 and Backgrounder material; (See Dubner). *TB-20 Turbo Paint:* features of DPS-1; faster processor; x/y/z axes manipulation; key frame animation; (See Dubner).

Super TEXTA-500: titling, graphics station, 3-D animation, paint; (see Dubner).

See ad on page 9, 181, 183, 185, 187

James L. Grunder Associates **Circle (777)**

P135 Maurice Minor: zoom effects controller; entry level to expanded Maurice effects systems; internal μ P interface to P147-30 framestore; from CEL, UK.

Harris Broadcast Group **Circle (781)**

IRIS networking: six 6-user IRIS systems link for simultaneous access to on-line library management of 86,000 stills; for IRIS-C and -II models.

Imaging Laser Disk Systems **Circle (801)**

ICMS Paintstore: full color still image system; high resolution paint, capture, compose, store; 8,000 images on 12" optical disk; 6MHz bandwidth digitized NTSC composite or component; 1.9s access time to on-line image, 9s if disk change required.

Integrated Technologies **Circle (806)**

Image-Maker: 24-bit paint system; real-time frame grab, 3-D animation, texture mapping, metamorphosis; transparency control; with -386 μ P for 5x faster rendering. *News-Maker:* PC-based still store; frame grab facility, 24-bit paint system.

JVC of America **Circle (821)**

M-3000 titler: titling, animation from Mindset; character generator; logo creation; real-time, cel animation; effects; integral keys with composite, component inputs.

See ad on page 19

Knox Video Products **Circle (836)**

K40 Microfont: 16-page, 32-color titler; housed keyboard, external power; expandable memory; upper, lower case Helvetica; auto keyer/mixer, genlock; roll, crawl, title, italics by line.

K200 Chromafont-II: 8-intermixed fonts; 512-color selection; adjustable character position, line spacing; adjustable horizontal, vertical edging; 64-page memory.

Laird Telemedia **Circle (838)**

Model 1540: high resolution paint option for 1500-series; create images from scratch or from 1500 screen; zoom, touch-up; 65,000 colors; match color to input video; 1500x483 resolution.

1450 CeeGee: 35ns resolution titler; 65,000 colors; italics, edging, flash, underline, H/V flips; RGB output; with 1034 fader/keyer.

Landy Associates **Circle (840)**

Black's VidCAD: computer-aided-design software.

Ampex/Cubicomp: PictureMaker.

Continued on page 116

NEED TO EDIT AUDIO FASTER?

We have the Solution...

With Our Edit Suite Audio Mixers



Model 616



Model 612



Model 608

Specially designed for television, the ESAM from Graham-Patten Systems lets you edit audio the same way you do video... operating from the edit keyboard. Only the ESAM has a proven track record in edit system integration: for Ampex ACE, CMX, Calaway, Convergence, Grass Valley Group, and other editing systems that operate a production switcher. Tailored to the needs of every facility, ESAMs are offered in 8-, 12-, and 16-input models. Additionally, an electronically controlled programmable equalizer is available for the 12- and 16-input models. Here are just a few other innovative ESAM features:

- Operates like a video switcher with preset, program & preview busses
- Manual & full edit system control of source selection, transitions, & previews
- Separate electronics & control panels for maximum flexibility & compact size
- Delivers high quality demanded by recording & post production professionals

Yet there's more! For a complete brochure, call us toll free:



GRAHAM-PATTEN SYSTEMS, INC.
P.O. Box 1960, Grass Valley, CA 95945

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Circle (74) on Reply Card

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High Resolution Diode Gun™
Plumbicon® TV Camera Tubes for
diagnostic imaging.

Pyroelectric DTGFB vidicon tube
with 8-14 micron sensitivity for
thermal imaging and 24-hour
surveillance.

Image intensifier tubes
including microchannel
plate and proximity
focused types.

High resolution frame
transfer CCD image
sensors for color and
black and white applications.

Diode Gun and Triode Gun Plumbicon camera
tubes for color or general purpose imaging.

Whatever your imaging application – medical or industrial diagnostics, machine vision, broadcasting or CCTV, surveillance or robotics – Amperex is eager to work with you.

The resources available to you at our Slatersville, Rhode Island facility include our Research and Development and Applications Engineering Departments. Both are integrated with a "super clean" Class 100 manufacturing plant. In addition to offering a broad range of imaging devices including the newest solid state image sensors, Amperex is continuously developing new technologies and adapting existing products to the specific needs of our customers.

The Amperex reputation as an image maker is based on supplying the right products for your imaging needs. For more information call or write Imaging Products Group, Amperex Electronic Corporation, Slatersville, Rhode Island 02876. (401) 762-3800. A North American Philips Company. Outside the U.S.A. contact: Philips Electronic Components and Materials Division, 5600 MD Eindhoven, The Netherlands.

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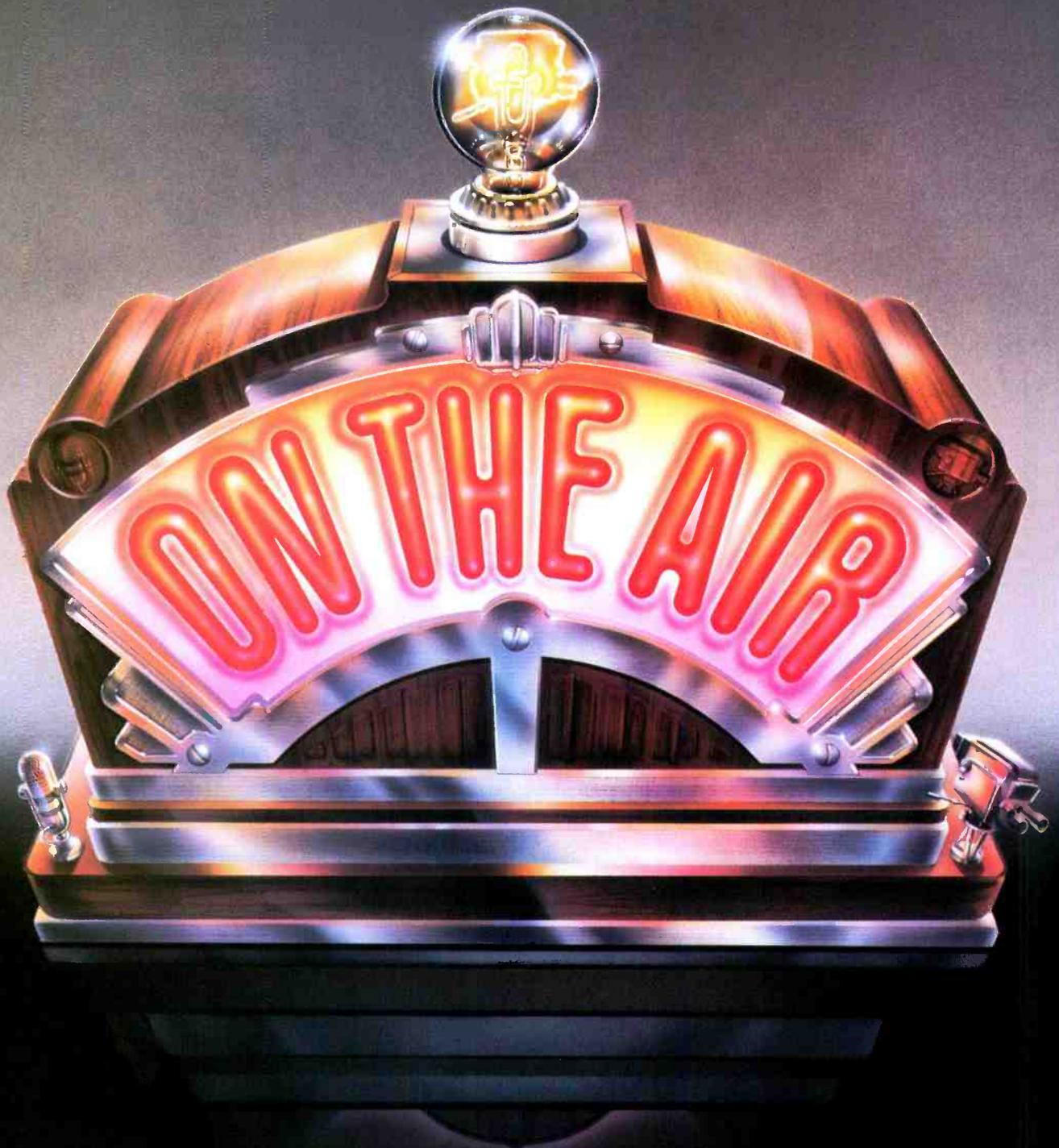
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THE
HARRIS CONNECTION
WILL KEEP YOU ...



Here's What Broadcasters Say About THE HARRIS CONNECTION:

VHF-TV

Joseph A. Carriere, President
Caprock Telecasting, Roswell, NM/Lubbock, TX:

"When a studio fire wiped us out, our Harris sales manager was on the scene in six hours and we were back on the air in 10 days!

Our VHF equipment from Harris gives us the best quality money can buy. And Harris really stands behind its products.

Over the years, Harris has treated us very well. Other manufacturers may make good equipment, but not all can give the kind of support we get from Harris."

KNOB, FM-RADIO

John R. Banoczi, General Manager
Anaheim, CA:

"When it came time to buy a 35 kW transmitter, we found that Harris had the right product with the right features at the right price — so we went with the Harris FM-35K.

Besides — Harris has an excellent reputation for backing and servicing the products it sells."

KCOB, AM-RADIO

John Carl, General Manager
Newton, IA:

"Our SX-1A, 1 kW AM transmitter performs as advertised. It gives us a stand-out presence on the dial — especially in our fringe areas.

And Harris's SunWatch has completely solved our PSA/PSSA power scheduling problems. I don't know how a station could do it otherwise.

When we've needed service, Harris has always come through."

WEAT, AM-RADIO

Bert Brown, Chief Engineer
West Palm Beach, FL:

"Most AM broadcasters who have upgraded their facilities in this part of the state have gone with Harris SX transmitters. As you are well aware, this is a lightning prone area of the country, and our SX-5A has performed well above our expectations in the area of maintenance and downtime.

We chose Harris for its professional service and support. I have a good rapport with Harris people."

WSTQ, FM-RADIO

Al Moll, General Manager
Streator, IL:

"Before we switched to Harris, we were barely on the air with a poor signal. Our FM-3.5K, 3.5 kW transmitter makes us a stand-out on the dial."

KHBS, UHF-TV

Don Vest, Director of Engineering
Sigma Broadcasting, Fort Smith, AR:

"KHBS is our first Harris installation, and I'm very glad I did it.

What impresses me most about Harris is the service and parts support. In 19 years of broadcasting, it's the most cooperative and helpful in the industry.

Harris knows how to treat its customers. Harris is going to win!"

WOMA, FM-RADIO

Dale Eggert, General Manager
Algoma, WI:

"Our FM-3.5K, 3.5 kW transmitter has operated flawlessly since our sign-on last November.

And our Harris representative not only helped us put our equipment package together, but stayed on duty after the sale to see that we met our critical air date!"

WKNO, VHF-TV

Pat Lane, Chief Engineer
Memphis, TN:

"Before I ordered our two new transmitters, I tested three service departments. Harris was the only one with an engineer on duty at 10:30 p.m., the Fourth of July. With the others I got a recording and an answering service.

What impresses me most about Harris is the attitude and the people."

Find out today how The Harris Connection can keep your station ON THE AIR . . .

. . . and we'll send you your free, full-color ON THE AIR poster. An up-to-the-minute symbol of our industry's rich tradition.

Just call us TOLL FREE at 1-800-4-HARRIS, ext. 3002. Or write: Harris Corporation, Broadcast Division, Marketing Department, P.O. Box 4290, Quincy, IL 62305. Our poster supply is limited, so act today.



Continued from page 112

Leitch Video **Circle (852)**
VCD-5600: video character display; key SMPTE/EBU time code derived time into program video; time/user defined alpha/numeric text from RS-232/-422 input may be displayed.

DSF-1300N still: NTSC digital still filing system; accepts non-synchronous input for storage; 650 fields per disk; expandable to 10,000; retrieval 0.6s; database handles library management; ten sequences of 99 stills each is available.

[See ad on page 77](#)

Media Computing **Circle (881)**
TCS-1000: control unit for Aston IV titler; IBM PC, compatible software, controls 50 sequences of 20 displays per sequence; controllable time lapse between displays from 0.1s to 99.9s.

Microtime **Circle (889)**
RP-1 effects: 3-D with antialiasing; open architecture allows upgrades, features, options; get 2-D system to start, build to 3-D in future.

MicroTek **Circle (908)**
SupraStar 1/II: character generator/production titlers; 64kByte memories; digital tape storage; communications board; gen-lock; 5-font Font Pak; -II dual channel.
SupraEdit: off-line text editor; 3½" disk with 720kByte memory for 12,000 screen pages; remote capability through modem.

PESA Electronica **Circle (953)**
CG-4722 titler: NTSC or PAL encoder with DSK; keyboard adapts for international users; auto subtitles with optional time code reader; eight resident fonts; 15-page memory; camera input for font, logo composition; 121 different colors.

[See ad on page 198](#)

Pinnacle Systems **Circle (956)**
Video Workstation: 4:2:2 component digital video graphics, effects, animation system; includes still store, paint, 3-D functions in a building block structure:

- Model 2030 - Painter, FreezeFile paint, effects, still store.
- Model 2033 - paint, 3-D Sculpture, still store, effects.
- Model 2040 - 3-D and animation with effects, still store, paint.
- Model 3000 - paint, 3-D (animation, still store, effects optional).

Quanta **Circle (968)**
Dimension 32: 32-bit graphic computer; modular software concept; 3-D, paint, graphics through software add-on; 6-axis joystick control of 3-D software; fly mode to create animation; network capability.
QCG-34/-38 titlers: four/eight proportionally spaced type fonts, respectively; 18ns resolution at 16 scanlines, instant sizing; 512 colors; RS-170 sync, gen-lock; PAL or NTSC encoder.

Microgen Plus: 50ns resolution titler; four resident type faces in upper, lower case; 512 colors for characters, backgrounds; auto page sequencing.

[See ad on page 55](#)

Quantel **Circle (969)**
Harry Enhancements:

- Rainbow: color grade control of gain, offset, gamma for segment matching; color

change for fundamental alteration of color assignment; track/trail vapor trail, movement tracking effects; difference/average for removal of static picture elements, summation of moving elements.

- Dynamic rounding: combines digital images without interference artifacts.
- Scratch track: 60s (or optional 120s) audio scratch track for timed cuts against audio.
- Non-additive mix.
- Clip management: enhanced for simpler, faster access to images.
- Keyer setup library.

Digital production center: links Paintbox, Harry, Encore, Mirage, Sony DVR-1000 into integrated component 601/4:2:2 production system; RGB, YUV and NTSC inputs; processing in component digital domain.

Pro4 Paintbox enhancements:

- Restore brush, selective reveal under current picture restores original artwork.
- Smear brush, smears background as cutout moves across picture.
- Smudge brush, for outlines of cutouts.
- Airbrush, rate of paint flow percentage selectable from menu; • Stamp, for multiple placements of a single cutout.

• Cypher, Paintbox cutouts transferred to Cypher via C-Link microfloppy system for manipulation against Cypher backgrounds.

Encore enhancements:

- Corner pinning: put 2-D image into 3-D space by pinning corners into position.
- Starlight: real-time dual lighting sources with variable luminance and color control.

Cypher enhancements:

- Total dynamics graphics: background picture library facility for setup and presentation of dynamic, captioned graphics.
- C-Link interface: accepts and manipulates 3-D cutouts from Paintbox, for multichannel effects with words and pictures keyed over backgrounds.
- Keyer: internal digital keyer; keys over 601 external component digital source.

Mirage Enhancements:

- Turbo: enhanced effects, smoother control of posterization, mosaics, curves, multi-user management.
- Network: interface to other Encore, Mirage units.
- Digital combiner: links Mirage effects from Harry.
- Contour: shape generation without programming skills.
- Starlight: for six real-time variable light sources, lights adopt any selected color, while ambient light can be different.

Rank Cintel **Circle (977)**
Presentation File 4:2:2: network management for multiple Slide File work stations, Art File graphics tablets and Gallery 2000 optical disk storage libraries; conforms to CCIR 601/SMPTE RP 125-1984; production effects; NTSC artifact removal; image re-touch; linear keying; up to 16 Slide File/Art File stations on line.

[See ad on page 159](#)

Shima Seiki USA **Circle (1011)**
Shimatronic image system: paint with 16 million colors; cut/paste; color match; multiple paint brushes; water color mix; 16:1 zoom; 4096x4096x24-bit frame buffer; ray-tracing dimensional rendering; video input interface.

[See ad on page 31](#)

Symbolics/Graphics Div **Circle (1052)**

SCOPE: high speed image processing, synthesis work station; Symbolics 3675, Pixar Image computers; Genera software environment; Flavors object-oriented programming system; S-Paint, S-Render, S-Geometry and S-Dynamics software packages.

3M Broadcast and Related Products **Circle (1085)**
D-6000 Panther: graphics generator with titling features; paint, frame grab, logo animation; flips, spins, zooms.

Silver: videographic work station; cartridge software-based system for real-time video digitizing; for post production, corporate communication needs; with layout, effects, text, paint, still store, VCR controller.

D-2200 titler: software-driven; font library from diskette; 2-channel for production or unattended message services; 2,000 page extended memory; keyer locks to composite Beta, VHS, U-matic video.

Specter 3-D: animation work station; menu-driven, high-level command language; boosts graphic productivity with Silicon Graphics Iris 3130 or comparable host; easy manipulation, rendering, animation; project with Neo-Visuals, Toronto.

[See ad on page 136-137](#)

Torpey Controls & Engineering **Circle (1092)**

VCLK-20: video display system for time and Celsius or Fahrenheit temperature; option includes station logo.

VCLK-10: video display using 16x16 dot matrix for characters.

Transformations **Circle (1096)**
EFX graphics: flexible, open-ended 3-D graphic, rendering equipment; render routines microcoded for speed; live video from camera, VCR; uses MicroVax hard disk and tape equipment; ADAGE frame buffer.

Vertigo Systems Int'l **Circle (1121)**
Modeling work station: networked modeling separates time-consuming modeling projects from on-line use; shares animation database.

Interfaces: digital video to Sony DVR-1000 recorder or Abekas A-62 disk recorder.

V-2000: computer animation system; 2D, 3D high speed scene rendering; supports NTSC/PAL, accepts RGB, YUV inputs.

Editing equipment

- Controllers
- Machine synchronizers
- Animation controllers

Alta Group **Circle (638)**
Centaurus production system: still store, retrieval with effects, A/B roll switching, stereo audio mixer, two TBC/synchronizers, dual infinite window, independent frame/field freeze; 50-picture storage on removable Winchester disk, more on external disks; DSK.

Amherst Electronic Instruments **Circle (531)**
AM-2100 controller: video processor, machine control; open bus via software; 32-



Freeze. Frame.

Introducing the fastest, easiest way to get quality prints and slides from video.

Now you can capture the moment, freeze it, and frame it. All with the touch of a button. With the new Freeze-Frame Video Image Recorder from Polaroid.

FreezeFrame produces sharp, instant color prints and color or black and white 35mm slides from virtually any video source. And it delivers a finished picture that is far superior in quality and resolution to direct screen photography or thermal video



System includes Video Image Recorder, control console, and print film camera adapter. 35mm camera adapter optional.

image recorders.

FreezeFrame can be used in broadcast, production and advertising to proof, edit, storyboard, or reference.

It can also be used to pull a print off a just-breaking news story.

The FreezeFrame system includes a Video Image Recorder, control console, and print film camera/adaptor. And the system connects easily to video cameras, professional VCR's, laser disc players and computer graphics systems.

New FreezeFrame from Polaroid. It's fast, easy and at \$1,899* very affordable.

To find out how Freeze-Frame can help you, call toll-free 800-343-5000 8 a.m. to 8 p.m. Eastern Time.

Or fill out and return the coupon. We'll give you the full picture and show

you just how easy it can be to capture the moment on FreezeFrame.

For more information, mail this coupon to Polaroid Corporation, Dept. 678, P.O. Box 5011, Clifton, NJ 07015.

- Please send more information.
 I'd like a demonstration.

BE6/1

Name _____

Title _____

Company Institution _____

Address _____

City _____ State _____ Zip _____

Telephone _____

Video Source _____

Application _____



line TBC, RS-170A, video proc amp; SMPTE/EBU time code, control track reader; modem; IBM compatible.

CTX1000 machine control: SMPTE/EBU time code, control track reader; modem for control via Telco, keyboard override; interlink units via RS-232; help menus; diagnostics accessible by phone; IBM compatible 8088 μ P.

AmpeX AVSD Circle (533)

ACE-200 edit control: 6,000 line EDL storage on 20Mbyte hard disk; LSI-11/73 CPU with 2Mbyte on-board memory; 16-device system for VTRs, Zeus, AVC/Vista switchers, ADO systems, and 20 GPI pulse controlled interfaces for other peripherals.

Frame accurate edit: enhanced VRC-2 remote controller for four serial VTRs.

Serial slow motion edit: for VTR-80 type C video recorder; source machine playback speed control from edit controller.

[See ad on page 39](#)

Amtel Systems Circle (536)

Transform-1 system: managing post production activities; allows material produced on film to be edited on videotape; film conformation, story board feature and list management.

AMX Corporation Circle (537)

SX16+: programmable 16-channel remote controller.

SX-DCU: programmable 2-way data control unit.

SoftWire Control Panel: 3-wire multiplexed control panel.

Apert-Herzog Circle (544)

StepFast device: 1s (32-image) video memory; 16-image display in 4x4 matrix; 525-line mono/NTSC, 625-mono standards; telecine enhancement for fast location of scene changes.

SatSync: stores 20 4-field frames; random, sequenced access from keyboard control; 768x512x8bit per frame; operates as 40-frame still store, animation assembler or fixed/variable display; audio delay option.

Audio Kinetics Circle (565)

Pacer: 2-deck chase synchronizer.

Eclipse/Q-lock: A-V synchronizer, off-line storage for loop, event, Q-key, offset.

BHP Circle (590)

TouchVision editor: non-linear, film style system; touchscreen control for 24 VCRs; speed control knob similar to flatbed systems; frame-by-frame, jog; trial, picture edits, multiple sound tracks; VITC and proprietary tape synchronizers.

BTS Broadcast TV Systems Circle (611)

BBE-990 edit controller: expandable post-production system for four 1/2", 3/4" or 1" VTRs in A/B roll editing; any VTR controllable while other auto events occur; controls video, audio mixers; inputs for live camera, color bars.

[See ad on page 59](#)

Calaway Engineering Circle (614)

CED+ edit control: see Quanta.

[See ad on page 55](#)

Camera Mart Circle (619)

Ediflex-12: computer-aided editing system by Cinedco.

Cipher Digital Circle (644)

Phantom: video transport emulator, adds audio, film transport control.

4800 Shadow II: synchronizer control; RS-232/-422; learns control characteristics of transport, adjusts capstan speed to keep it synchronized within 0.01 frame (0.003s); typical deck lockup time from stop is 2-5s.

Softouch Softpac: data storage system for audio editor; allows unit soft key control and loop memory to be altered, preserved, reviewed; 500 instructions/data cartridge; supports Shadow II event controller; interface to CDI-750, event controller, Cypher.

Shadow Pad: controller for Shadow transport synchronizer.

[See ad on page 52](#)

CMX Circle (647)

CMX-3600: on-line edit control; large scale; DEC LSI-11/73; 3,000-line EDL, expandable; 16 ports for 8 controlled devices; frame accurate; SMPTE/EBU drop/non-drop, tape timer counting; rotary motion control; dynamic motion memory; RS-232, 9600-baud, CMX 8-bit binary communication.

CMX-6000: random-access edit control; makes video editing emulate film flat-bed; extensive help files; standard system has two picture modules, two sound modules, four videodisc players; 3.5" floppy, 20Mbyte hard disk; video, audio switching.

CMX-100: 3-VTR edit system for short segment program production; A/B rolls; A, B, two aux, black sources; four GPI keyer triggers; 5-input video switcher; 6-input audio mixer; cuts, fades, 3-VTR control.

CASS-1: computer-aided sound system; control from Adams-Smith synchronizer;

remote control

PLUS

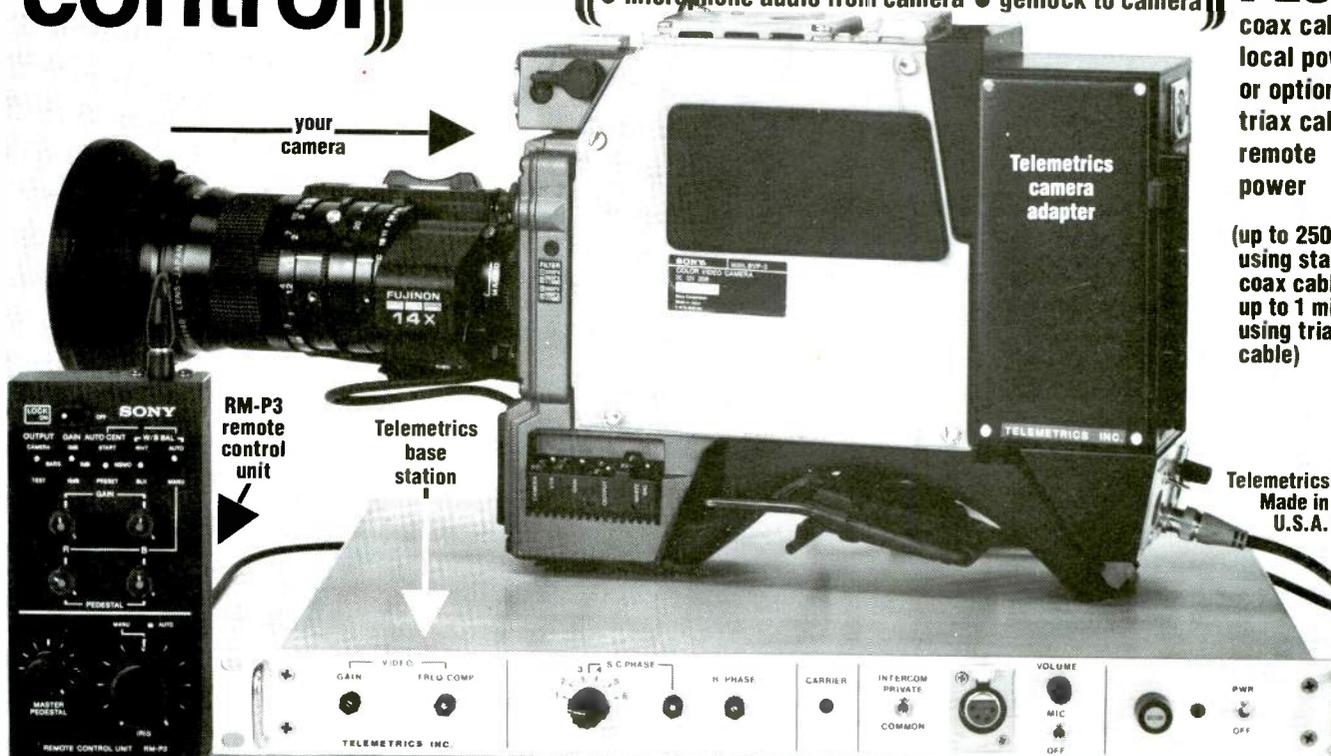
PLUS

- camera video from camera
- external video to viewfinder
- microphone audio from camera

- interphone (bi-directional)
- genlock to camera

coax cable-local power, or optional triax cable-remote power

(up to 2500 feet using standard coax cable, or up to 1 mile using triax cable)



Telemetrics camera adapter

Telemetrics base station

Telemetrics Made in U.S.A.

your camera

RM-P3 remote control unit

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GAIN VIDEO FREQ COMP

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Circle (78) on Reply Card

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"Telemetrics — over 20 years the innovators in camera control signal multiplexing"

* Ask for details on Telemetrics Remote Pan/Tilt Systems.

interfaces to six video or audio machines, 14 code devices via GPI relays; SMPTE/EBU time code; edit, mix automation modes; *CASS-1E* for editing only.

Comprehensive Video Circle (656)

Video software: Moviemaster, film-style scripting, auto format pagination of screenplays; Promptmaster, prompting program for IBM-PC or compatibles; Librarymaster, tape management; Handshake, aids system configuration between RS-232C devices with other hardware, software protocol.

Evertz Microsystems Circle (740)

Model 7000RCT: audio-for-video chase synchronizer; time code driven; reads code from two transports, maintains predetermined time relationship between them. *7100 emulator:* audio transport interface; integrates audio deck into video suite without extra VTRs and external synchronizer; same transport interface and control as 7000RCT.

Future Productions Circle (758)

Quality control: for tape duplication systems; full function; monitor picture, video RF and audio RF, four audio channels (linear and HiFi stereo); random access to all VCRs; auto sequencing; *QCMC-1* main; *RMC-50QC* remote, *MMC-series* monitoring main, *MMC-8EX* expansion control units. *FP-80/-200 duplicators:* full function video-cassette duplication for 80 and 1000 VCRs. *AVD-10/AVD-25:* stereo A/V DA systems with 10, 25 outputs; audio SNR 90dB.

Graham Patten Systems Circle (771)

UTECS: unified TV equipment control sys-

tem from single, multiple control panels; eight analog controls, eight 2-state controls, keypad device selection, 4-character functions display; capacity of 256 devices.

See ad on page 112

Generic Designs Circle (1189)

SCA communications adapter: μ P-based unit; interfaces parallel machines to serial-only controller; VCR powered, connect to VCR remote-control port allowing them as source or record side of RS-422 serial editing system.

DeskTop Editor: expandable on-line edit control; auto assemble, trim, clean; match, calculate, macro functions; RS-422 machine control.

DeskTop Utilities: *DU-1* EDL cleaner, scene manager; *DU-2* BackTracer list trace utility; *DU-3* film, production manager.

James L. Grunder

Associates Circle (777)

P158 Eric: edit system; A/B roll, expands from 2-machine system to 12 plus; help screens, prompts; use with most VTRs/VCRs in any mix; split audio edits; frame accurate; EDL management; integrates to CEL Maurice effects; by CEL of England.

J&R Film

Circle (814)

LOK-BOX: hard-lock synchronizer moviola, film editing equipment; synchronizes video deck to film equipment; μ P control, VITC, tachometer provides sync, even in still mode.

JVC of America

Circle (821)

Paltex edit controllers: EXCEL, EDITSTAR multi-source system; μ P-based, insert/as-

semble, split video/audio; SMPTE time code or control track timing; A/B roll; edit list management.

See ad on page 19

Landy Associates

Circle (840)

Paltex EDDI: editing controller.

Lyon Lamb VAS

Circle (864)

MINIVAS: animation controller; enables single frame recording, with frame grabbing from PC-based graphic computer screens to standard VTRs.

Paltex

Circle (943)

EDDi: non-linear virtual recording system for video/film scene composition; laser-disc, VHS sources allow immediate playback of changes to Scene Log; system VHS producer copy recorder becomes a source for complex real-time playback situations.

Elite: expandable edit control system; compatible with Excel, ES/D-P, Esprit Plus; budget-conscious entry system includes EDL memory, slow play with speed set; user key text, editing.

E-series enhancements: user key text, edit a chain of user key functions without complete sequence reentry; non-volatile EDL memory; auto phase monitors off-tape video phase relative to reference black, auto compensation for errors in sync.

Panasonic Broadcast Systems

Circle (944)

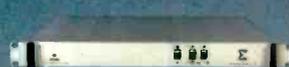
Field-Edit system: for OB use, combines two AU-550 field edit recorders, AU-A50 edit controller and AU-MX-50 audio mixer; optional AU-TB50 TBC for on-air from field; ac/dc power.

HOW DO YOU REPLACE THE MOST POPULAR SYNC GENERATOR LINE EVER?



CSG-450

CSG-455



CSG-460

CSG-465



WITH A BETTER ONE!

Sigma's new line offers improved performance, features and reliability.

- ★ Selectable SMPTE bars, crosshatch, safe areas, plus audio tone.
- ★ Highly stable and accurately shaped RS-170A sync outputs.
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(717) 569-2681

Circle (79) on Reply Card

AU-A65 edit control: combines with three AU-650 VCRs, auxiliary video audio circuits, optional AU-SW65 remote switcher; phase modification function for frame-accurate time code editing; 128-event in/out point memory; RS-232; selectable pre-roll for 3, 5, 7 or 10s.

See ad on page 91,93,95

Quanta Circle (968)

CED MK II editor: integral computer with 80286 μ P; rack-mount chassis, keyboard, monitor, motion controller; direct control of six RS-422 controlled 1" C, 3/4" U, or 1/2" VTRs; CMX, GVG-ISC type EDL format; other interfaces through Calaway upMc, upLt modules.

TCPC Comparator: time code phase comparison determines if code has been recorded correctly; bargraph displays result; both bars indicate correct phase.

See ad on page 55

Sony Broadcast Products Circle (1023)

BVE-9000 edit control: modular, customized control for 14 VTRs; 4-channel audio select, record assign; full look-ahead auto assembly; dynamic motion control, color frame, status display; control for switchers, mixers, GPUs; LTC, VITC, CTL timing.

See ad on page 24-25, 98-99

Soundmaster International Circle (1028)

SMART Sync: varispeed machine synchronizer; interlocks transports at non-standard speeds.

SYNCHRO: programmable synchronizer; edit system component with IBM PC, compatible software; machine-mounted inter-

face for universal cabling; multi-tasking, expands to 16+ transports.

TASCAM Circle (1058)

ES-50 synchronizer: flexible, fast-lockup; for audio, videotape transports; SMPTE time code with subframe accuracy; offset of 0.01 frame steps based on time code or vertical interval sync; digital servo accuracy to $\pm 50\mu$ s.

See ad on page 45

Timeline Circle (1088)

Biphase master/slave: module reads, generates biphase film sync signals; compatible with 2x-100x frame rate standards; links to Lynx system via RS-422 port; allows transport to operate at any speed, while associated modules operate other transports at different speeds.

5850 interface: for Lynx VSI, SAL modules; intelligent interface for Ampex, GVG, CMX, Sony, other leading editing controllers to talk with 5850 transport.

Lynx system controller: multifunction control accesses eight Lynx time code modules controlling external transports; keyboard, display unit for operator control; keypad, function keys, soft keys on user interface.

BVH-2000 interface: serial link for Sony standard P-2 communication, control port to Lynx SAL module.

Videomedia Circle (1128)

Mickey series: -1 cuts-only edit controller, upgradable to -2 A/B roll editor; 50-event memory; distributed intelligence; video dissolve, stereo audio switcher; printer port; frame accurate; cruise, jog, split edits;

GPSI for external devices.

Ani-Mate: interface for VTRs, graphic systems; allows frame accurate animation sequences; MicroLoc-II, SMPTE code; for serial, parallel VTRs; VTR status feedback.

Production, master control switchers

Abekas Video Circle (502)

T8 video switcher: composite, component 10-input; linear key, DSK, fade-to-black; rotary wipes; aux bus; by Michael Cox, UK.

See ad on page 47, 195

Ampex AVSD Circle (533)

AVC/Century series: high-end video post-production, broadcast; extensive key, key mask, key memory; 2M/E 16-input to 3-M/E 32-input; editor interface; optional ADO interface.

AVC/Vista: compact switcher; graphic display; adjustable transition times, memory setups, diagnostics; 10- or 18-input, full M/E; two linear keyers with luma, ISO, RGB/composite chroma, Spectrakey option.

See ad on page 39

BTS Broadcast TV Systems Circle (611)

RME video switcher: production, on-air; multiple, versatile and multiple mix/effects on each mix level; preview, key buses; RGB chroma, borderline key; flip-flop program/preset buses; rotating wipes; optional DSK, control function memory, learn mode.

AT LAST! STEREO FIELD MIXING COMES OF AGE!

Professional Net
Only \$1295



Until you try the new AT4462, you'll never fully realize what other mixers put you through, just to get a stereo signal on tape, on film, or on the air. Because simply adding pan pots or another output to a mono mixer is not enough for today's stereo.

Field Tested and Refined

We went to network and independent broadcast engineers, and leading film and A/V audio people to learn your problems and needs first-hand. And we returned again and again to test our solutions. These tough critics agree that the new AT4462 sets up far faster, provides better signal control, and results in better audio...even in the hands of inexperienced personnel.

**NEW AT4462
STEREO FIELD MIXER
WITH EXCLUSIVE
MODU-COMM™**

Introducing Modu-Comm™

The AT4462 is designed for the real world. For instance, let's assume you're doing a simple sports remote. You set up microphones for the sportscaster and the color announcer, plus a stereo mike for the ambient crowd noise. Normally you would also have to run a

For name of
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CALL 1-800-992-ATUS (2887)

CFM upgrade: Control Function Memory for RME; stores 100 mixer settings for individual, sequenced events.

BTA-2300 automation: technical machine control, distribution, master control switcher; H-P 9000 Series 300, UNIX OS, 68020 CPU.

[See ad on page 59](#)

Central Dynamics **Circle (629)**

Strata-7 switcher: video production; 7-level with μ P control; Super SFX processing for five overlays, two backgrounds through keys, titles, non-additive inserts.

CD-400LE switcher: production; 16-input, 4-bus; three independent key levels for DSK (four selectable inputs), separate key, fill inputs; sequential effects generator (SFX) for 7-combinations of mix, wipe, cut transitions independently.

Series-690 switcher.

[See ad on page 53](#)

Michael Cox Electronics **Circle (675)**

T8 video switcher: composite, component 10-input; mix/effects on program, preset, key buses; linear, DSK, fade-to-black for key flexibility; dual pattern generator, rotary, clock wipes; aux bus; auto non-sync detection.

Digital Services/DSC **Circle (705)**

SX-2000D switcher: upgrade, on-air, production or post; auto playback MLE sequences; access all switcher M/E, key, effects functions; manual, auto transitions defined by frame rates; two Z 80A μ Ps; SCAN rapid sequence review.

Echolab

DV-5 switcher: 10-input production switcher; two mix/effects systems; autotakes; Soft-Take; computer control; contact closure editing interface; μ P for system calibration automatically or manually, evaluates signal, changes setup level, wipe positioning.

For-A of America **Circle (751)**

PVM-600: 12-input, 4-bus; compact; three video black outputs; independent auto-transitions for effects, program, DSK, fade-to-black; separate background, border, DSK matte colorizer.

[See ad on page 111](#)

Grass Valley Group **Circle (772)**

Model 200: 20-primary input; two cascaded M/E systems, each with two keyers; standard DSK, full preview, E-MEM effects memory; linear, luma, chroma key; RS232/422 ports for editor interface, dual serial adapter.

Digital switcher: prototype component digital production switcher; demonstrations with Sony, Quantel, Rank Cintel.

[See ad on page 9, 181, 183, 185, 187](#)

Ikegami Electronics **Circle (798)**

DSS-5108C switcher: digital component; integral A/D converts Y/R-Y/B-Y to 4:2:2; NTSC composite signals for superimposing input; CCIR-601 interface option; 8-input Y/R-Y/B-Y, RGB, YIQ; three super inputs, one key; compact design.

[See ad on page 146-147, 169](#)

Intergroup Video Systems **Circle (808)**

9600 switchers: production; 16- or 24-input,

with 1-2 mix effects; REFEX effects memory stores 'snapshots' of panel, smaller functional groups; M4 multielement, multiplane, multilevel memory keying; linear key, DSK.

4001-pattern generator: digital; up to 30 matrix wipes to luminance key input, frame accurate transitions; GPI/RS-422; 0-99 frame transitions, 0-3.3s; normal, reverse.

[See ad on page 191](#)

JVC of America **Circle (821)**

KM-3000U component switcher: 8-input system for Y/R-Y/B-Y video; three RGB for DSK input; 23 wipe patterns; luma/chroma key, color matte generator; integral sync generator; RS-422.

[See ad on page 19](#)

Ross Video **Circle (995)**

Model 210A: 10-input production switcher; MLE; DSK, memory functions of key setups; three matte generators, three auto transitions units.

Model 216A: 16-input switcher; MLE; DSK, encoded/RGB chroma, analog border keys; RS-232/422; 12-event setup memory.

Thomson-CSF Video Equipment **Circle (1083)**

TTV-5650 system: for digital component production, post; meets 601/4:2:2 spec; input/output data rate 243Mbits/s, 9-bit serial sampling, 8-bit parallel; 15 serial inputs; nine color background generators; programmed transitions; effects memory; four pattern generators, three digital chroma keys.

[See ad on page 177](#)

wired or wireless feed to the sportscaster for his cue phone.

But with the AT4462 and Modu-Comm, cue is fed through the announcer's mike cable already in place. Add a small accessory decoder to the end and plug both the cue phone and the microphone into the same cable. Cue can be program, an outside line, or "talk over" from the mixer. No extra wires, no crosstalk, and no change in audio quality! Nothing could be simpler or more efficient.

Now, No-Fuss Stereo

Actual stereo mixing is equally straightforward. The sportscaster and the color announcer in our example appear on separate pannable inputs so they can be centered as desired in the sound field. The stereo crowd pickup goes to a stereo input, with clutch-ganged controls for one-hand level control. And there's a second stereo input for another mike or line level source

(a second field mike perhaps, or for pre-show interviews on tape).

True Stereo Limiting Plus LEV-ALERT™

Adjustable limiters can operate in tandem, or individually as you prefer. And our Lev-Alert system can give you peak level audible tone warnings in your headphones when you can't watch the VU meters. Trust Lev-Alert to keep your standards high...even when it isn't easy!

Take A Close Look

When you examine the new AT4462



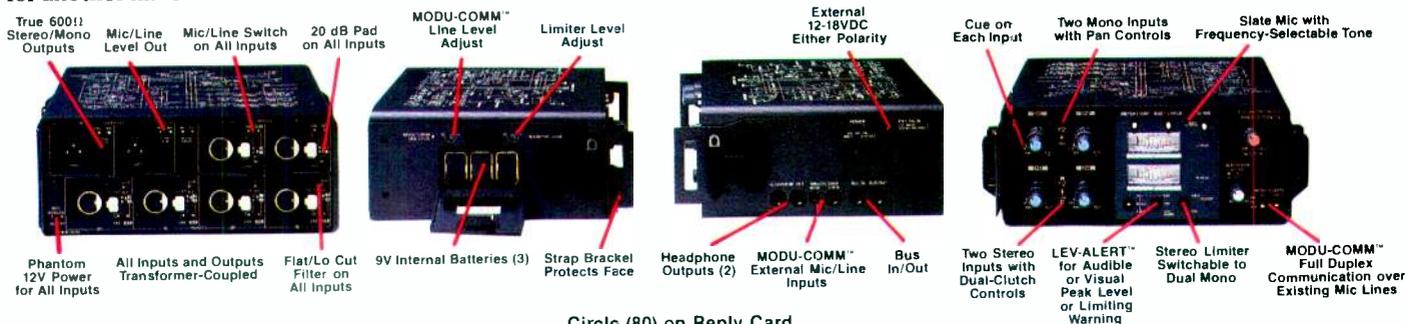
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you'll see a host of other features to help you do your job: Cue on every channel...Separate headphone amplifier...Phantom power for all types of mikes...Three-frequency tone oscillators...Slate mike...Supplied carrying strap and protective case...Powered either by internal 9-volt batteries or any external 12-18 VDC supply, any polarity.

A New Era in Stereo Begins

We've made the new AT4462 a working tool that helps you and your staff take full advantage of the production values stereo has to offer. And a hands-on test will quickly prove it. To learn how the AT4462 can help you create better audio every day, call or write us now.



Circle (80) on Reply Card

3M Broadcast and Related Products Circle (1085)
324 Master Control: TV on-air switcher; performs keys, dissolves, cuts, transitions; 32-input A/V, four assignable inputs with alphanumeric readouts, full audio-over/under capability.

Utah Scientific Circle (1112)
MC-502B: master control; 16-bit μ P supports present functions, future enhancements; SAP channel switching; six VU meters; selective metering, listening to three audio channels.
SAS-II: automation for MC-502B or other master control systems; menu driven through color displays; word-processing log editing.

See ad on page 33, 163

Vital Industries Circle (1133)
Vital-3000 switcher: 26-input, two M/E or three M/E systems, four inputs and two edgers per M/E; extensive keying capability includes linear, chroma and line keys; simultaneous upstream/downstream mix/wipe with independent rate; IEEE-488 links panel, rack; PSAS system, independent for each M/E.
3000+ switcher: all features of the 3000 system with continuous pots for instant memory override; independent DSK source and fill buses; for post production.

Prompting systems

Broadcast Dynamics Pty Ltd Circle (601)
CUEWORD-IV: computer prompter; 8088 μ P; 640k, expands to 1MByte; word processing in 16-, 40-, 80-column modes; function key controls; roll mode; dual screen mode; 4 foreground, 14 background colors; parallel printer, communications ports.

Comprompter Circle (657)
Totaprompter-PC: computer prompting system uses Toshiba T1100 Plus portable PC, dual drives, fold-up LCD screen, ac/dc power; 9" or 12" monitor/mirror with light-weight camera tripod mounting; software available separately from hardware.
ENR-PC: PC compatible, for prompting, newsroom scripting; software available separately from hardware.

Compu-Prompt Circle (658)
Podium prompter: full-color display, smooth scrolling; invisible to audience; instant, random access to any point in text; 8-bit 6502 μ P; interface to IBM-PCs and other computers via modem.
System/software support: extended memories, to 80 minutes; up-loadable user-defined character sets; file transfer utilities for most computers; text decoupling from IBM and other word processors; extended warranty programs.

Computer Prompting Circle (661)
CPC-2000 teleprompter: captions and prompting from IBM or compatible computer based system; minimum 256k EGA and RAM memory with two disk drives; line 21 encoder; hand controller connects to game adapter.
CPC-1000: computer teleprompter system; essentially like CPC-2000, without the captioning/line 21 encoder capability.

Listec Video Circle (858)
A-5000 prompter display: stand-alone unit for formatted prompting text created on host computer; may be addressed by host computer; interconnect through modem; to 9,600 lines of text; driven from word-processing software; -5001 control box; -5002 speed control; -5003 color option; -5004 international character set option.

Q-TV Circle (964)
QCP Mark I: computer prompter software for IBM PC and compatibles; variable speed, bi-directional, smooth scroll; two upper/lower case fonts, two additional uppercase fonts; multi-lingual characters; compatible with PC-DOS ASCII files.

Tekskil Industries Circle (1062)
909C prompter: light-weight system; membrane seal on computer keyboard; internal switch for NTSC, PAL; vacuum fluorescent display.

Telescript Circle (1067)
Computer prompters: based on C-64 and IBM computers.

Telecine, film-related products

AF Associates Circle (513)
Marconi B3410: telecine system.

TAKE IT ON THE ROAD. SEE WHAT IT WILL DO.



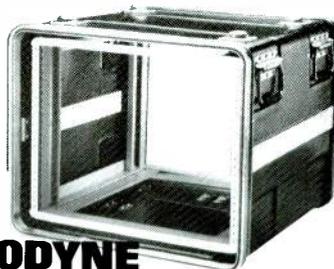
Rack-Pack™ cases are tough. Hit the road with them and you'll know just what we mean. Bumps and jolts typical of location shooting can take its toll, even when you're being careful.

That's why we put those unique little ribs in the pliant high density polyethylene shell, to absorb shock. The Rack-Pack does just that, it repeatedly handles virtually all impact. Minimal vibration reaching the interior is instantly overcome by the elastometric shock mounts supporting the rack frame. Delicate equipment remains totally unharmed.

Water tight? You bet. And, versatile because Rack-Pack opens both front and back, so everything can be

prewired in advance. You can be up and running in minutes, not hours. Also, interlocking Rack-Packs can be stacked to form modular workstations.

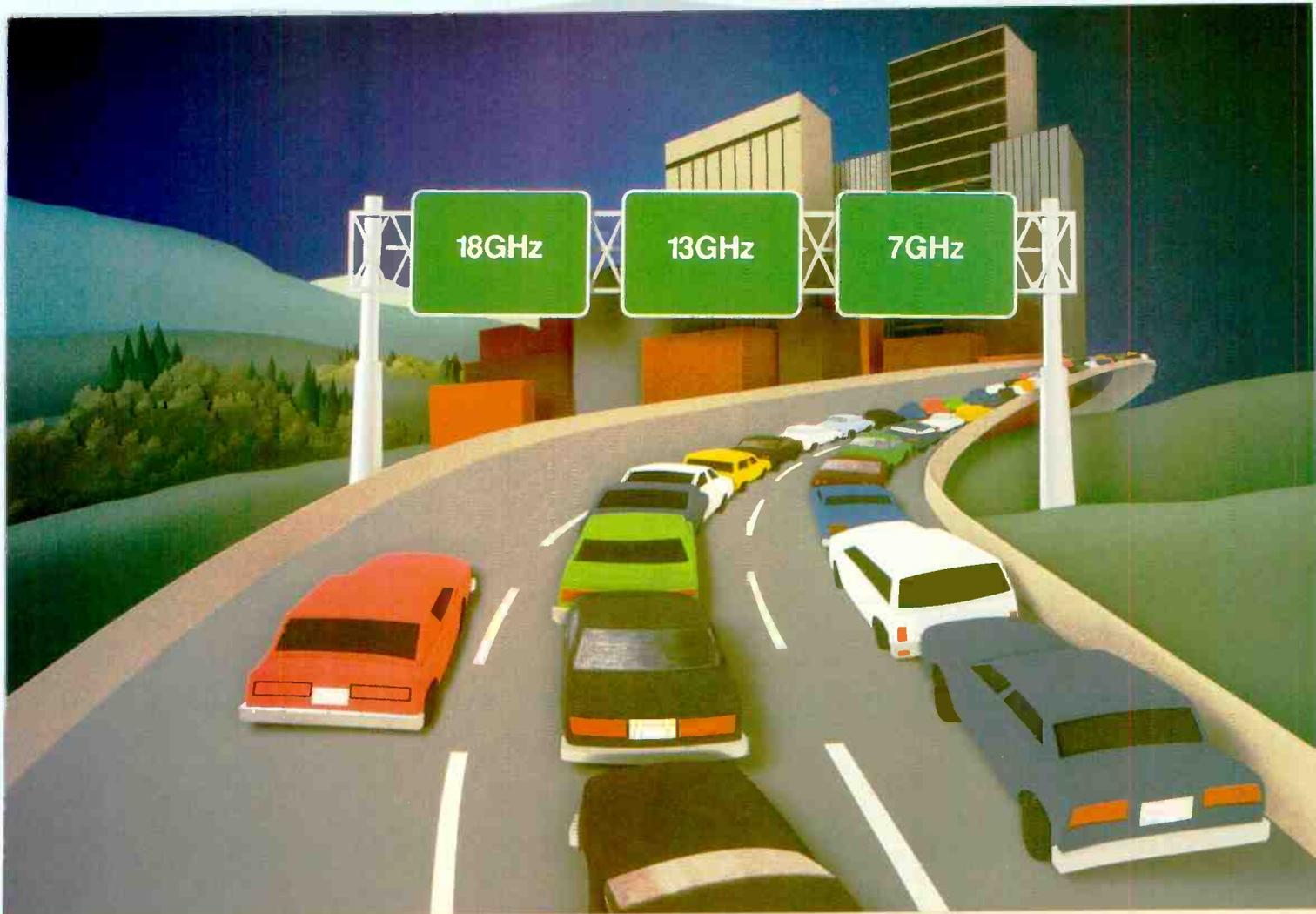
So, the next time you and your equipment decide to hit the road, you'll be better off leaving those fragile old plywood and fiberglass cases at home. Move out with Thermodyne cases, and you move out with total confidence.



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Circle (81) on Reply Card



Beat the traffic.

M/A-COM opens up a new lane for broadcasters with our new 18GHz microwave system.

If you've been looking for an open frequency at 7 or 13GHz, you're not alone. In many areas, they simply aren't available: there's too much traffic and not enough spectrum.

M/A-COM's new 18GHz microwave system gives you another option: a wide-open band which the FCC has assigned to broadcast. It gives you 50% better link availability (or 40% longer range) than 23 GHz, and none of the congestion of the lower frequencies.

The MA-18CC is a fully-featured microwave system, designed to meet or exceed all RS-250B short-haul performance

specifications. It is field tunable, and a single gunn oscillator covers a wide selection of frequencies so spare parts can be kept to a minimum.

For over 20 years M/A-COM MAC has specialized in providing microwave radio equipment to broadcasters. Every unit with our name on it is built in our own factory, so we not only control the quality, but we know how to service it.

For more information on how you can streamline your microwave needs, contact M/A-COM MAC, Inc., 5 Omni Way, Chelmsford, MA 01824, (617) 272-3100.

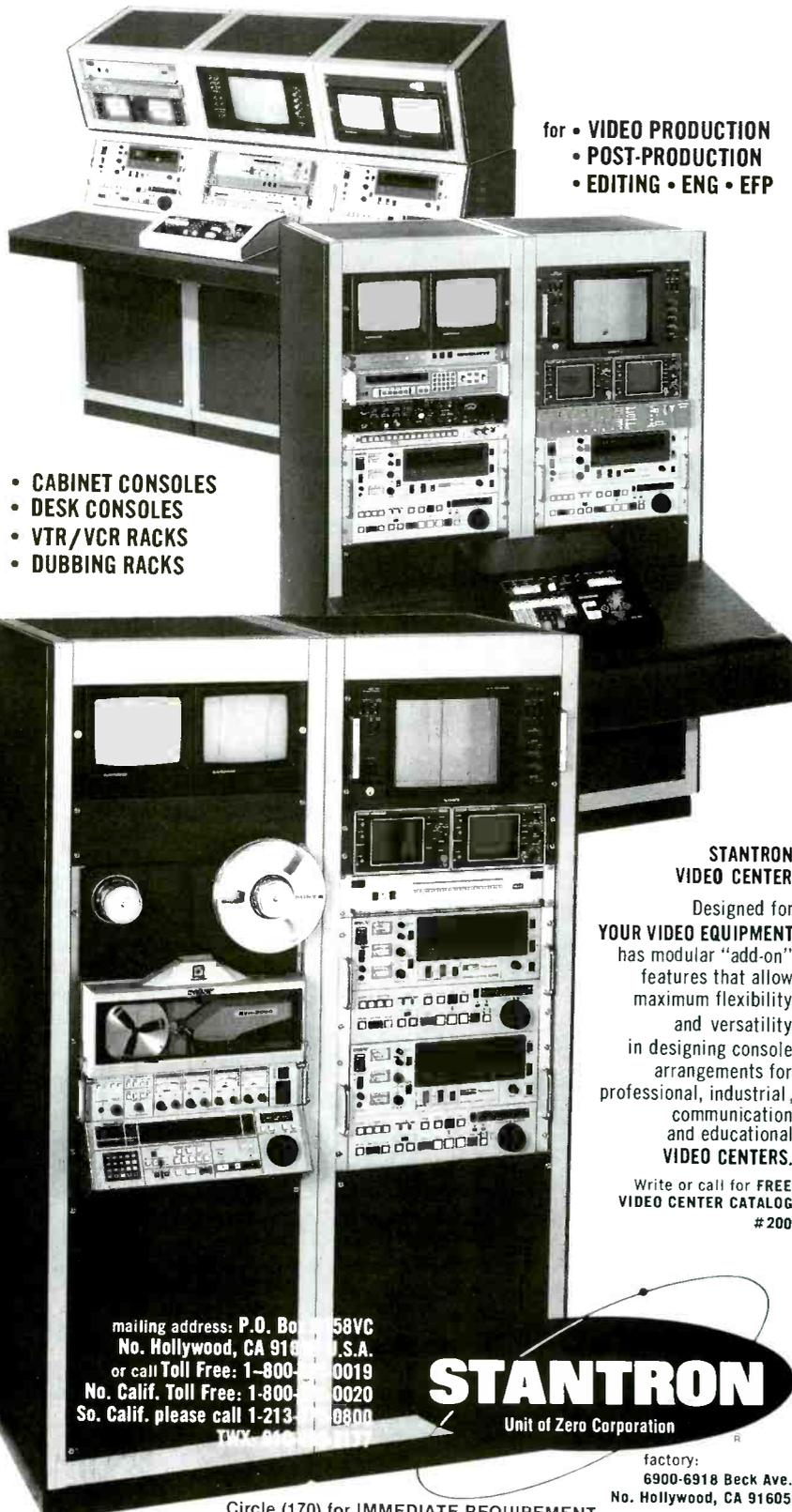
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Circle (82) on Reply Card

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Circle (170) for IMMEDIATE REQUIREMENT.
Circle (171) for LITERATURE ONLY.

BTS Broadcast TV Systems Circle (611)
FDL-60 film scanner: CCD line sensor technology with digital frame store; offers slow motion, programmable freeze/defreeze, variable speed from 16-30fps, preselection of negative film stock types; integral manual color correction operates with programmable reproduction system.

FRP-60 telecine programmer: companion to FDL-60 for color correction by individual frames; store, recall of PanScan, transport, audio and customer-definable functions.

See ad on page 59

Dwight Cavendish Circle (626)
Copymaster Telecine: flying spot scanner; interchangeable film gates for 8mm, 16mm, super 16mm, 35mm; 35mm wet gate optional; floating scan window eliminates CRT burn; NTSC, PAL; positive, negative film, pan-scan; compatible with standard color correctors.

KEM Elektronik Mechanik GmbH Circle (829)
EdgeWriter: encodes film data, reel numbers, scene/take, edge code numbers to SMPTE LTC and VITC user bits; interface to Lake Systems with Macintosh computer.
KEM Telecine: portable film-video transfer system; with Edgewriter; window display of film data; multi-track sound.

Multitrack Magnetics Circle (1193)
ST-35E/DCS: high speed projector; reversing system; electronic intermittent; smooth transition from incremental mode to 6x speed; transition point adjusts 36 to 48fps.

NAC Circle (910)
Laser telecine: HDTV Hi-Vision film-to-tape or HDTV air; laser reads HD film source; optional use of 16mm and 35mm cine, 35mm slides; cooperative project with NHK, Japan.

Hi-Vision recorder: HDTV 35mm laser film-from-video transfers.
Sound recorder: optical sound using laser source; 35mm film media.

Nytone Circle (929)
VSS-1/VSS-2: video slide scanners; 80-slide capacity carousel; self-contained operation possible; color bar source; optional random access, 750TVL resolution; composite, RGB outputs.

Optical Disc Circle (935)
Model-615: pulldown processor; eliminates exact relationship between film and video frames; inserts flag in vertical interval of first field of each new picture; telecine sends frame advance signal.

Polaroid Circle (959)
FreezeFrame video recorder: makes print (4"x3" Type 339) or 35mm transparency images of video picture; captures NTSC signal from any video source; allows color, luminance adjustment, raster-fill; applicable to computer output at 15.75kHz in RGB/TTL mode.

See ad on page 117

Rank Cintel Circle (977)
ADS Amigo: telecine preprogrammer, for broadcast telecine system; functions include varispeed, auto edit, auto error correction, Panscan, X-Y zoom; color balance, gain, gamma, pedestal can also be controlled.

Digivac-3 aperture corrector: for enhanced MK IIIIC flying spot telecine; coarse, fine vertical aperture correction, coring for 16mm, 35mm and anamorphic film; eliminates noise from over-correction of diagonal detail.

See ad on page 159

Research Technology Int'l Circle (983)
TV-2000 enhancement: film editing system; PHASAR non-contact defect detector; previews, edits from 0-400ft/min; inspects, surface cleans film; QUIK-TRAC speech processor for normal sound pitch to 2x speed; optional EM-480 liquid cleaner.

Video monitors, TV receivers, Projectors

ASACA ShibaSoku Circle (553)
CM44A1/CM43A1 monitors: dot/in-line CRT; three NTSC inputs: H/V delay; H-AFC select; CM44, 500TVL resolution; CM43, flat screen.

Barco Industries Circle (578)
CVS37/51 monitors: 14", 20" CRTs offer slot-mask in-line P22 or dot-mask in-line gun EBU/SAP choices; encoder choices include quad (NTSC-3.58, NTSC-4.43, PAL-B, SECAM), PAL-M or PAL-N; μ P-controlled auto setup; remote control for single or multiple units.

Digital Interface: two serial, one parallel CCIR 601 4:2:2 data streams at 243Mbits/s; plug-in module.

Analog Interface: plug-in for parallel component video standards, including RGB, Y/Pr/Pb, Y/I/Q.

Input module: five additional coded inputs for CVS monitor; modify to four coded video, one external sync input.

See ad on page 170

Conrac Circle (668)
Model 2660: monochrome monitor with 15" diagonal CRT; replaces DZB series with 25MHz bandwidth, 800 TVL resolution, D6500 phosphor; 2-input, modular.

6545/6550 Micromatch: production model of color monitor with automatic setup capability of 20s per unit; 13", 19" dot-mask PIL CRTs use 0.31mm and 0.44mm dot pitch; digital beam current feedback; auto NTSC, PAL sensing.

Information Display Systems

Circle (802)
Eidophor: multistandard HDTV projector; to 40-foot widths for 1125/60 standard; aspect ratio 16:9; 3,500 lumen output.

JVC of America Circle (821)
VM-R190U monitor: 19" CRT, 0.4mm pitch, 600TVL resolution; comb filter; component, RGB analog/TTL inputs; cross-pulse.

See ad on page 19

Mitsubishi International Circle (894)
AM-3501R: 35" monitor with auto variable horizontal scanning from 15-35kHz; compatible with IBM PC PGC/CGA/EGA graphics; high res CRT; 2-channel audio, speakers; NTSC/RGB, RGB/mono TTL.

Panasonic Industrial Company

Circle (945)
BT-D1910Y monitor: 19", 550TVL resolu-

TAPE MACHINE TESTING AND LOTS MORE!

Tape machine testing is just part of Audio Precision System One's repertoire. For tape, System One does:

- response on stereo machines—or multi-tracks to 192 tracks
- distortion across the entire spectrum
- wow and flutter, rotational and scrape
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- separation (worst-case crosstalk on multi-tracks)
- azimuth adjustments
- phase vs frequency
- gap scatter on multi-tracks
- spectral analysis of noise

ANALOG TAPE: System One tests VTRs, ATRs, reel-to-reel, cart, cassette formats—two or three head—using tapes you make or standard reference tapes, even with voice between tones.

DIGITAL TAPE: System One's -100 dB (0.001%) distortion levels make it the selection of the leading manufacturers of digital recording systems. Try measuring the -85 to -90 dB distortion 16-bit PCM systems with a test set with -75 dB residuals!

AND LOTS MORE: Audio Precision's System One tests all audio equipment in your inventory—compact disc players, consoles, power amps, distribution amplifiers, switchers, transmitters. Even acoustical tests on loudspeakers and microphones.

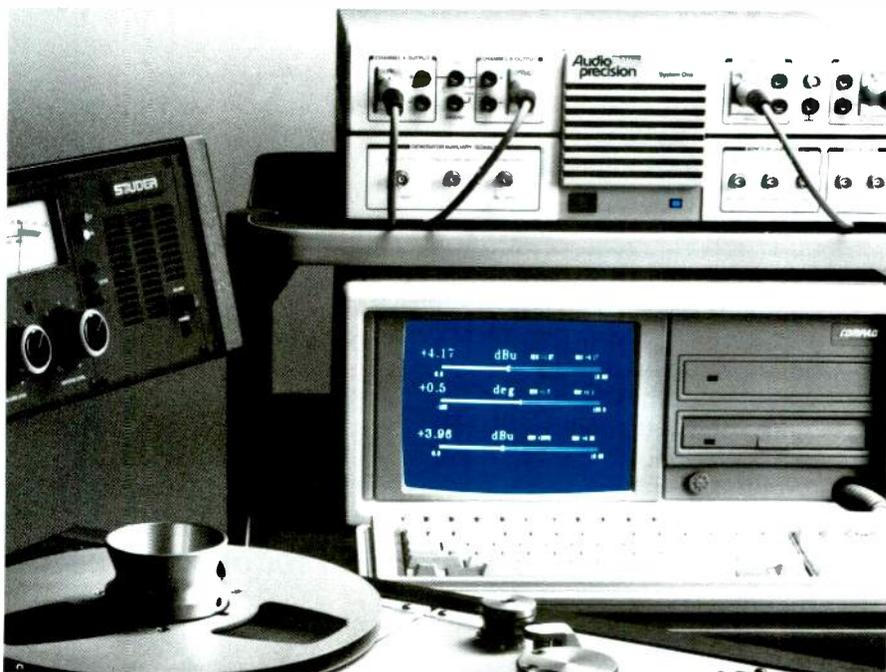
Features such as:

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Circle (84) on Reply Card

tion; standard pulse cross, underscan, blue-gun only mode; 2-line VTR, RGB inputs; presettable controls; A/B split; selectable Comb/Trap filtering and AFC. (BT-M1310Y uses 13" CRT).

BT-S1000N monitor: 10" CRT; ac/dc; 300TVL resolution; normal, underscan modes; pulse cross, blue-gun only; 8-pin VCR and RCA audio/BNC video inputs.

ST-1000M monitor: 10" CRT unit for 300TVL resolution; comb filter; targeted for industrial, scientific applications.

CT-1030M monitor: 10" 300TVL display with BNC video, RCA audio, 8-pin VCR inputs; comb filtering; magnetic shield.

See ad on page 91, 93, 95

Sony Broadcast Products Circle (1023)
IDX-5000 Indextron: 5" color monitor, 10x brighter than conventional displays with improved beam efficiency.

See ad on page 24-25, 98-99

Sony Professional Video Circle (1152)
PVM-2030 Cubic: 20" Trinitron monitor; 560TVL resolution or 640x200-pixel analog RGB IBM CGA image; stack easily to video wall displays; hidden touch panel controls; dynamic focus, velocity modulation scanning; beam current feedback.

VPH-1040Q Superbright: video projector, with 900TVL RGB, 520TVL composite resolution; twice light output of previous models; for 72-250" diagonal image; amplifier, speaker; BNC connectors; IBM CGA displays with adapter.

See ad on page 40-41

Tektronix Circle (1063)
650HR-C monitor: component, composite

picture display; for use with WRM-300 component analog waveform monitor, TSG-300 component test signal generator.

See ad on page 28-29

Telex Communications Circle (1073)
MagnaByte: computer image projection system.

See ad on page 87, 96

Thomson-CSF Video Equipment Circle (1083)

Digital monitor: developed with Barco Industries; display of integrated digital decoding of digital video images.

See ad on page 177

Videotek Circle (1129)
AVM-19s: 19" diagonal color monitor; integral audio speaker; A/B/VTR inputs; blue gun, pulse cross, underscan; keyed back porch clamp; int/ext sync; external demod input; switchable comb/notch filter; sharpness control.

See ad on page 104-105

Zenith Circle (1199)
SC2791-series: digital System-3 TV receivers; integral World Teletext decoding; digital comb filter; stereo; on screen displays of viewer preference features.

Processing Equipment

- Color correctors
- Encoders, decoders

- Frame synchronizers
- Keyers
- Standards converters
- Sync generator systems
- Time base correctors

AF Associates Circle (513)
AVS ADAC: standards converter, frame synchronizer, TBC.

Aston Electronics Circle (556)
Acron 610N: linear keyer/encoder; anti-aliased titles with shaded backgrounds.

AVS Circle (574)
ADAC: standards converter, frame synchronizer, TBC; motion processing with adaptive 4-field interpolation; adaptive comb filtering; 9dB luminance, 12dB chroma noise reduction; RGB, YUV, YIQ, composite video are standard; CCIR-601 spec.

Broadcast Video Systems/BVS Circle (608)

CDK-100: component DSK keyer; fade-to-black in mix or mix-key modes; remote RGB, Y/R-Y/B-Y selection; internal mix-key for component into component; external allows keyhole pattern from composite signal.

Masterkey linear keyer: linear, normal key, seamless inlay, antialiased edges; adjustable key slope; mix-to-key; sensitive to 5 IRE level differences.

Vistek decoder: converts composite NTSC, PAL to RGB, YUV; (see Vistek).

See ad on page 196

Short Interval Audio Testing (SIAT)

The Short Interval Audio Testing was conceived by CBC (Canadian Broadcasting Corporation) to provide a day-to-day surveillance of stereophonic audio program network transmission parameters. The testing is performed during short broadcast transmission intervals of a few seconds only. The measurement system, developed by SCHMID TELECOMMUNICATION, consists of a test signal generator and several measuring receivers. The latter are automatically synchronized to the test signal sequence received. The system measures all important transmission parameters, and the receivers compare the measurements with pre-programmed limit values for an automatic go/nogo decision. The receivers print out the results together with time and date, and store them for a later remote access after suitable interrogation. Additional equipment necessary to automatically insert the test signals into the transmission lines is also available.



Schmid Telecommunication Zurich

Rieterstrasse 6
CH-8002 Zurich

Telephone + 41/1/206 11 11
Telex 815 875 sz ch

Circle (85) on Reply Card

BTS Broadcast TV Systems Circle (611)
XD-CD 7184 encoder: digital; converts RGB, Y/Pr/Pb analog to parallel bit-encoded CCIR 601 compatible signals.

LDK4210 sync generator: genlocking master sync/subcarrier generator; available in NTSC, PAL, PAL-M, PAL-N, SECAM.

See ad on page 59

Crosspoint Latch Circle (677)
Model-6070: RS-170A sync generator; genlock, SC/H phase measurements; SMPTE color bars, 1kHz audio tone; six color black outputs; ID color lock pulse, field ID pulse, S/CH ID pulse.

Model-6051: precision RGB-NTSC encoder; integral RS-170A genlock sync generator; supplies sync, subcarrier outputs; self-checking with internal bar generator.

Faroudja Laboratories Circle (744)
CFD-N decoder option: high quality NTSC-RGB comb filter decoder; optional chroma enhancement eliminates ringing, apparent loss of chroma bandwidth; 1H+1.5 μ s delay option, matches RGB delays for colorkey with RGB, NTSC composite signals.

For-A of America Circle (751)
FA-740 dual channel TBC: parallel 8-bit component processing; independent TBC, freeze-frame, dropout compensation for A, B channels; mosaic, paint, strobe-freeze effects on A and B; other effects on a separate effects channel.

CCS-4350 color corrector: internal sync; gen-lock; adjustable vertical blanking in 1H increments from 10H to 21H; independent RGB controls.

See ad on page 111

Fortel Circle (753)
CC-2 color corrector: component operation for RGB, Y/R-Y/B-Y, M-II; plug-in change for 525-, 625-line standards; black, white, gray color balance; black/white gamma; track ball control; hue, saturation, luma adjusted separately.

GML America Circle (766)
System Processor: TBC, frame store synchronizer; modular design expands from single channel TBC with digital effects to dual channel operation and eventual extension to dual frame store; four NTSC inputs, two advanced reference outputs; 260TVL resolution; 58dB SNR; 8-bit Y/U/V processing.

Graham Patten Systems Circle (771)
VAMP: video audio multiplexing process; combines baseband video, four digital audio channels, aux data channels for transmission over satellite, terrestrial links; cooperative project with Dolby.

See ad on page 112

Grass Valley Group Circle (772)
STM-85N module: decodes encoded subcarrier signal of GVG-9500 generators to discrete sync, blanking, subcarrier, V1 and color black signals; -35, +27 μ s phase control; 2H advance, 1H delay; subcarrier, H-sync/phase relationship constant.

CV-25N encoder: fits CV-20 series trays; two NTSC outputs from composite, non-composite RGB; pulse regeneration of blanking from sync; integral alignment generator.
DS3 products: #4500 video codec for bidirectional transmission of NTSC, with four asynchronous DS1, 2-audio, 4-voice and 1-data channels; digital cross connect net-

work management; 87DS3-PSW protection switch per pair of bidirectional DS3 transmission lines, acts upon sensing loss of incoming signal or external switch closure.

SCB-100N generator: 9500-series NTSC/SMPTE color bars, tone; SC/H-phased.

Model 9550: sync generator changeover switch; monitors on-line and backup generator; visual, audible alarms; LED status, diagnosis.

See ad on page 9, 181, 183, 185, 187

Harris Broadcast Group Circle (781)
#642 TBC/synchronizer: separate inputs for synchronization, TBC modes; clean switching between modes; freeze-frame; Smart Noise Reduction for 12dB video noise improvement.

J-Lab Circle (819)
SAST-1048/2048: safe area title generators, by Field Engineering.

JVC of America Circle (821)
KM-F250U TBC/synchronizer: NTSC, Y/C and component video multiformat 1-frame memory; converts among components for KM-3000U switcher; complies with CCIR 601, RS-170A; RM-P250U remote unit also controls KM-F250U effects package.

See ad on page 19

Lelch Video Circle (852)
SPG-1300N sync: NTSC model; for master/slave operation; option with 2600TG signal generators for 12-bit digital test signals; dual RS-170A outputs.

MTG-2600N generators: modular products in rack frames with genlock; eight related

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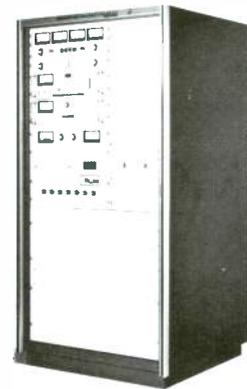


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- 2/4-shot automatic overload recycle
- Automatic RF power output control
- AC power failure recycle
- Remote control interface
- SCR power control
- Internal diagnostics
- Solid-state IPA



5,000 watts FM

Continental's NEW 815A FM transmitter is totally solid-state, except for a 4CX3500A in the final amplifier. An 802A exciter is on board to deliver a clean, crisp

signal. The harmonic filter is contained in the 815A for easy installation. Call your local Continental Sales Manager for complete information.



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Continental: For a Sound Investment

Circle (87) on Reply Card

signals available in 525-line NTSC, RGB, YIQ, B-MAC, M-II and others.

[See ad on page 77](#)

Lenco **Circle (854)**
PSG-313A: sync generator; meets RS-170A specification; multifunction genlock includes PC-lock; optional temperature controlled VXCO.

Merlin Engineering **Circle (883)**
ME-888 standards converter: all TV standards, including PAL-N; two motion interpolation modes; SECAM output encoder optional; by Snell & Wilcox, UK.

Microtime **Circle (889)**
VISION 4: digital processor/recorder; 160s capacity, expands to 340s; CCIR-601 interface; inputs/outputs for RGB, Y/R-Y/B-Y analog, 4:2:2 digital, optional NTSC encoder/decoder; time code interface; single frame capability; multi-layer production with various keys; by PVK, West Germany.
Tx2 TBC: component single, dual TBC; compatible with most 3/4", 1/2" VTRs, including SP; memory >1 frame for freeze, sync duty; 13.5MHz sampling of Y/R-Y/B-Y; noise reduction, chroma comb.

Nova Systems **Circle (927)**
700 TBC: 32-line memory for 3/4", 1/2" VTRs with advanced sync; transparent 8-bit 4xSC sampling heterodyne mode; digitally generated RS-170A output; 15x FWD/REV in shuttle operation.

[See ad on page 135](#)

Polar Video **Circle (1150)**
PCK-1 Chroma-key/linear DSK: chroma-key with any color; fade the foreground; independently controlled hue, saturation, luma of color matte; positive, negative keying; local, remote control.

[See ad on page 155](#)

QSI Systems **Circle (966)**
Model 5500: processing amp; full regeneration, replacement of sync with RS-170A spec phasing; lock modes for SC/H, H and helical scan VTRs; bypass on loss of lock, black on loss of signal.

Quality Video Supply **Circle (967)**
TELEcomp2000: computer/video combiner; interface for most computers with TTL digital RGB or composite video output to other video equipment; compatible with IBM PCs, compatibles, Apple, Commodore, Atari, Radio Shack and others; recordable output from mix or overlay modes.
TELEcomp1000: computer/video combiner; mix, combine, superimpose B/W genlocked camera video with computer generated text, graphics; -1000B, phono video connectors; -1001B, RF modulator, phono video; -1005B, BNC video connectors.

Rank Cintel **Circle (977)**
Decoder: comb filter design reduces chroma crawl, cross luminance; fully adaptive; senses vertical color transitions; CCD dual line delays, render three full lines of simultaneous picture values; outputs for RGB, YUV, YCrCb components.

[See ad on page 159](#)

Sierra Video Systems **Circle (1181)**
CIK-1 mixer: for keying two video signals; may operate with component or encoded

NTSC signals for chroma keys; linear key with user-adjustable gain.

Tamron Industries **Circle (1057)**
FOTOVIX Pro: image processor with genlock; converts negative, positive, color, mono photographic images to NTSC video; 6x zoom; cropping, image shifting; joystick color correction; vertical, horizontal image rotation BNC connectors.

Transimage Int'l **Circle (1195)**
TS-102B/102C options: balanced in/out and unbalanced in/balanced out versions of TBC Time Sharer system.

RCU/VU-102 remote: control for Time Sharer; slide faders for audio for individual VTR audio levels; push-button VTR select; LED VU meter to ANSI stereo spec.

AIF-102 option: automation interface to Time Sharer for control of main system-functions; video select, fade-to-black, audio level; works with any automation system.

CTS-102 module: component video provisions for Y/C dub signals from 3/4" VCRs (Y688 in NTSC); multi-standard operation with NTSC, PAL, SECAM possible.

TS-102S: Super Time Sharer allows 8, 12 or 16 VTRs/VCRs to use facilities of one TBC; cascaded systems.

Ultimatte **Circle (1101)**
Demonstration: applications of Ultimatte-5 with Faroudja encoder/decoder; permits compositing from videotape to appear as RGB quality video.

Vistek Electronics **Circle (1196)**
Varicomb decoder: conversion of composite NTSC or PAL-I/B/G to component formats RGB and YUV.

Varicomb V2044 decoder: wideband luminance and chroma decoding system with reduced cross-color and cross luminance artifacts; 2-D variable spatial filters separate color components; allows composite to component conversion for various applications.

V4030 encoder: clean or conventional coding modes of RGB to NTSC for improved picture quality, simplified studio timing.

Yamashita Engineering **Circle (1198)**
Manufacture/YEM

TBC-701: NTSC or PAL TBC; Y/R-Y/B-Y processing; field freeze mode; RS-170A gen-lock; CCIR-601 sampling; composite or dub inputs; composite, component, dub outputs; 8-bit luminance; 6-bit chroma.

ENC-300 encoder: integral gen-lock and color bars; RGB, Y/R-Y/B-Y, Beta inputs; four encoded outputs; RS-170A/EBU spec.

CVS-701/702/800: computer video synchronizers; eliminates field flicker; converts computer RGB to NTSC or PAL composite video.

ENC-2000 encoder: RGB, Y/R-Y/B-Y inputs to NTSC, PAL composite.

RS-1701RB/-1702RB: dual sync generators; based on rubidium oscillator; stable SC/H phase; -1701, NTSC/RS-170A; -1702, EBU.

Time code, timers, counters

Adams-Smith **Circle (506)**
Zeta Three: time code and synchronizer;

for ATRs, VTRs, MIDI use; reads, generates SMPTE/EBU time codes, MIDI sync signals; references song pointer to time code; 1/4-frame accuracy.

AmpeX AVSD **Circle (533)**
VITC: vertical interval time code units for VPR-6.

[See ad on page 39](#)

Audio Kinetics **Circle (565)**
Striper: time code generator for prestripping on audio decks; allow operation at 2x, 4x play speeds.
Gearbox: converts between different time code standards.

Autogram **Circle (572)**
Autocount clock: count-up timer; panel-mount, or stand alone; count-up timer, stop watch, lap timer or accumulated time modes; maximum 59min, 59.99sec.

Beaveronics **Circle (582)**
LED-80 clock: Favag digital display clock; operates from alternate polarity impulses; 3.15" characters may display date, time.

Broadcast Supply West **Circle (606)**
ST500: Radix studio timer.

[See ad on page 152](#)

Coherent Communications **Circle (649)**
TC-400A/TC500A: dumb/smart slates; 3-wire XLR audio/mic cable connects to source of SMPTE time code; unit displays time code and pertinent take data; -500A includes a time code generator; -400A requires external drive.

Denecke **Circle (1174)**
Dcode TS-1: reads, displays time code; driven by wired or optional wireless time code source; slate area for written data.

ESE **Circle (737)**
ES-161TZ, -166TZ, -993TZ, -991TZ: slave displays with time zone offset; operate from ES-100 series master clock or other ESE clock with ES-167 serial time code generator; set to operate at a time zone offset from master clock; 6-digit displays except -991TZ 4-digit.

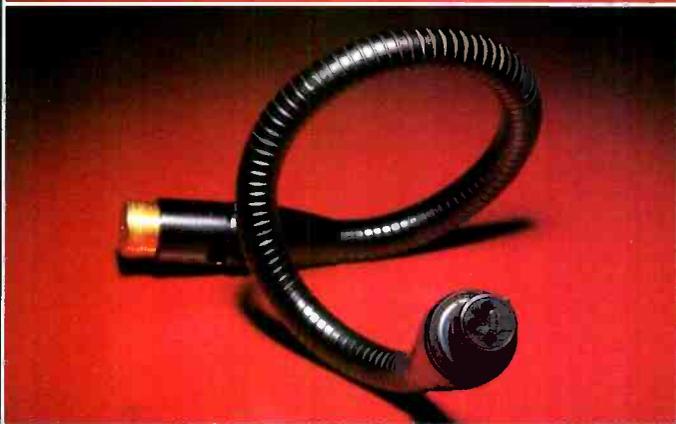
Evertz Microsystems **Circle (740)**
Models 120/125: general purpose wide-angle displays; large characters visible from 100ft; four brightness levels; reads SMPTE/EBU time code; 120E with RS-232/-422 ASCII, to 38.4kbaud.

For-A of America **Circle (751)**
TCR-3300: time code reader production models; auto, manual LTC, VITC, from still to 110x play; user bit, video title generation; SMPTE/EBU; I/O ports for external time code input, remote control.

[See ad on page 111](#)

Gray Engineering Labs **Circle (774)**
FC-142 counter: counts film feet, frames from film projector or telecine; data may be in feet/frames, edge numbers/frames for 16mm, 35mm; parallel data output for user bits; integral character generator updated per TV field.
DT-213 data transmitter: SMPTE LTC, control code transmitter for master time code generation with slave decoding; displays

Continued on page 132



HHSmith. Your exclusive connection for Neutrik® precision connectors.

Today's sophisticated audio and industrial componentry is only as good as what links it all together. And it never gets as good as Neutrik brand precision engineered connectors, only from HHSmith. Advanced interconnects that receive a level of design attention usually reserved for the finest electronic circuitry.

Take our XLR straight and right angle connectors for example. Alloy gold and silver plated contacts for ease of signal flow. Hard polyester inserts, fiberglass reinforced for extra strength. A

chuck type clamp for secure strain relief without damage to insulation. And a high reliability die-cast zinc shell, finished in satin nickel or black chrome.

Or our XLR receptacles with gold or silver plated brass pins, beryllium copper contacts and easy 2-screw mounting.

There's even an X series 3 pin male/female connection system that saves you up to 50% in assembly time. Or our same-size male/female "D" series receptacles with PC board or solder spring selection, and receptacle inserts that lock in and

out for repair without shell removal.

All examples of truly precision engineering and craftsmanship. The kind that makes itself evident in every Neutrik product, including AC connectors and receptacles, phone jacks, plugs, goosenecks and transformers.

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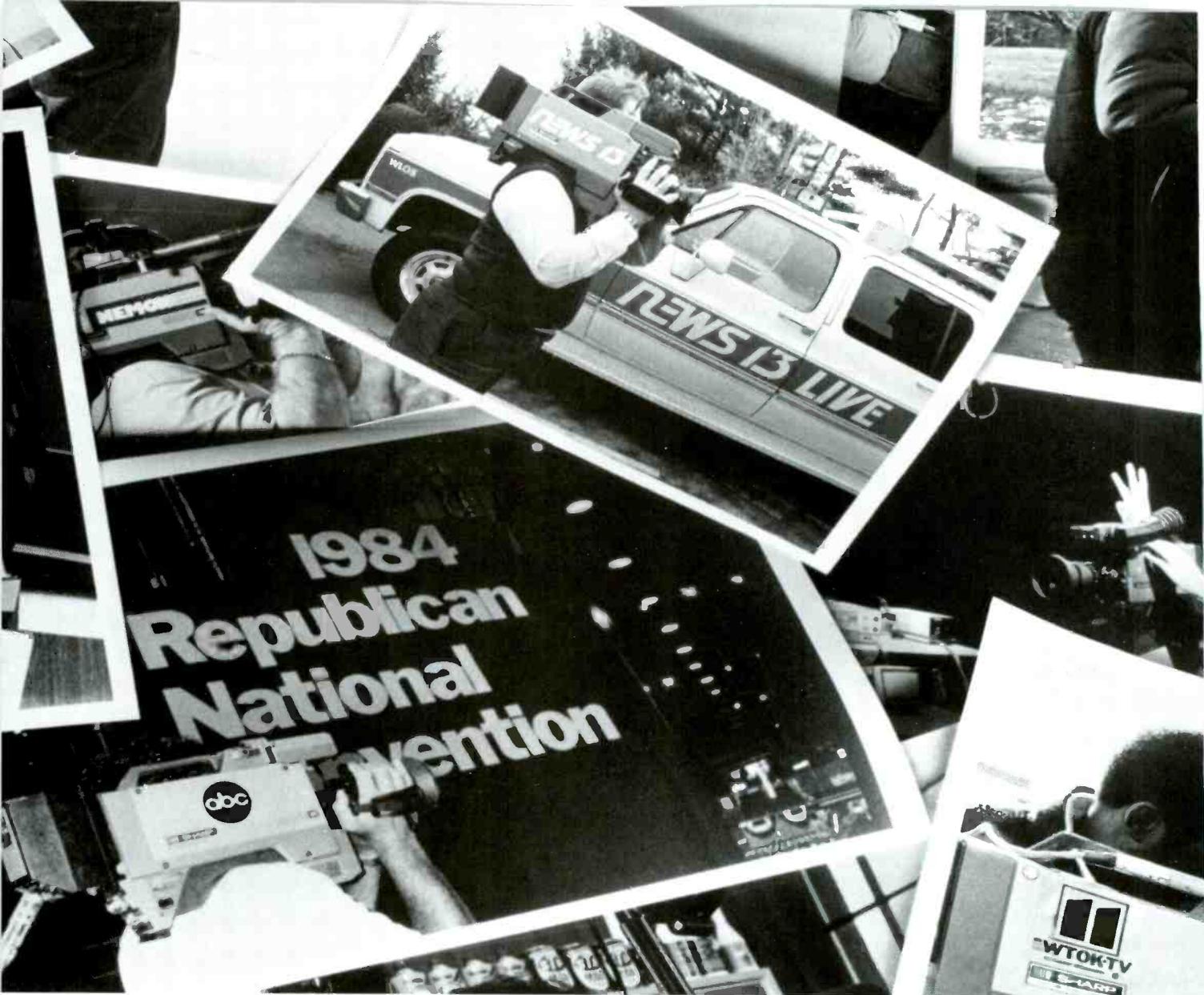
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Circle (88) on Reply Card



IT ONLY TOOK TEN YEARS TO GET TO

After ten years of research, design, and field experience, Sharp has developed two new video cameras to meet the demands of the broadcast and professional users: the XC-B10 with Saticon® tubes and the XC-B20P with Plumbicons®.

What make both of these cameras so remarkable are their features.

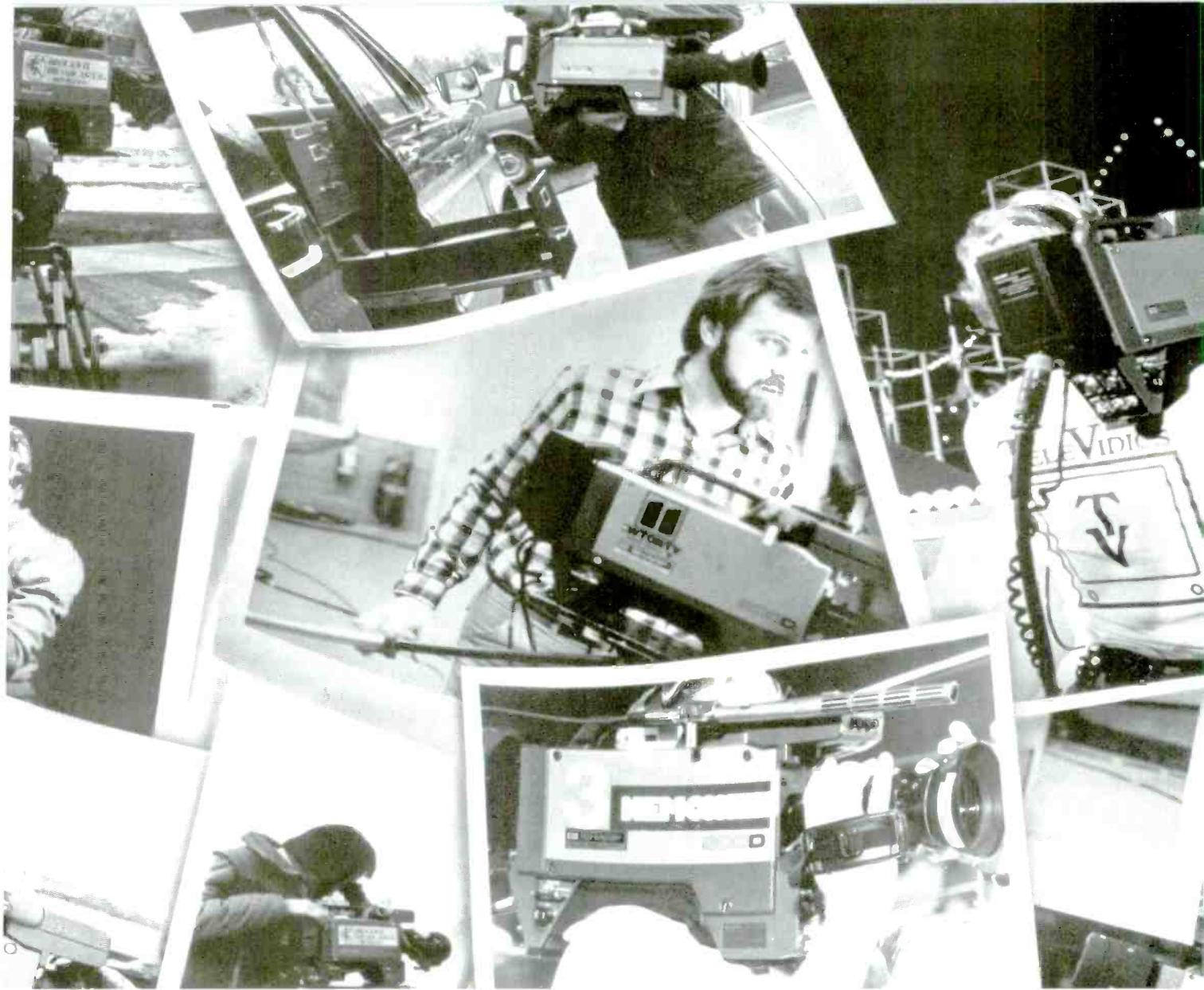
Like Beta and MII component output. So you can connect directly into component recorders without adapters.

And a unique auto contrast circuit to change washed out video into crisp, clean information. Plus auto knee that prevents losing your video in ultra-bright scenes.

We've even put in a unique computer-controlled clock/calendar that gives you the option of burning the date and time into your recordings for editing and archival use.

THE NEW XC-B10 SATICON®





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THE NEW XC-B20P PLUMBICON®



The tubes themselves deliver exceptional pictures, thanks to their state-of-the-art low capacitance mixed-field diode gun technology.

And both cameras have information-packed viewfinders, multicore and triax remote units with full system capability, and prism temperature sensing. Not to mention selectable 6-12 or 9-18dB gain and rugged diecast construction with extensive EMI protection.

All in all, the XC-B10 and XC-B20P are truly remarkable cameras. But don't just take our word for it. Contact your local Sharp broadcast dealer and ask for a demonstration.

Then you can see for yourself the kind of technology that's made Sharp one of the fastest growing camera companies in America.

SHARP®
FROM SHARP MINDS
COME SHARP PRODUCTS™

Continued from page 128

time, user bits; NTSC-30, PAL-25, FILM-24 code available from internal crystal; Gray Field Code for video-assisted film editing. *TCA-143 production model*: time code analyzer; reshapes out-going code with level correction; bar graphs for input level, phase; recognizes phase, bit count, sync word, sequential count error.

[See ad on page 88](#)

Kinometrics/Truetime Circle (831)
GPS-DC: synchronized clock for positioning system; provides time to ± 200 ns; IRIG-B time code; RS-232 interface; 1MHz, 5MHz, 10MHz squarewave, 1Hz reference pulse; for antenna positioning, position location. *Model OM-DC*: Omega synchronized clock.

Multitrack Magnetics Circle (1193)
SETC-II shaft encoder: SMPTE time code generator; replacement for time code on film; eliminates need of TC head, preamp, film track.

QSI Systems Circle (966)
CB-2440 generator: gen-lockable, SMPTE color bar; 24-character ID; memory for 40 IDs; ID transfers to VBI for active video. *Model 2400*: 24-character identifier; for satellite uplink ID use; ID includes telephone number point-of-contact and operator ID, user license number and call letters.

Skotel Circle (1018)
TCR-111C reader: LTC time code unit; from 1/40x to 80x speeds; RS-232C, RS-422 data port interfaces to computer; flexible data format, communications protocols selection; time, user-bit output; reshaped LTC code output. *TCR-132 reader*: LTC, VITC codes for operation from pause through 80x shuttle; auto selection of valid code; time, user-bit display; reshaped LTC code outputs; selectable character heights.

[See ad on page 160](#)

Videolab Circle (1127)
TCR-5 retrofit: time code kit; provides address track time code for type 5 VCRs; precision rotary erase gating; zero crossing detectors; 4-adjustment head base. *TCR-6 retrofit*: time code kit; electronics for address track of VO-6800 VCRs; upgrades VO-6800 to most BVU-110 functions.

Video recorders, tape, disc, RAM

Abekas Video Circle (502)
A64 disk recorder: component digital; 50s/100s capacities; variable and real-time forward, reverse playback, random access; RS-232/-422 interface, GPI in/out; dissolves, keys simultaneously with play, record; CCIR-601/4:2:2.

A60 disk recorder: component digital; real-time, variable speed play, forward/reverse; random access; 25s/50s capacity in 525-line; 30s/60s in 625-line; RS-232/-422; time code trigger; CCIR-601/4:2:2 spec.

[See ad on page 47, 195](#)

Alpha Video & Electronics Circle (525)
Sony VCR modifications.

Ampex AVSD Circle (533)
ACR-255 demo: digital video cartridge/spot player; composite format; expanded software, enhanced robotics.

Type C enhancements:

- Multi-Gen Setup: optimized multiple generation performance for VPR-3/-6 with Zeus processor; 23 generations, minimal degradation.

- Status-at-a-Glance: on-demand interactive video display for easy VTR operation.

Betacam-SP series:

- CVR-75 studio VTR: record, play, edit with AST tracking; TBC; dynamic motion control learns variable play profile, replays on command; Dolby C NRS.

- CVR-35 field portable: RS-422, serial remote controllable from CVR-75; cuts-only editing; 30-minute metal particle or oxide tape.

- CVR-40 studio VCR: Betacam format edit deck.

- CVR-5 camcorder: viewfinder playback, confidence, normal playback modes; 4-channel audio; 30-minute cassette capacity; compatible with tube-type cameras.

- CVA-5 adapter: interface to composite, component camera for CVR-5 recorder.

- CVA-500 playback adapter: composite color video output for in-field viewing.

- VCR-2 remote control: for 4-VTR format mix with RS-422 ports.

- BVX-10 corrector: component color control for CVR-75 in EFP, editing duties; controls gain, gamma, black level for individual Betacam signals.

- BVR-50: TBC remote controller for CVR-75 VCR.

[See ad on page 39](#)

ASACA ShibaSoku Circle (553)
ADR-5000 recorder: magneto-optical videodisc system; 10-min record/play, 18,000 still images/disc; additional discs extend time to 100 min; 16-bit quantized digital audio; simultaneous erase, record; conforms to CCIR 601.

AL2110 Reed-Solomon decoder: error correction LSI for digital VTRs and magneto-optic discs; coder, decoder circuitry; parity, syndrome generation; error location, pattern, correction.

BTS Broadcast TV Systems Circle (611)
BCN-52/53 VTR: B-format; continuous slow motion from 0.25 reverse to normal playback; reduced headwear, buffer retains high bandwidth image during transition to slow motion; separate video monitoring; 2nd pair of video heads; -52 portable, -53 rack-mounted.

BCB-21 VCR: Betacam field player; search with monochrome, 2-channel audio, Dolby-C NRS; +3.5x search speed; time code reader and RF modulator option.

BCB-25 VCR: Betacam recorder/player; 18.4 lbs with battery and cassette; use with KCF-1, other ENG/EFP cameras; composite, component inputs and outputs, integral time code generator, reader; external TBC connection; backspace editing.

BCB-15 player: Betacam for the studio; integral time code reader; color composite, component signals; still-frame.

BCB-40 VCR: studio recorder/player; insert, assemble editing of video, audio, time code; auto edit simulation in preview with edit monitoring; integral TBC; Y/C output; integral time code reader, generator; slow motion, search modes.

BCB-75 Beta-SP VCR: compatible playback

of existing programs, record/playback of metal particle tape; improved resolution, 4-channel audio with Dolby C NRS; RS-422 serial control.

BCB-35 field VCR: record/play deck; simultaneous viewfinder, chroma, audio monitoring; two Dolby C, two FM audio tracks; RS-422 control for frame accurate editing with BCB-75.

Digital disk recorder: CCIR 601, 4:2:2 digital video disk recording prototype; control from FGS-4000/4500; 25s real time storage for animation, still-frame recording.

[See ad on page 59](#)

Elcon Associates Circle (724)
Elcon-EA1200: tape cleaner, profiler system; for B, C formats; optional optical inspection on all units.

Hitachi Denshi America Circle (787)
HDTV digital VTR: prototype; 1,125-line, 9:16 aspect ratio, 54MHz and 27MHz 8-bit sampling of luma/chroma, 56dB SNR; 48kHz 16-bit audio, 92dB SNR; 6-channel, 108Mbit/channel/sec writing speed.

[See ad on page 3](#)

J-Lab Circle (819)
Interfaces: for recording; converts video Y/R-Y/B-Y to RGB universal component format; compatible to M-II, Betacam.

HL-79: component adapter/CCU; allows recording of components, while painting with composite.

JVC of America Circle (821)
CR-600U VCR: $\frac{3}{4}$ " recorder; μ P control system; front-load, rack-mount; full direct-drive transport; 2-digit diagnostic codes; integral time code capabilities; 9-pin serial, 45-pin parallel control ports.

KR-X200U docking recorder: attaches directly to ENG/EFP camera; M-II format; uses 20-minute cassettes.

KR-X400U recorder: portable M-II VCR; NTSC/M-II conversion.

KR-X800U recorder: M-II format; for production, post production, broadcast; SMPTE time code reader/generator, 32-line TBC, noiseless slow, still modes; 9-pin serial control; FM audio.

KR-Z800U recorder: editing M-II VCR; SMPTE time code track, 45-pin parallel remote port; high-speed search; color search to 4x play; Dolby C NRS; edit in/out points.

BR-9000U time-lapse VCR: for security, surveillance; VHS, 120-hour frame or 240-hour field record modes; six camera operation with TM-9060U monitor.

[See ad on page 19](#)

Nagra Magnetic Recorders Circle (912)
VPR-5: type C video recorder; portable format; joint project with Ampex AVSD; now available through Nagra/Kudelski.

NEC America/Broadcast Circle (918)
SR-10 solid-state recorder: 34s, expandable to 136s, with true slow motion; instant access; 34s delay use; one to four channel configurations; suggested for sports, talk shows, news.

[See ad on page 107](#)

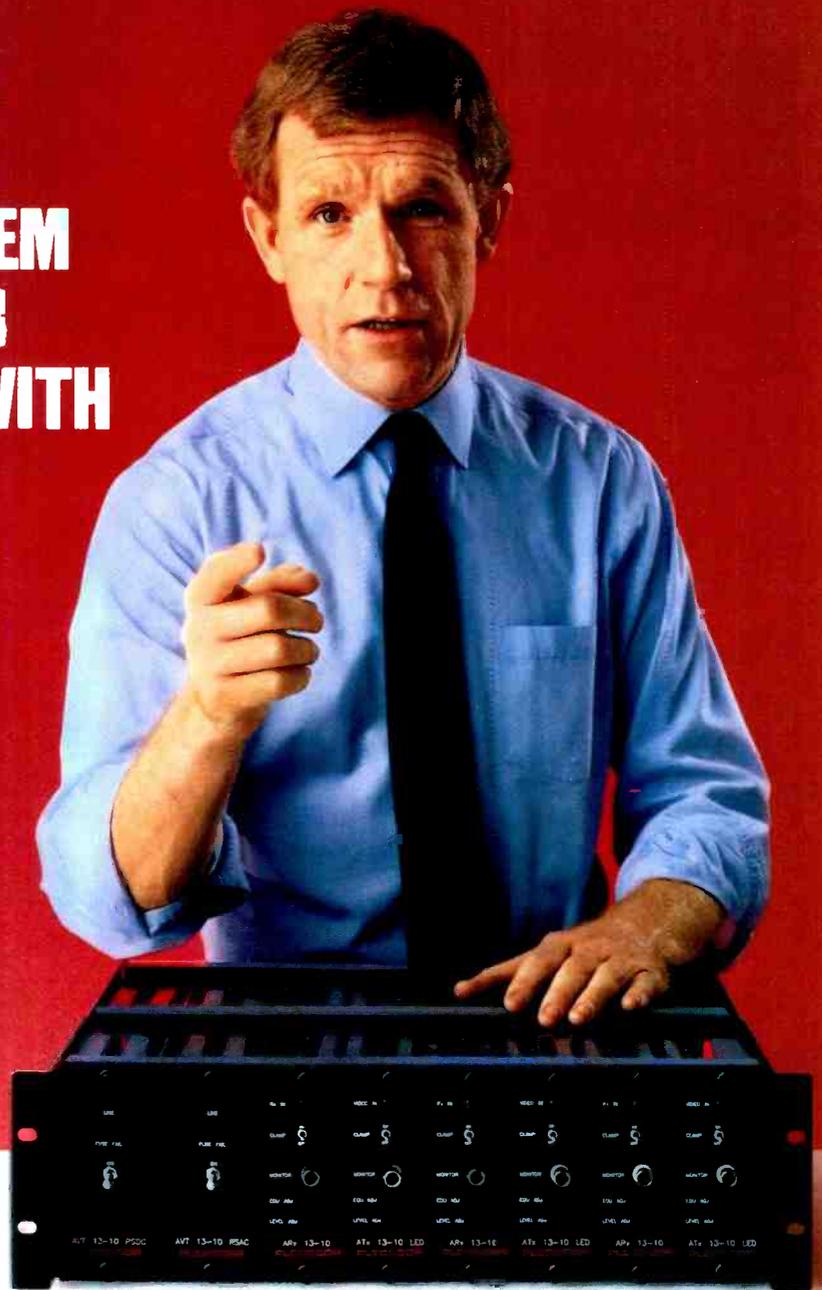
Optical Disc Circle (935)
RLV recordable laserdisc: glass substrate optical disks.

You said,

"I NEED A VIDEO TRANSMISSION SYSTEM THAT MEETS RS-250B SHORT HAUL SPECS, WITH BETTER LINEARITY, SUPERIOR PICTURE AND LARGER LINK BUDGET..."

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that come across loud and clear. Features like a user friendly front panel that give you total control over cable equalization and system gain adjustments. Front panel clamps for easy formatted or unformatted selection. Add to that 75 ohm and 124 ohm simultaneous outputs and it's easy to see why this is the video transmission system that really puts out.

Additional performance is available when you specify our optional upgrade cards including 4 simultaneous outputs, 2 high fidelity audio channels, and redundant AC or DC

power supply, just to name a few. Available with both multimode and single mode light emitting diode and/or laser sources, repeaterless link distances up to 60 kilometers may be supported in current cable plants.

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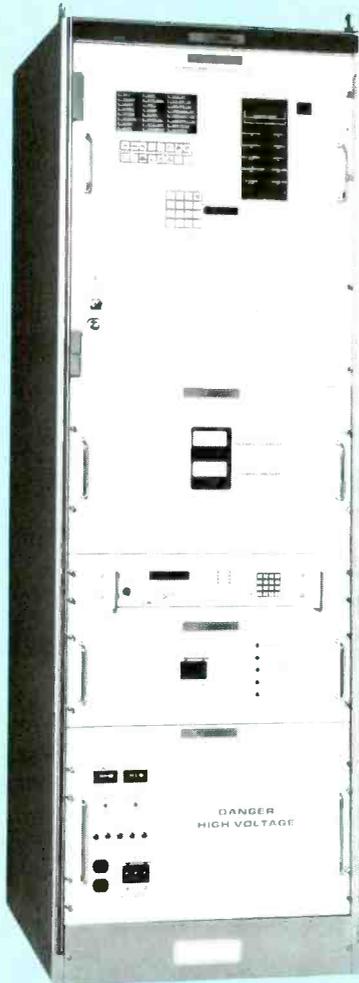
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- ruggedization for transportable applications
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Panasonic Broadcast Systems

Circle (944)

AU-505 portable: M-II play deck for office playbacks; two standard audio tracks and 2 FM audio channels from multiplexed chroma track; Dolby C NRS; A/V, integral modulator RF outputs; LCDs display time, frame number with CTL/UB/VITC/LTC, battery life; infra-red remote control.

AU-620 player: M-II studio unit doubles as deck for M.A.R.C.; trim keys control tape speed by $\pm 10\%$; integral TBC, VITC/LTC time code reader with auto mode switching; 9-pin RS-422 or 50-pin parallel interfaces; two standard, two FM audio channels.

M-II accessories:

- AU-ER65 encoder remote controller for encoder block functions of AU-650 VCR or AU-TB50 TBC.
- AU-WR65 waveform remote control for monitoring signal levels from four AU-650s.
- AU-IA35 transcoder for conversion of M to M-II.
- AU-SW65 video/audio switcher for A/B roll, component/composite input selection.

See ad on page 91, 93, 95

Pinzone Communications Circle (957)

TRC-100 service: parts, service, refurbishment program.

Quantel

Circle (969)

Central Lending Library Enhancements:

- Optical disk store: More than 1,500 frame storage on each side of optical disk; instant random access recall.
- Fiber link: interconnects rack equipment for satellite digital library systems to Central Library from distances of 1,500 feet.

Research Technology International

Circle (983)

Tapechek 22-DG: video dropout detector, time code generator; evaluates and stripes time code in one step; records black, allowing LTC or VITC time code and user bits; hardcopy printout of tape condition; alphanumeric display of time code, dropout data.

Tapechek-6120: 1" evaluator, cleaner; operates at 20x play speed; Micro-Pulse multi-track dropout detection system; color CRT display of tape condition.

Sony Broadcast Products Circle (1023)

Betacam-SP production models:

- BVV-5, portable recorder; Y, CTDM playback in viewfinder; VA-500 adapter for in-field color playback or direct microwave.
- BVW-503 Saticon-tube camcorder with BVV-5.
- BVW-505 CCD camcorder with BVV-5 recorder.
- BVW-530 Plumbicon-tube camcorder with BVV-5.
- BVW-35, portable recorder/player for in-field editing; VITC/user bits time code; four audio meters; 30-minute record/play time.
- BVW-75, studio recorder/player; 30-/90-minute cassette lengths; 32x shuttle speed for B/W, 5x for color; improved Y-frequency response; integral diagnostics, dynamic tracking; B, C component outputs; RS-422 interface to edit controller.

BVH-3000 Type C VTR: VLSI circuitry for improved control; air-threading; 10-point cue memory; sync track for full slow mo-

tion; BVH-3050 TBC; RS-232C interface option.

DVR-1000: CCIR-601/4:2:2 component digital recorder in production.

U-matic/SP Type IX: 330TVL with 1.2MHz luminance carrier; 6-digit frame code system; RS-232C and 33-pin parallel interface; bidirectional search; lower profile; Dolby C NRS; Sendust audio heads; *VP-9000* player, *VO-9600* recorder/player.

VP-7000 player: replaces -5000; with most features of Type IX U-matic machines, but not SP capability.

See ad on page 24-25, 98-99

Sony Information Services Circle (1156)

MVR-5500 Pro Mavica: still video recorder; 50-field/25-frame images per 2" video floppy disk; 360TVL resolution; RS-232C port, remote control port for RM-E5500 edit control; Y/R-Y/B-Y.

MVP-2500 still player: RS-232C, 9-pin, 15-pin ports for RM-2500 program, edit controllers.

CSS-10 still system: 12" optical storage to 3.28GBytes; disk controller, frame memory; analog RGB, composite, component video; FSC-100 frame store; random access to 8,000 images; 768x500-pixel; 450TVL, 52dB SNR; RS-232/422 interfaces.

Steenbeck Circle (1040)

ST-7223: studio magnetic film recorder, reproducer.

TASCAM Circle (1058)

TEAC/LV-200A: laser videodisc recorder; 108,000 stills or 2 hr play time with 30cm disc; input from camera, VTR; dual audio channels; optional film video processor; time-lapse capability; random access retrieval with 1s search through 54,000 frames.

See ad on page 45

Thomson-CSF Video Equipment

Circle (1083)

TTV3505 VCR: Betacam SP recorder for use with TTV-1640 CCD camera system.

See ad on page 177

Weather graphics, radar, data systems

Accu-Weather Circle (503)

Front door 750: PC hardware/software package; receives, archives satellite-delivered weather graphics.

Siswriter 2000D: plain paper printer for DIFAX weather maps; high resolution; 4-hour maintenance program.

NEWRAD: radar, display system; multiple observations hourly show advance, arrival and retreat of precipitation.

Airport Traveller: weather advisory system.

Advanced Designs Circle (510)

Doprad-II software update: for Doppler weather radar; 768x484x8 resolution; pull-down menus, windows, icons; touch control membrane radar screen; map builder feature.

Alden Electronics Circle (517)

C2000C radar: remote weather system; col-

Continued on page 138

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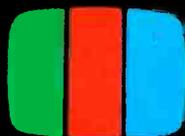
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If digging for oil is the story, digging for news will take you there. And the tape you take is the 3M 3/4" MBR™ Videocassette—created to exceed even our widely acclaimed MBU Videocassette. Designed with our exclusive Anti-Stat™ System—to reduce its static charge and help prevent the dust buildup that causes dropouts. To give you a true picture.

TO THOSE WHO GIVE A CLEAR PICTURE OF THE NEWS, ONE TAPE IS TRUE.



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We see our job as being the same as yours—to give a clear picture of the news. And that's been our job since we invented videotape 30 years ago.

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And we stand behind you—with some of the most advanced research in the industry.

All to keep our standing—as number one in the world of the pro.

NUMBER ONE IN THE WORLD OF THE PRO

3M

Worldwide Sponsor
1988 Olympic Games



Continued from page 135

lects precip. data from NWS radar; displays intensity overlays on map backgrounds; higher intensities take precedence; sweep line, zoom, multimemory; ground clutter suppression.

See ad on page 49

ColorGraphics Systems Circle (651)

LiveLine PC: weather graphics for IBM PC/AT; animated looping, color cycling; auto map drawing; paint capabilities; interface to weather information services.

LiveLine IVA: enhanced animation modes for cel, image looping; improved user control; text shading with vector fonts; Ethernet LAN option.

LiveLine V: weather graphics; 32-bit/pixel architecture; cut/paste, stencil, pan/zoom, full-color, paint, animation; compatible to weather data services; extensive map library; optional interfaces to Doppler radar; RRWDS dial-up radar; Ethernet LAN to Art-Star.

Kavouras Circle (826)

AP-series: Triton graphics/animation; art, paint features; speed improved by 10x; improved scaling, rotation; in-betweening, zoom, pan, scroll, synoptic weather animation modes; GEOS satellite, radar animation at 30fps; 64,000 colors.

Surecasting: weather maps, charts from Kavouras earth weather database; Mcldas graphics pinpoints weather conditions more accurately.

RADAC-2000: higher resolution base maps; multiple radar images displayed simultaneously; easier image manipulation; composite radar; GOES imagery; advanced

lightning overlays.

WSI Circle (1146)

SUPERseer: on-air visual shows nationwide cloud cover at 12, 24, 36 or 48 hours in future, uses NWS nested grid model with WSI enhancement analysis of upper air soundings; available to meteorologists via WSI service twice daily.

RF/Tower products

- AM/FM radio transmitters
- TV transmitters
- ITFS, MDS/MMDS, STL equipment
- Power amplifier tubes, klystrons
- Receivers, demodulators
- Remote transmitter control systems
- RF amplifiers
- RF generators (SCA, MTS stereo)
- Satellite antennas, electronics
- Towers, hazard lighting

Acrodyne Industries Circle (505)

TRH/30KA transmitter: 1-tube, 30kW high-band VHF; for any CCIR standard; remote-control interface; power interrupt restart; dual channel, stereo option; Marconi B7500 exciter.

TRU-25KVC transmitter: 25kW UHF TV; stereo ready; Thomson TH-393 Hypervapotron tetrode PA operating class AB₁; final stage bypass for 2kW standby, if PA fails.

LL/400 TV amplifier: 400W solid-state VHF module.

TLU/200 translator: 200W solid-state UHF TV; MTS ready.

Adelphon Circle (508)

RAPID: rapid antenna position/instrumentation deployment system; triangular, spring-steel mast structure; quickly extends, retracts; with guy-wire winches; 150-ft height possible.

Advanced Micro-Dynamics Circle (511)

TC-8 control: remote transmitter control, full supervision; Touch-Tone phone access; synthesized speech report of parameters, status; for AM, FM; TSU option installs at studio.

CDA-4 FM DA: 1-in/4-out composite audio distribution; noise <-109dB, 0-53kHz; phase error <0.1°, 20-53kHz; outputs isolated.

AEG Circle (512)

S-3217: 10kW FM transmitter; 1-tube design in single 19" rack; computer control system.

S-3185: 1.5kW FM transmitter; all solid-state; three 500W PA modules for primary operation, two 100W modules in reserve

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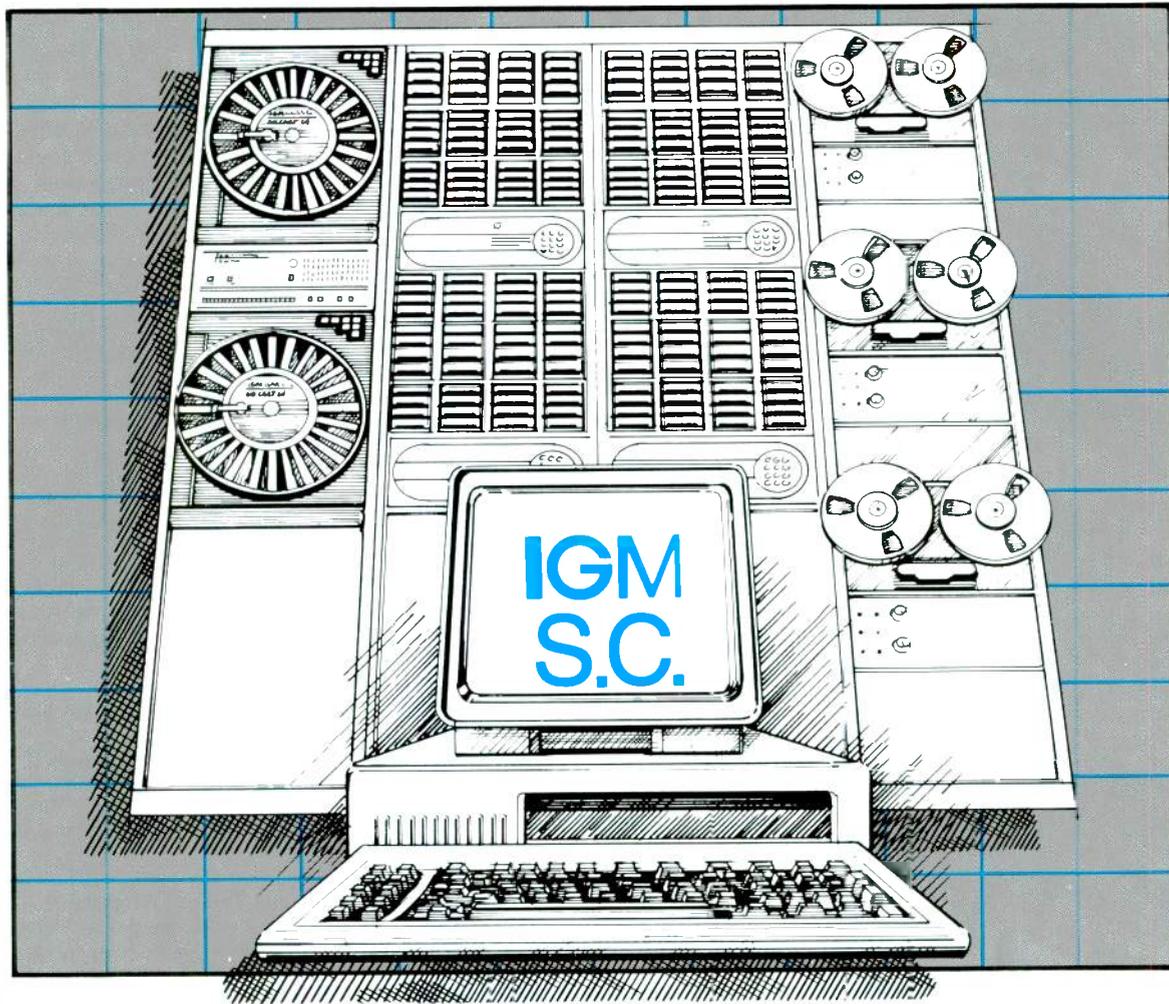
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We can build a program automation system for your station using an IBM-PC or compatible as the brain to

control the IGM-SC or IGM-EC automation controllers. Depending on your specific application, you can add the IGM GoCart and Instacart to handle your commercials and announcements or, if you need reel-to-reel machines or other cart machines, we can include the Studer-Revov PR-99 and Fidelipac cart machines in your system.

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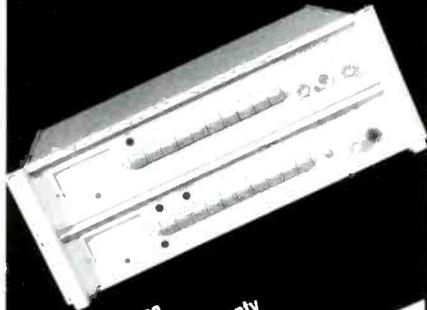
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Circle (98) on Reply Card

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See ad on page 143

Altronic Research Circle (526)
5800-series Omegaline: self-contained heat exchanger, RF coaxial load resistor; continuous duty power to 25kW, 50kW; 60Hz-800MHz; where water supply is not readily available.

6725-series Omegaline: RF coaxial load resistor; 25kW dc-250MHz; 3 1/8" w/o EIA flange; pressurized air.

Andrew Corporation Circle (539)
Trasar VHF antennas: traveling wave, slotted-array for highband VHF channels 7-13/CCIR III; circular, elliptical or horizontal polarization; directional or omni (± 1 dB), with heavy null fill.

4.6-meter antenna: Ku-band earth station, 2° spacing compliant; delivers 25% more power than designs of like diameter; rear-fed Gregorian optics; self-shielding, non-icing subreflector.

4.5-meter antenna: prime focus; simultaneously receives C-/Ku-band; on-axis 4-port feed for two each linear orthogonal C- and Ku-band; improved cross polarization; high-speed drive; reflector anti-icing; programmable controller option.

2.3-meter antenna: van-mounted, prime-focus, offset-fed; 2° compliant; electronics on feed support boom; 4-port combiner; 3-axis motorized drive, remote-control panel.

LDf6-50 Helix: 1 1/4" foam-dielectric, semi-flexible cable for FM; power handling to more than 9kW over 88-108MHz; low attenuation loss <0.28dB/100ft.

Rigid coaxial line: 50Ω material, 3", 4" and 6 1/8" sizes.

AVCOM of Virginia Circle (573)
SCS-200 receiver: 950-1450MHz satellite audio unit tunes subcarriers of video carrier; preset and continuous tuning, variable frequency response; AVPAND-A audio processing.

SCPC-200E receiver: FM 3.7-4.2GHz SCPC signals; four crystal-controlled audio, data channels (option for 8); selectable deemphasis, AVCOM AEM-123 audio expander.

SCPC-500 IF processor: SCPC block down-converter; converts to 50-550MHz IF; AEM-123 audio expander option.

SCPC-500.7 downconverter: C-band SCPC processor signals; downconversion to 70MHz IF; AEM-123 expander option.

Barco Industries Circle (578)
VSD demodulators: -1 multichannel, multi-standard; -2 multichannel, single standard; -2/X crystal controlled, single channel, single standard; AGC independent of picture content; visual, sound level meters.

VSD-1000 stereo/dual sound: demodulator for B/G/I/L transmission standards; envelope, synchronous detection, SAW IF filter; M/N version prototype.

VSBM-1000 modulator: precision unit for B/G/I/M/N/DK transmission standards; SAW filtering standard; stereo/dual audio option; for transmitter exciter, CATV and test systems.

See ad on page 170

Barrett Associates Circle (579)
Satellite interface: satellite program controller; between downlink feed and local

equipment; fades between satellite, local sources; silence sensor signals loss of local program.

RTU-100 Tempsenz: remote indicator of relative ambient temperature; signals change from normal temperature; interfaces to telemetry system.

Belar Electronics Lab Circle (583)
FMM-3: FM frequency monitor; digital design.
SCM-2: SCA modulation monitor.

See ad on page 142

Bird Electronic Circle (591)
4641/42-series: single-, double-socket directional THRULINE wattmeters; 4 1/16" flanged; 2.5-80kW at 50-750MHz.

4843/44-series: single-, double-socket directional THRULINE wattmeters, 4 1/16" unflanged; 2.5-80kW at 50-750MHz.

8575-series: 5kW dry load resistors; dc-500MHz; forced-air cooling.

8345-115: 6kW attenuator; 30dB ± 0.5 dB, usable from dc-500MHz.

Bogner Broadcast Equipment Circle (592)
DUI-series: UHF TV broadcast side-mount transmitting antennas; reduced weight and windloading.

Broadcast Microwave Service Circle (604)
BMA-3000: dual axis auto tracker; installs on building or tower; tracks azimuth and elevation of microwave source.

ENG Stadium System: relays signals from roving camera to production center; mobile system includes directional horn; interim receiver uses hemispherical omni antenna; connects through cable or another link to truck.

Cablewave Systems Div/CELWAVE Circle (613)
FLC-1 1/4": low-loss foam Cellflex cable; service to 3.4GHz, 50Ω; 88% velocity of propagation; peak power to 188kW; black polyethylene jacket; annular corrugated copper.

Catel Telecommunications Circle (625)
D-850: tunable TV demodulator.
FMS-2000: TV stereo generator.
FMS-3000: FM stereo system.
Series-3000: remote satellite receiver/transmitter system.
Microwave video, IR optical links.
Receiver: multichannel for broadband networks.

CAT Systems Circle (624)
HQ-series: remote-control system; high-speed option for all existing CAT systems; multiple site control from multiple control sites; computer graphic display shows system status.

CCA Electronics Circle (628)
FM transmitter: rated 650W.
FM transmitter: for broadcast band, rated 25kW.
FM exciter.

Central Tower/CTI Circle (630)
Antenna towers: all welded; to 160 feet.

Coaxial Dynamics Circle (648)
81070 Wattchman: station RF monitor and alarm; measures FWD/RFL RF power simul-

taneously in 50Ω lines; plug-in elements from 100mW to 100kW, 2MHz-1GHz; audible, visual alarms, 15ms response time; remote reset provision.

Comark Communications/ Thomson-CSF Circle (653)
H-series transmitters: VHF TV, 5kW to 50kW; 30kW CTT-V-30H solid-state PA, 192 output transistors in hybrid combination; 50kW CTT-V-50H 1-tube visual PA; forced air cooling; automatic linearity correction.
CTT-U-60SK: 60kW UHF TV transmitter; uses Varian/Eimac Klystron in Class B operation; available Fall 1987.
 See ad on page 27, 97

Communication Microwave/ COMWAVE Circle (654)
SB100A-MRC transmitter: 100W solid-state; ITFS, MMDS, OFS; 2500-2700MHz NTSC, PAL, SECAM; separate aural, visual PAs; integral test, system status displays; broadband amplifiers require no tuning.
SB-MRC series: -010, 15W; -020, 30W; -050, 50W; ITFS, MMDS, OFS in 2.5-2.7GHz range.
A-100S amplifier: modular amplifier for ITFS, MMDS, OFS; 2500-2700MHz; 100W solid-state; all color standards; integral test, system status display.
R10S/R50S repeaters: ITFS, external diplexing; separate aural, visual solid-state PAs.

Conifer Circle (1186)
CIT-series: ITFS downconverters: -LN bandpass filter before, -SLN after RF stage; dual-cavity bandpass filter; pre-tuned to 4, 8, 16, 24 or 31 input ITFS/OFS channels; output pre-tuned to 4 through 31 VHF/UHF channels.
QL-series: MMDS block converter; 31-channel capacity; modify for non-standard frequency scheme; compatible with PAL, SECAM; interface to CATV set-top converters.
CDPF-series downconverter: for MMDS/ITFS where 4, 8 or 16 channels are received; for non-standard output channels; pre-, post-RF bandpass filter; PAL, SECAM.
Paraceptor: MMDS/ITFS receiving antennas; -2515 15dB, -2518 18dB, -2521 21dB gains; aluminum anodized, zinc-plated steel; H/V orientation; slotted reflector folds over radiating dipole for storage.

Continental Electronics/ Varian Circle (669)
Type-314F AM: modular, solid-state 1kW AM transmitter; VSWR protection; stereo interface; operates unattended.
Type-814C FM: solid-state 3.8kW FM transmitter; uses single-phase power source; type 802F exciter; multiple 700W broadband amplifier modules with splitter/combiner network.
Type-815A FM: 5kW FM transmitter; 4CX3500A tetrode final; SCR power control, auto SWR circuit with output power fold-back; auto power output control; IC control logic; solid-state IPA.
Series-816R driver: solid-state unit for 10-35kW transmitters; SCR power control; auto RF output control, SWR protection; harmonic filter; IC logic for control, monitor.
 See ad on page 127

CSI Electronics Circle (679)
CSX-20F: FM exciter; 2nd order PLL synthesizer.

T-40-F2: FM broadcast transmitter; CSX-20F exciter; YL-1530 tetrode in grounded-screen, grounded-grid, cathode-driven design; >70% plate efficiency; front-panel breakers; remote control.

Peter W. Dahl Circle (683)
TLT-2000/-2040: tower lighting transformers; 120/240Vac systems; Hipersil steel toroid cores; pass ac, block RF; 12pF interwinding capacitance; adjustable lightning ball gaps.

Delta Electronics Circle (698)
RG-3A receiver/generator: update of RG-3; frequency counter; correlation detector; high output power; use with OIB-1/-3 impedance bridges for antenna measurements.

Dielectric Communications Circle (703)
DTW-series: doubly truncated waveguide; loss, windload equal to circular, but without axial ratio compensation, absorbing loads or cross polarization modes.
UHF Polarizer: adds vertical component to UHF TV pylon antennas; supplements horizontal polarized radiation of new or existing antennas; 8-layer assembly of full-wave dipoles; pressurized radomes cover dipole feed points.

EEV Circle (723)
K3672BCD klystron: external cavity; 470-810MHz (Bands IV/V); rated 60kW visual service; 65% efficiency with correction, beam pulsing; air-cooled body, cavities; water or vapor cooled collector.
K3271BCD klystron: external cavity; 470-860MHz (bands IV-V); rated 30kW with 60% efficiency.
CR2382 tetrode: to 1GHz; forced-air cooling; 12.5kW dissipation grounded-grid or CW oscillator service.
CR2347 UHF tetrode: aural, visual linear amplifier in TV bands IV/V; rated 4.5kW dissipation, 500W for peak visual carrier.
 See ad on page 71

Electro Impulse Laboratory Circle (725)
DPTC-25KFM load: dry forced-air; dc-110MHz; 25kW continuous power capability; 3/8" EIA input; rejection load available.
DPTC-55KFM: forced-air cooling, dry dummy load; 1.15:1 VSWR; 55kW continuous power capability; 3/8" input; reject load option.
DPTC-75KFM load: forced-air cooling; dc-110MHz; 1.15:1 VSWR; 75kW continuous power; 208/230Vac, 12.5A; 50Hz option.

Electro-Optics Div/EG&G Circle (726)
LS-161 beacon: aviation obstruction warning; omnidirectional light; meets FAA spec L866, white medium intensity.
LS-159 beacon: aviation obstruction warning device, as LS-161; for antenna mounting.
MVS-2020: machine vision strobe, MVS-2 xenon flash lamp; couple to CCD camera to freeze motion, eliminate blur, enhance image.

Electronic Research Circle (728)
Series-200 FM: side-mount antenna; input from 10kW-39kW; gain 0.4611-8.0798; end-, center-fed models; deicer option; VSWR 1.07:1 for carrier ±100kHz, 1.15:1 for carrier ±200kHz.

STANDARD & CUSTOM-WIRED AUDIO PATCH PANELS

TELEPHONE JACKS

PATCH CORDS

AUDIO PATCH PANELS

ALL AVAILABLE IN LONG-FRAME (1/4") & MINI (.172")

audio accessories audio line

Audio Accessories, Inc.
 Marlow, NH 03456
 603/446-3335

Circle (99) on Reply Card

"THESE KNOBS TURN HEADS"



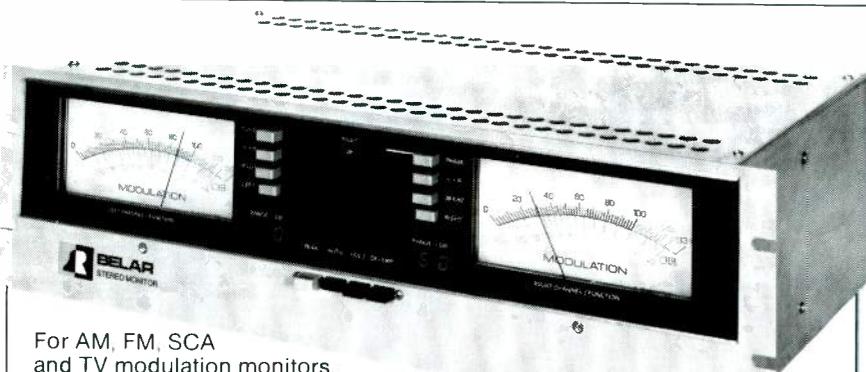
When format, polarity, phase or routing errors threaten your stereo image, reach for the SCIP Stereo Signal Manager.™ Comprehensive signal monitoring and manipulation features let you *diagnose, reconfigure, correct* and *calibrate* stereo signals quickly and precisely. Even *azimuth errors* from fixed audio head VTR's. Give yourself the latitude to enhance your mono capability and stereo imaging.

3302 Stereo Signal Manager ≡ The Control Solution

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ELECTRONIC SYSTEMS

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For AM, FM, SCA
and TV modulation monitors.

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information on Belar AM, FM, Stereo,
SCA and TV monitors.

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remove the Peel-Off Label (which is used
to address your magazine) and affix it to
the Reader Service Card, the Address
Change Card, or to any correspondence
you send us regarding your subscription.

EMCEE

Circle (731)

MC-2127 downconverter: 2-input, broad-
band 2.15-2.162GHz or 2.5-2.7GHz for si-
multaneous MMDS/ITFS reception; output
range 100-400MHz; 25dB gain; surface
mount components, PLL control.

TTS10FA: MMDS/ITFS transmitters; fre-
quency agile.

Energy-Onyx

Circle (733)

AM Protector-enhancer: with AM limiting
to conform audio signal to meet NRSC rec-
ommendations; integral 10kHz filter attenu-
ation per NRSC; 10dBm headroom, distor-
tion <0.1%.

Ethereum Scientific

Circle (738)

EMBARC network: Ethereum Mobile
Broadcast And Reception Consortium; 20-
regional divisions in United States for
uplink services; mobile ENG, production
vehicles, teleport facilities.

Flash Technology

Circle (750)

FTB-301: medium-intensity beacon; meets
specifications for towers to 500 ft.

SCI100: controller for high-intensity beacon
lights.

RSC-610: controller for red obstruction
lighting.

General Electric/Comband

Circle (761)

3BDC900: Comband block downconverters
transform 33 microwave frequencies to
CATV signals; *Superband* 31-channel ITFS,
MMDS, OFS to superband; *Dualband* 33-
channel ITFS, MMFS, OFS, MDS-1, MDS-2
to superband, midband; *Midband* specific
set of eight channels to midband.

Gentner Engineering

Circle (764)

VRC-1000 firmware: enhancements to re-
mote-control unit; remote setup alteration;
alter time duration of momentary com-
mand outputs from 1/16s to 15.9s; change
duration of alarm conditions; clear all
alarm conditions.

VRC-1000 software: terminal emulation; al-
lows MS-DOS PC with modem to call or
answer VRC-1000 with display of metering,
status and command channels.

See ad on page 56,196

GTE Spacenet

Circle (778)

News Express: Ku-band news service; ma-
terial provided without editing.

Call Express: communication service via
satellite for user with telco network from
any location in the 50 states; for voice, data
or telex.

Turnaround: conversion of C-/Ku-band sat-
ellite signals.

Hallikainen & Friends

Circle (779)

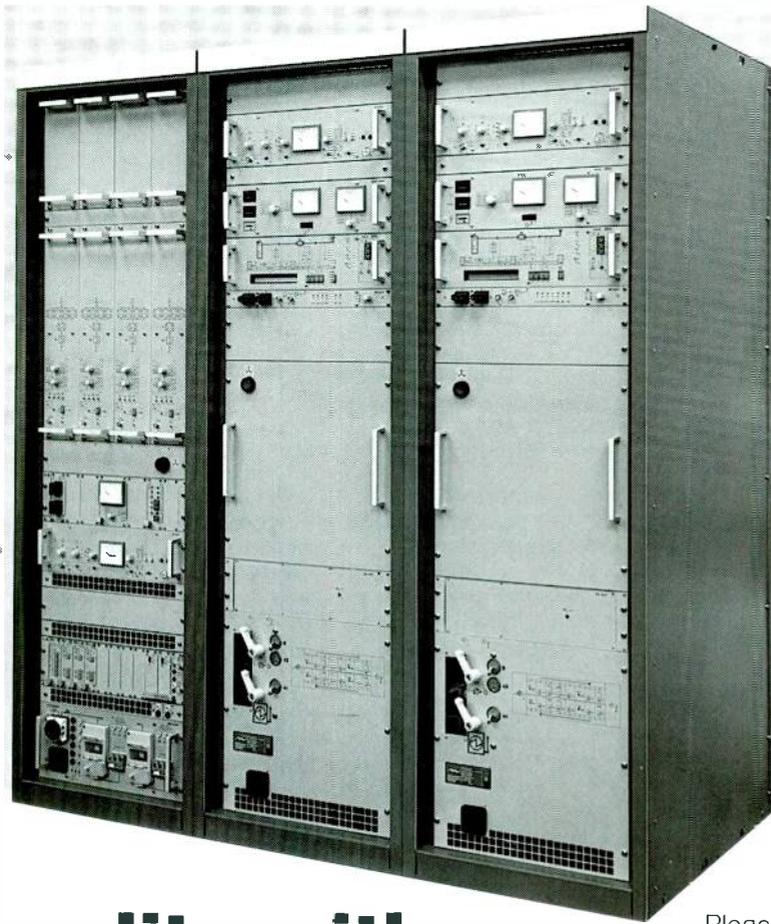
DRC-190 remote: digital remote control;
operates manually or monitors, displays
and prints information with computer pe-
ripherals; RS-232 port; programmable in
BASIC; RAM for standard control, logging,
expandable to full ATS.

ITO-177: intelligent transmitter operator,
full computer operation of Moseley TRC-15
remote control through Hallikainen Tel-171
telemetry adapter; Commodore 64/128 μ -
controller.

Harris Broadcast Group

Circle (781)

UX-series transmitter: UHF TV system; ex-
ternal cavity; 60, 120, 240kW power levels;
three sources for klystrons; MCP-2 visual,
aural exciters; external heat exchanger, re-



Hi-Fi quality with VHF/FM transmitters from AEG.

Radio listeners all over the world daily receive broadcasts from VHF/FM transmitters around the clock – thrillers, hit parades, news spots, concerts, sports and a variety of other programs to their entertainment – and this of superior Hi-Fi stereo quality.

For over 60 years AEG has been pacemaker in the development of VHF/FM transmitter-technology. Long standing experience in VHF/FM work has lead to professional equipment with outstanding performance. This established know-how and experience has been to the benefit of national

and commercial broadcasters as well as "International Telecommunications Organisations". The fact that AEG has supplied more than 2 000 VHF/FM transmitters worldwide speaks for itself.

Fully solid-state modules with inherent redundancies give the user maintenance-free operation with minimum down-time. Automatic stand-by facilities keep stations on air around the clock.

Consistent to the concept of VHF/FM transmitters AEG supplies light and compact VHF antenna arrays proven to withstand the most adverse weather conditions, too. VHF/FM radio equipment is just one of the many facets of the wide scope of products and services AEG can furnish to broadcasters.

Please contact us for detailed information on specific areas of interest.

AEG Aktiengesellschaft
Kommunikationstechnik
Sickingenstrasse 20-28
D-1000 Berlin 21
Telephone (030) 34 63-0
Telex: 181819
Telefax: (030) 34 63 24 19

Please send me further information on VHF/FM transmitters from AEG:

Name _____

Company _____

Address _____

K 1 WAK 3670 E

AEG

Circle (103) on Reply Card

dundant fans, pumps.

Switchless combiner: for dual VHF installations; hybrids connect through phase-shift device; control logic keeps maximum power on antenna; adds redundancy.

Sentinel-48 control: intelligent remote control; responds to changes in operating environment; color CRT with color-coded conditions, light-pen operation; single to 6-site capability from studio location; basic system includes 16 telemetry, status, command lines.

DX-10 AM: solid-state 10kW transmitter; digital modulation; reduced THD, IMD, audio overshoot, tilt, ringing; 80% ac-to-RF efficiency; incidental quadrature modulation (IQM) -35dB; FlexPatch soft failure feature; ColorStat signal flow.

FM-25K1 FM: 25kW transmitter; 1-tube PA, 150W solid-state RF pre-amp; 600W IPA; MX-15 exciter; 2.8MHz system bandwidth; auto power control, VSWR foldback, FlexPatch emergency package.

Microstar T1-over-video: T1 1.544Mbit datastream via video modem on tunable subcarrier frequencies, 6-12MHz; Microstar 23GHz duplex video radio; RS-250B broadcast video, three audio subcarriers, 24 PCM voice channels or 1.536Mbit data simultaneously on same link.

Hipotronics

Circle (786)

A480-600YZB: PAVR Peschel automatic voltage regulator; 40A-2kA; 240V-13.8kV; wye-connected; line voltage held within $\pm 1\%$ for input variation of -14/+9%; not ferroresonant or SCR; optional phase control, bypass switch, line-drop compensation.

Holiday Industries

Circle (790)

HI-5000-SX: measure RF, microwave fields for hazard evaluation; display of time-averaged value in varying fields; compliant to 6-min time-averaging provision of ANSI standard.

HI-3002 meter: portable field-strength meter; broadband; combine with HI-3320 data-logger to form HI-5000-SX system.

HI-3600: radiation survey meter; measure complex electrical, magnetic fields; interchangeable sensors.

Hubbard Communications

Circle (794)

MS-2: switches primary to backup final uplink amplifiers, control, waveguide; front-panel or remote control.

DS-1: pressurizes dry air to coax, helix, rigid waveguide; 0.5 to 3.5 lbs/in².

Ikegami Electronics

Circle (798)

PP-70: portable ENG/EFP microwave link; 3-4 hr operation from camera battery; 7GHz (1.2W) or 13GHz (120mW) bands; audio, video test generators; 4.6 lbs each transmitter, receiver; mounts with Frezzolini bracket.

PF-711: portable minimicrowave link; 2GHz, 7GHz, 13GHz operation; 117Vac, 12Vdc, optional 24Vdc; integral test generators; operates with or without control units; 1-5W frequency band dependent.

See ad on page 146-147, 169

Inovonics

Circle (805)

Model 705: FM stereo generator with FMX option; digital pilot, subcarrier synthesis; integral peak overmodulation protection; filter overshoot control; adjustable composite EQ for STL.

Itelco USA

Circle (812)

TV transmitters: for bands I,III; 20kW-40kW output powers; external diplexing; Hyper-vapotron cooling.

Portable microwave: 2HGz system; used with camera and support.

ITS/Information

Transmission

Circle (813)

ITS-300: ICPM measurement system; requires no demodulator; waveform monitor or oscilloscope outputs.

ITS-12/-18: VHF exciter; 20W visual CW, aural modulated carrier outputs; ICPM corrected; ready for MTS sound; -18W frequency compatible; output triplers for high-band use.

ITS-27: VHF aural 41.25MHz IF modulator; three audio inputs, 30Hz-15kHz, 75 μ s pre-emphasis, 75 Ω broadband for composite audio, high-pass filtered for subcarriers.

ITS-75: VHF solid-state video modulator; to replace, upgrade unit in RCA A/B line transmitters.

ITS-1610C: 10W/20W ITFS/MMDS transmitter; for any 6MHz in 2500-2686MHz; aural 1W/2W output; separate aural, visual amplifiers; diplexed.

ITS-1658C: 100W ITFS/MMDS amplifier; 50-100W visual at diplexer output; aural at 5-10W; on any 6MHz channel between 2,500-2,686MHz.

Johnson Electronics

Circle (820)

ST-TV Pro/Sap tuners: for channels 2-6, 7-13; audio outputs to 1.8Vrms unbalanced, 1.4Vrms balanced; for monitoring or special TV subcarrier services.

STS-II test set: 88.1-107.9MHz FM; synthe-

Continued on page 148

This new QuantAural™ QA-100 Audio Program Analyzer gives you the advantage in competitive broadcasting

Simply put, the QA-100 quantifies what you hear. Your station sound can now be electronically monitored the way you hear it. Exactly. And, you can monitor the competition too!

Real time analysis of any audio signal. From a receiver, tape recorder, or processing equipment. You see the measurements as you hear the sound. Changes in processing or variations in system performance are immediately shown on the QA-100 panel meter or bargraph display—using program material as the signal source.

The QA-100 hears like a program director and talks like an engineer. With it you can monitor maximum peak level (relative peak modulation), overall

processing effectiveness (average level), tightness of sound and processing control (peak density), tonal balance, consistency and preemphasis (four band real time analyzer), stereo image width (L + R to L - R ratio) and "punch" (special "aural intensity" measurement).

Interested? To learn more about how the QA-100 will help your station compete, call Potomac Instruments today.

QuantAural is a registered trademark.



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932 PHILADELPHIA AVE. SILVER SPRING, MD 20910
(301) 589-2662

Circle (104) on Reply Card

Tough as Sony.



Pound for pound, Sony videotape is the toughest you can buy.

One word sums up everything we tried to achieve with V1-K one-inch videotape: durability.

It was perfected for the world where rugged dependability counts every bit as much as dazzling picture quality.

Its strength comes from a truly tough, cross-linked binder system, a very strong adhesive base film and our carbon black anti-static back coating.

This durable foundation protects an ultrafine Vivax™ magnetic particle

formulation, which delivers astonishing picture quality, higher stability and optimum S/N ratio.

Amazingly enough, V1-K also has the lowest headwear rate of any major one-inch videotape. Our efforts have benefitted BCT Betacam® and the BRK U-matic® videocassettes, too, with trouble-free still frame editing, totally reliable repeated playback and worry-free long-term storage.

So, after all, Sony professional videotape is just like any other Sony: standard-setting video and audio with a "tough as nails" reputation. That's why it's the only videotape you can treat like a Sony.



SONY
THE ONE AND ONLY.

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Circle (105) on Reply Card



The Right Stuff!

Ikegami's HK-322 Studio and HK-323 Field/Studio Cameras: Here to Stay.

Ikegami's HK-323 1" and $\frac{2}{3}$ " field/studio cameras, alongside the ever popular HK-322 full production camera, gives the broadcast marketplace a choice of two distinct, yet unique cameras, second to none.

The HK-322 with 1" or $1\frac{1}{4}$ " tubes remains the ultimate production camera in the industry, with specialized functions not found on any other camera. These include 6 vector color corrector, scan reversal with memory, negative video, out-of-bands horizontal aperture correction, scene files with extensive memories, dream effect and much more. For complete flexibility, the hand-held HL-79EP is available as the companion camera.

For field/studio operation, the HK-323 1" and $\frac{2}{3}$ " cameras, recently introduced by Ikegami, are quickly gaining acceptance with the networks as the market leaders in this segment of fully automatic micro-processor controlled, lighter weight broadcast cameras. The HK-323 is available with the optional hand-held companion, the HK-323P, which operates off the same base station.

Once again Ikegami is right where the marketplace expects us to be; with a commitment to excellence and our assurance of the best.

For a demonstration of the Ikegami HK-323 and HK-322, contact us or your local Ikegami dealer.

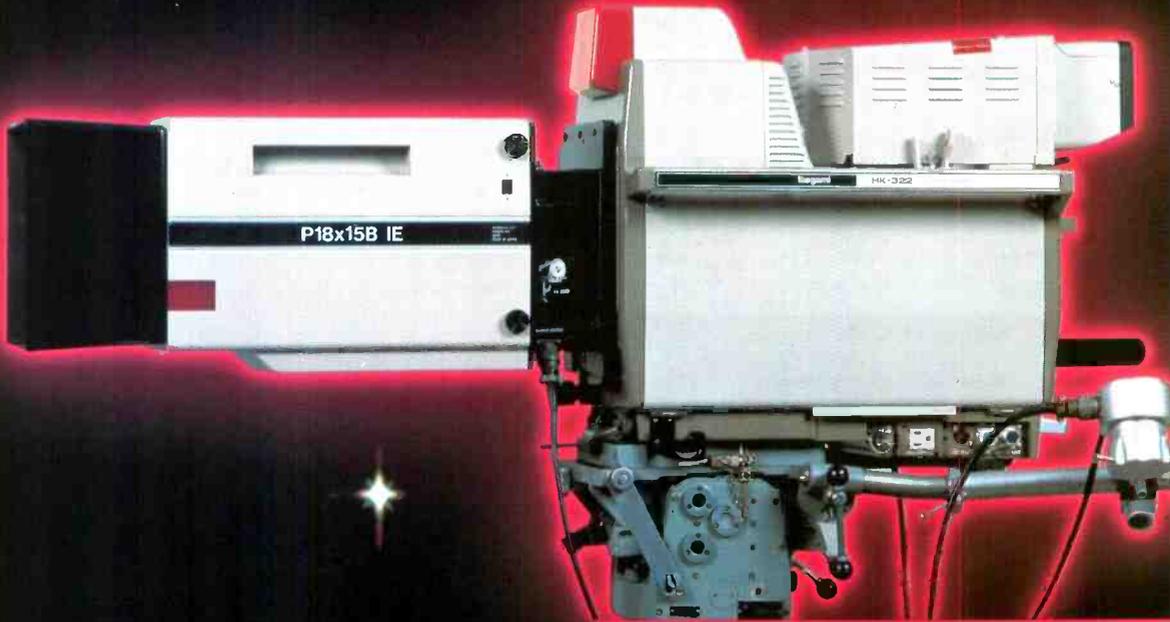
Ikegami[®]

Ikegami Electronics (USA), Inc. 37 Brook Avenue Maywood, NJ 07607

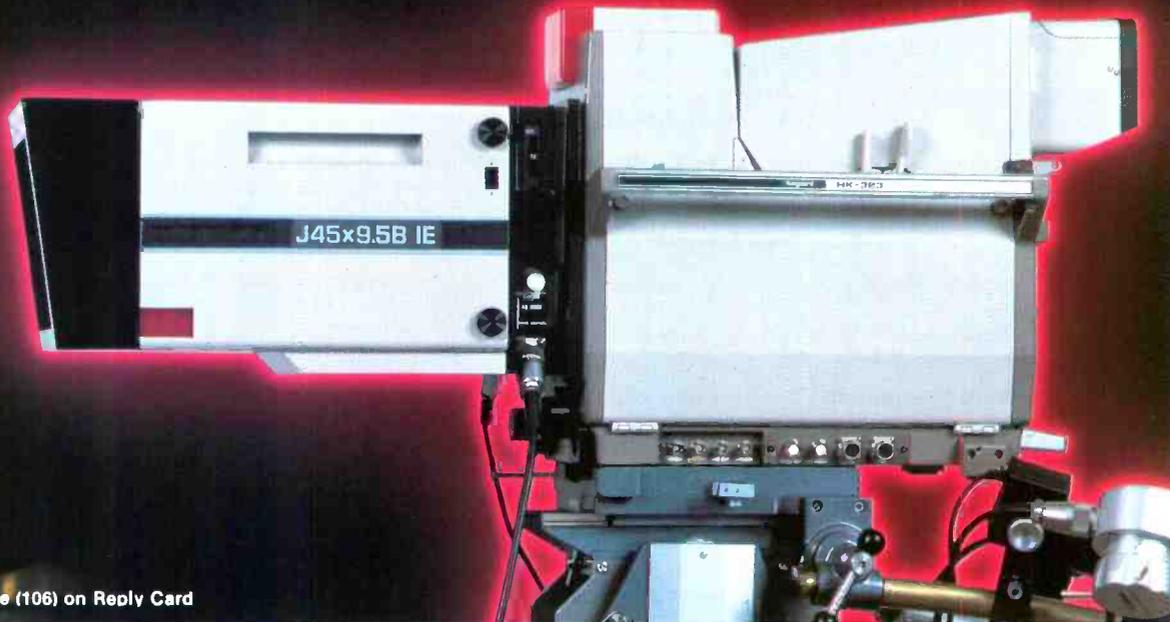
East Coast: (201) 368-9171; West Coast: (213) 534-0050; Southeast: (813) 884-2046 Southwest: (214) 233-2844;
Midwest: (312) 834-9774; Hawaii: (808) 946-5955



HK-322 hand-held companion HL-79E



HK-323 hand-held companion HK-323P



Continued from page 144
sized steps of 200kHz; 55dB switchable attenuation simplifies antenna alignment in strong signal areas; signal level meter.

Kahn Communications Circle (823)

POWER-side: combines ISB AM stereo system with audio processor, forces most energy to fall on one sideband, but within FCC rules; reduce AM interference, noise.
Flattener: AM antenna broadbanding aid; uses mono/stereo generator to produce signal at 1.4MHz, <1mW; interfaces to 6-circuit network for antenna adjustment.

Key Industries Circle (827)

Phase converters: 1-to-3 phase systems; supplies 3-phase power in remote areas where available power is single phase.

Keltec Florida Circle (828)

R60-300Ku: medium-power HPA for 14-14.5GHz; rack-mounted; 70 lbs; 300W TWT for 275W output; with type-N female or SMA-RF connectors.

H60-300Ku: TWT HPA system for 14-14.5GHz; hub-mount; interface for remote operation; type N or SMA RF connector, high-gain options.

Kintronic Laboratories Circle (834)

MS-3P-158: 3-port manual switch for AM; 1½" EIA flange; alternative for switching 2nd transmitter into antenna load; with ¾" or 3¼" EIA male flange.

PP-78-7U: 7-port patch panel; ¾" unpressurized line.

AG-3: variable horn/gap assembly.

RFC-20-10-2: double-pole, double-throw RF contactor.

Larcam Comm. Equipment Circle (842)

TTS-5LH: 5kW highband VHF transmitter; solid-state, external diplexer; μ P-controller.

CP antennas.

LeBlanc & Dick Communications Circle (849)

CP antennas: lowband VHF (Ch 2-6), circularly polarized; replaces super turnstile without increased tower loading.

M/A-COM MAC Circle (865)

MA-18CC microwave radio: 17.7-19.7GHz; solid-state, for broadcast; meets RS-250B; one video, three audio; diagnostics.

Super-2MX microwave transmitter: self-contained; video, two audio; 1.99-2.11GHz ENG; 21-channel synthesized; ac/dc power; 3W, 12W RF output; TwistLoc antenna mounting.

See ad on page 123

MARCOM Circle (870)

Model 711: low-cost TV stereo generator.

Marconi Communications Systems Circle (871)

B7500: 30kW highband VHF TV transmitter.

B6128: 500kW HF shortwave transmitter; grounded-grid.

Marti Electronics Circle (873)

STL-23 digital STL: 23GHz simplex, duplex (STL/TSL); audio/AFSK, RS-422 subcarrier options; compatible with PCM video processors; weatherproof antenna-mounted electronics housing.

ATS-15D transmitter switcher: for units to

50W, auto switching at any power level; each transmitter sampled through adjustable comparator.

ASO-200D auto receiver/switcher: routes audio/SCA functions from one receiver to another on the same frequency upon signal loss to the main receiver.

TSL-30 transmitter: AM, FM, TV TSL telemetry link; 450MHz; for analog, digital telemetry, voice from 50Hz-2800Hz; mic, line inputs.

RPT-30: remote pickup transmitter; 140-180MHz, 200-260MHz, 280-340MHz or 400-480MHz bands; 1-, 2-frequency versions; four balanced mic or 3-mic, 1-line inputs; compressor, limiter.

Micro Communications Circle (884)

55000 series: HOT switch transfer between main/alternate transmitter or main/aux antenna; like 4-port transfer switch.

UHF combiners: two waveguide bandpass filters and two 90° hybrids; combines two 120kW transmitter outputs on different channels to a common feedline and antenna.

ELR transmission line.

Microdyne Circle (885)

Newslock: 1100TVL/TVK hard scrambler/descrambler; access addressable decoders; vertical interval unaffected.

1100-BKR receiver: Ku-/C-band; RS-250B spec; frequency agile; two tunable audio subcarrier demods, 10kHz step tuning; four IF bandwidths; compatible with VideoCipher or BMAC.

Modulation Sciences Circle (897)

StereoMaxx: spatial image enlarger; enhance separation; operates with loudness processors, does not effect dynamics; increases average energy of L-R channel.

ModMinder: modulation status panel; shows wideband demod, such as TEK 1450-1, MTS signal status at-a-glance; includes total modulation, overmodulation, subcarrier status, injection.

See ad on page 80

Moseley Associates Circle (901)

PCL-600/-600C STL: -600 monaural, -600/C composite stereo; direct modulation, PLL reference oscillator; dual-conversion receiver; panel meters show system status; SCD-9 stereo demod for AM stereo.

MRC-1600 option: dial access; connects remote control to DTMF telco line for multi-point monitoring, control; voice status reports; 32 relay-isolated command lines, 16 status lines, 16 telemetry input channels.

See ad on page 65

Motorola Communications Circle (902)

MSF5000 base/repeater: 110W (435-475MHz); circulators, intermod protection filtering; individually programmable channels, private-line, digital private-line coded squelch; auto ID.

OPTRX printer/charger: personal message center add-on; adjunct to display pager for hard copy of messages.

People Finder: on-site comm system; signals any Motorola pager, including Quick Call II for private 2-way use.

R-2400: communications monitor; integral spectrum analyzer; off-air or direct-to-transmitter hookup.

StarPoint23: high density 23GHz microwave radios; -23AD, digital voice, fax, async./sync. data; -23AT, telemetry, equip-

ment control information; -23AV, AM video; -23HPV, FM video.

HT600 2-way: FM portable communications radios; stores frequencies, squelch codes and other characteristics.

STX 2-way FM: portable SMARTNET 800MHz, Privacy Plus trunked radio systems.

Motorola C-Quam/AM Stereo Circle (903)

C-Quam ICs: MC13022, MC13024 AM stereo decoders; MC13021, MC13023 tuning stabilizers.

Narda Microwave Circle (915)

Non-ionizing radiation measurement devices.

Nautel Maine Circle (917)

AMPFET-1K: repackaged; in full height rack; five power level settings for pre-sunrise, post-sunset operation.

See ad on page 108

NEC America/Broadcast Circle (918)

TV exciter: solid-state, synthesized, stereo ready, with 30% fewer components, logged 50% improvement in MTBF (30,000 hr); output constant within ± 1 dB.

PCU-930SSW: 30kW solid-state UHF transmitter; MTS compatible; IF modulation; reduced power, maintenance costs.

PCU-960HC: 60kW UHF transmitter; two klystrons may be Amperex, EEV, NEC; vapor or water cooling; new exciter; non-linear distortion corrected at IF.

PCN-1430AL/1: lowband 30kW VHF transmitter; solid-state aural amplifier, 1-tube visual; frequency synthesized exciter; integral CIN diplexer.

See ad on page 107

Nurad Circle (928)

3-series: superheterodyne transmitters, receivers for STL/ICR service; 2-13GHz.

23GHz transmitter/receiver: full diagnostics, alarms; four audio subcarriers; RS-250B spec.

20AR3/23AR3: superheterodyne ENG central receivers; fully agile; low noise pre-amp; selectable IF.

RX2-series: frequency agile portable ENG receivers; 33% smaller package than RX1 series.

Orban Associates Circle (936)

8185A Optimod: TV stereo generator; digital baseband encoder, left-right inputs work with any audio processor; integral Bessel null calibration; improved peak metering; optimized NRS.

XT2 accessory: for 8100A Optimod-FM; adds 6-band limiting, precision adjustment of base, treble sound texture, program density, program dynamics.

9100B Optimod-AM: complies with NRSC 75 μ s pre-emphasis, 10kHz low-pass filtering (5kHz international); upgrade kits available for 9100A units in use.

See ad on page 7, 17

Pinzone Communications Circle (957)

8250k: Ku-band receiver; all-format, all-satellite; control from front panel.

8250s: S-band 2GHz ENG receiver.

CPG-ASWA: anti-skywave AM broadcast antenna; low profile nominally 30 ft high; 6dB gain in azimuth plane.

LNB downconverter: from Ku- to C-band conversions.



ITCHCRAFT, 1987

LET'S PAUSE FOR STATION IDENTIFICATION

Stations identify with us. Not only at "break" time, but from sign-on until sign-off. Because they can't afford dead air and inferior performance, broadcast engineers go with audio components they know and trust. Result: Switchcraft parts are part and parcel of hundreds of AM, FM, Shortwave and TV stations worldwide.

Because we identify with stations we're well aware of your industry and its exacting requirements. Our 40 year commitment to excellence comes through loud and clear. The superior reproduction quality, flexibility and durability of our thousands of electrically and mechanically verified standard and miniature products includes unique technological advances such as the innovative "QG" Quick Ground connectors. And, our support engineers are constantly available to answer your probing questions.

So - pause for a minute - and identify your own audio component needs - from jacks, plugs and jack-panels to connectors and adapters. Then send for our literature and see how easily your station can identify with us.



Circle (107) on Reply Card

Send me information on your quality components:

- Please have a representative contact me
- Please send me your General Line Catalog covering the complete Switchcraft line.
- My area(s) of interest is:
 - Switches Connectors Power Cords
 - EAC Receptacles Jacks Plugs
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- Future (date) _____

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Company _____ Title _____

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B6-87

Switchcraft

A Raytheon Company

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Chicago, IL 60630
(312) 792-2700

PYE-TV/Varlan **Circle (600)**
LDM1791: 60kW UHF TV transmitter; Amperex/Philips Valvo YK-1265 high efficiency klystron; LDM1170 IF modulated exciter; pulser for efficiency to 60%; BTSC stereo ready.
LDM1901/1902: TV transmitter with sound-in-syncs; audio channels digitally encoded, interleaved, inserted into sync pulse of a standard TV signal; crosstalk < -80dB.
FM transmitters: solid-state modular designs; modules consist of 2-3 600W FET sub-modules with combiner; series rated 500W, 1kW, 5kW; driven by LDM1248 exciter.

QEI **Circle (965)**
FMQ-10000: FM transmitter designed around one EIMAC YU148 triode in grounded-grid; Automod automatic modu-

lation control, auto power control, extensive μ P diagnostics and full remote control including diagnostics.

See ad on page 202

Radiation Systems **Circle (973)**
Model 240KV: RSNG antennas.
Models 551CF/551KS: 5.5m antennas; -CF meets C-band Intelsat F-1 spec; -KS meets Ku-band Intelsat E2, FCC 2° spec; 360° azimuth travel kingpost mount; electronics in hub; motor drive; rooftop, ground installation; Cassegrain optics.
Models 500CS/500KS: C-/Ku-band antennas meet Intelsat, Eutelsat, FCC 2° requirements; prime-focus fed; galvanized mount elevation-over-azimuth type.
Laux/Kenwood: TVRO systems.
Mark microwave antennas: parabolic, 21.2-23.6GHz; for 70MPH wind, 125MPH survival

with 1" ice; dual polarization.

Reach Electronics **Circle (980)**
2VR81 TOP: tone-only pager; increases traffic flow by requiring only 2.5s to signal a tone alert; triple-alert feature indicates to call one of three locations.
L'Page encoder: manual tone-signaling unit; selective calling of 1,000 separate pagers in groups of 30.
Liaison paging terminal: dial-access system; increases efficiency; up to four telephone line inputs; no separate interface required to telco.

RF Scientific **Circle (984)**
Uplink services: C-/Ku-band; transportable systems.

RF Technology **Circle (985)**
UPL-series: ultraportable ENG transmitters; wireless camera applications; 200mW, 1W outputs; frequency agile; mic/line switchable; for 1.7-1.9GHz.
LONGRANGER: weatherproof, remote-controllable repeater; extends ENG range; 1.7-15.25GHz; ac/dc operation; control by telco, audio channel, voice link.
UPL-200 series: 2-2.5GHz color TV links; 250mW, 1W and amplifier options to 30W output RF.

Richardson Electronics **Circle (986)**
Acrian TV60U: 60W 470-860MHz TV amplifier, 28Vdc; forced air, water cooled; modular, same amp blocks as TV30U, TV120U amplifiers; soft-failure redundancy.
833A glass triode: 350W rated for CW service; from National Electronics.

See ad on page 103

Rockwell International **Circle (989)**
DVS-1000 digital video system: modular digital video, stereo audio distribution; digitized signals combined in DS3 compatible system; transmission via lightwave, microwave, digital coaxial equipment.
DML-3x50: digital lightwave system with 50Mbits/s, 150Mbits/s optical line rates; for metropolitan networking of digitized information.
LTS-21130: lightwave transmission system; operates at 1,130Mbits/s optical line rate; for long-haul and interexchange network use.
MVR-1000: microwave video radio STL; simplex 1-channel transmitter, receiver package.

ROHN **Circle (992)**
7500 guyed tower: 7½-foot face width; designed for heavy loads.

Scientific-Atlanta **Circle (1005)**
Model-470 loop test translator: tests vehicular satellite systems without RF transmission; routes Ku- output to L-band receiver input; avoids transponder time for tests.
7555-03 uplink exciter: RS-250B compliant for broadcast; IF switching; front-panel tuning; full, ½-transponder bandwidths, deviation selectable; tunable audio subcarriers.
7510 L-band video receiver: for C-/Ku-band with appropriate low-noise block converter (LNB); RS-250B spec for broadcast, teleports, news gathering, video conferencing; compatible with B-MAC, 525-NTSC, 625-PAL, SECAM.



SIX ADVANTAGES OF THE STUDIO CONDENSER WITHOUT A SOUND OF ITS OWN

1 The MC 740 Studio Condenser is ideal for critical "on-air" and recorded voice-overs because it is virtually inaudible — no self-noise or sonic coloration of any kind.

2 All five of the MC 740's polar patterns have equally uniform and identically transparent frequency response, for consistent performance throughout the production process.

3 Effective "P" popping suppression for clean takes when close miking.

4 The MC 740's exceptional sensitivity captures "soft" copy with clarity and intimacy. Yet it withstands up to 144 dB SPL with the user-adjustable 10 dB attenuator in circuit, to transmit all the impact of a "hard" delivery.

5 A three-position low frequency rolloff filters out air conditioner and boom generated noise. The optional EA 740 shockmount provides a further degree of isolation from stand and boom-borne rumble.

6 The MC 740 captures the subtle inflections that reveal vocal character with world-renowned Beyer accuracy.

If you want cleaner, quieter, more natural-sounding voice-overs, narration or replacement dialogue, arrange for a hands-on audition of the unconventional MC 740. Contact your Beyer dealer or: Beyer Dynamic Inc., 5-05 Burns Avenue Hicksville, NY 11801 516-935-8000

ACCURACY IN AUDIO

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Circle (108) on Reply Card

Shively Labs **Circle (1013)**

Spaced antennas: 1/2-wave spaced for FM broadcast; reduced downward radiation characteristics.

Custom antennas: FM systems meeting specific customer requested H/V ratios.

FM antennas: special designs for compliance to reduced downward radiation requests in accordance with FCC regulations.

Standard Communication **Circle (1034)**

AGILE-OMNI Pro: C-/Ku-band receiver, broadcast grade; exceeds RS-250B.

AGILE-OMNI International: expanded frequency range receiver; for all ITU regions, all TV transmission standards.

Telemet Div/Geotel **Circle (1064)**

3713 demod: for BTSC sound; synchronous, envelope detection; in-phase, quadrature outputs; ICPM measurements; wideband output; integral demod tester; digital display.

4400-S1 modulator: VHF carrier plus composite video modulation at 45.75MHz IF; output channel determined by up-converter module; aural design for stereo; integral chroma, luma pre-correction.

Television Technology/TTC **Circle (1072)**

FM300T: 300W FM transmitter.

Silverline: 60kW UHF TV transmitter; can be combined to 120kW, 180kW; EEV external-cavity klystrons, others possible.

Model X: FM exciter; six composite signal inputs.

25kW update: cosmetic, operational and logic improvements; momentary contact switching.

Tennaplex Systems **Circle (1074)**

TVI: broadcast TV antenna; ideal vertical cosecant null-fill pattern.

FMi: broadcast FM antenna; ideal vertical cosecant null-fill pattern.

MEG1 system: multistation combiner; total TPO prime power input of 1MW.

TFT **Circle (1078)**

8500/8501: TV STL composite subcarrier system for MTS/BTSC; 8500 subcarrier generator; inputs for stereo, SAP, Pro or composite; 8501 demodulator; auto modulation control.

[See ad on page 101](#)

Thomson Electron Tube Div.

Circle (1082)

TH546 tetrode: power device in FM service; 100kW rating, Hypervapotron-cooling; 80% efficiency; 18dB gain in grounded cathode configuration.

TH346 tetrode: FM power device; rated 50kW; air-cooled.

TH3759A TWT: 300W device for 14-14.5GHz ES uplinks; operates in depressed collector mode for 34% efficiency.

TH341 tetrode: 10kW rating for FM transmitters; 80% efficiency with 17dB gain; tube and cavity approximately 1/3 the volume of previously available units; Pyrobloc grid design.

Thorn EMI Varian/TEV **Circle (1175)**

PT-5050/-5080/-5090 ACE: 4-cavity TV klystrons; rated 5-15kW, 15-32kW and 32-65kW respectively; Annular Control Electrode improves efficiency and power reduction through anode pulsing; uses PTE-series circuit assemblies.

TMD div/Will-Burt **Circle (1090)**

TMD-7-42: pneumatic telescoping ENG mast; 7 ft nested, to 42 ft; fixed azimuth or manually rotatable models; supports loads to 150 lbs; for ENG, satellite news vehicles.

TMD-6-27/-7-34: pneumatic telescoping masts for RENG; 6-27 ft or 7-34 ft; loads to 40 lbs; fixed azimuth or manual rotatable.

C-287/C-288: 1/8HP, 115Vac and 1/4HP, 12Vdc tankless compressor systems; extends TMD-6-27 type mast in 3-5 minutes.

Townsend Associates **Circle (1095)**

TB-3: IF exciter/modulator for UHF, VHF TV; 2W visual, aural drive; SAW filter VSB shaping, group delay correction; multiplex mode; gray scale generator; ICPM correction.

TB-10TM: 10kW UHF multiplexed TV amplifier; single klystron; visual power extended to 15kW with separate aural section; ready for stereo with TB-3 IF exciter/modulator.

TB-30L: 30kW VHF transmitter; 3-tube, grounded-grid triode; redundant parallel visual PAs; solid-state visual, aural drivers; air-cooled; stereo ready.

TB-60TG: UHF transmitter, rated 60kW; accepts EEV, Thorn-EMI, Amperex wideband klystrons; beam efficiencies of >80% with EEV gridded klystrons; digital amplifier, system control/monitor center; combine for 120kW, 240kW outputs.

TA-60TAM: 40kW simplex UHF transmitter; visual, aural multiplexed through single klystron.

[See ad on page 200](#)

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TCR 680

The TCR 680 SMPTE Time Code Reader/Inserter

Here's the perfect time and worksaving way to make a copy of your master tape - with time code displayed in the picture for efficient off-line edit decision-making. Its highly portable design makes the TCR 680 ideal for all location work, and an invaluable tool for precise editing. Don't waste time! Call us for the name of your local dealer. The TCR 680. It's about time.

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[Circle \(109\) on Reply Card](#)

Valmont Industries Circle (1116)
Support structures: freestanding masts, to 250 ft; towers, to 400 ft; guyed towers, to 1,000 ft.

Varian Associates/Eimac Circle (1117)
VTU-6393 T1 TWT: 300W rating for news gathering, fixed uplinks; 18.5" length; periodic permanent magnet (PPM) focus design places magnets closer to tube for better beam control; air-cooled.

VTU-6393 B1 TWT: rated 300W; conduction cooling.

VTU-6191 M2 TWT: rated 80W; conduction cooling.

Y863 tetrode: VHF power device for TV linear amplifier service to 250MHz; input circuit modification retrofit option for NEC 8F76R in NEC 10-15kW VHF TV transmitter;

increased gain reduces exciter output.

TWT linearizer: pre-distorts phase, amplitude to compensate for non-linearities in C-band TWT multiple carrier transmitter; diode design.

VJU-6795A2 combiner: Ku-band uplink power combiner; vehicular or fixed systems; control, monitor circuits and waveguide components; combines two LPAs and two MPAs, to 600W.

VPW-6892 MRU-II: modular replaceable power supply for TWT amplifiers; for small aperture uplinks; locates in antenna hub or enclosure less than 12 feet from antenna; 1,800W maximum.

VZU-2701H Gen II KHPA: power increased to 2.2kW; minimum 5,000 tuning cycles; digitally controlled power supply, RF attenuator; for manual- or computer-con-

trolled uplink KHPAs.

Vector Technology Circle (1119)
Toroidal transformers: for voltage sampling with RF feedlines in AM DA system; 0.5-5MHz; 0.25V/A, 0.5V/A, 1V/A and 1.5V/A sensitivities.

Vertex Communication Circle (1120)
1.8m-flyaway: Ku-band antenna, meets FCC 2°, INTELSAT, CCIR spec; offset prime focus, T/R configuration; unit packs in five cases for travel; 30-minute, 1-person assembly.

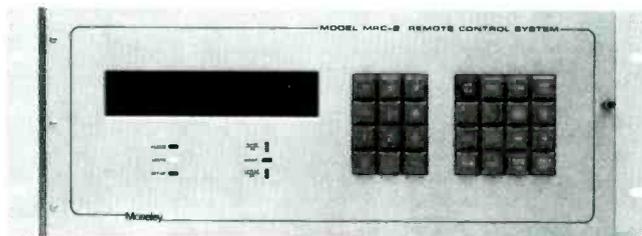
Watco Circle (1197)
8606A: TWT amplifier; 300W, 14-14.5GHz; 70dB gain, 20dB adjustment; ± 0.5 dB/24 hours; -65dBc 2nd harmonic, -40dBc 3rd harmonic.

8607-series: digital voltmeters; 4-digit, negative sign, internal decimal selection; 5Vdc or 115/220Vac; *8608-series* shunts for precision current measurements.

8604-/8605-series: racks and sub-rack products; 19" enclosures, instrument cabinets; standard, custom sizes.

Wegener Communications Circle (1136)
Series-2600: modular, agile automated SCPC transmission system; audio, data carriers on 1-, 2-way C-/Ku-band links; 7.5kHz, 15kHz audio subcarriers; 92dB dynamic range; Panda II audio processing.

BSW



Presents The Commander In Chief THE **Moseley** MRC-2 Remote Control At Its Finest

Multi-site, Multi-function

The MRC-2 controls and monitors as many as 99 remote sites, with multiple Control Terminal capability to let you delegate control from master to master as needed. Up to 255 status, 255 telemetry, and 255 command channels supervise your sites. Dual tolerance limits can be set to prevent a telemetry parameter from reaching critical levels. Choose from 6 modes in which to calibrate telemetry inputs, and set status inputs to initiate alarms or events on rising or falling waveforms, or both.

Control Options

Optional Automatic Loggers provide a printed record of system operation, and CRT terminals display your data in plain language. An optional ACU-1 Automatic Control Unit automates your operation by issuing programmable time and feedback-actuated sequences of commands without operator assistance. Add Multiple Direct Command and Multiple Status Display options for streamlined operator interface.

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Support Products

Automation equipment, program, newsroom, business

AF Associates Circle (513)
Pegasus automation: on-air commercial, program presentation.

Alamar Electronics Circle (516)
MC-1055 automation controller: remote control interface to 32 devices of mixed formats; to 6-program channel capability; 10,000-event disk storage; ESbus compatible; auto cue; accesses multiple spots on tape; optional as-aired log.

SC-2000 interface: modular approach to machine control; ESbus standard; no modification for most VTRs; program data on tape for auto cue, program confirmation.

RCMP-5 panel: links MC-1055, Auto-Cart, Copy-Cart, remote control, automation.

Auto-Cart: VTR sequencer; for 1-channel use with 3-VTR mixed-format and strip switcher; single event.

Copy-Cart: auto recording, delayed playback, 1-32 VTRs of mixed formats; optional routing interface preassigns crosspoints prior to recordings.

Schedule Manager: integrated traffic software; direct interface to automation; generates daily logs.

Circle (110) on Reply Card

Traffic Manager: interfaces existing traffic system, automation; cross-reference catalog entries for media assignment.

Allied Broadcast Equipment Circle (521)
Media Touch OPLOG: program control software for two IBM PC or compatible XTs, one AT; automation, fades, as-played verification; news wire capture; interface to station computer.

ASACA ShibaSoku Circle (553)
ACL-6000C automation: 600-videocart random access system for four or five Beta-cam, four M-II VCRs; Charles River Data Systems, Universe 6835 computer; 2,048 events per day; continuous 15s events with 4 VCRs; minimum duration 2s.

BAF Communication Circle (576)
JTW/SLB-1 computer: single board computer; adaptable to variety of VBI and sub-carrier data transmission schemes; by JTW Technologies.
Werner/Saber 386/sp: PC/AT desktop computer; 80386 μ P 32-bit system operating at 14.2MHz.

Basys Circle (580)
Newsdesk System-1: 66-device capability, multi-user automated news equipment; Xenix OS; Wyse μ C-terminals in standard equipment package, redundant 85Mbyte hard disk memory; for small, medium news department.
Archive system: on-line storage/retrieval, stand-alone or module of newsroom system; eight million stories in database; auto indexing of incoming data; supports AND, OR, NOT in search.

Broadcast Automation/BAI Circle (599)
IGM SMC-250 Carousel parts: tray and rotate motor replacement kits.
IGM EC system: automation system with Otari ARS-1000, single cart decks, remanufactured SMC-250 Carousels.

Channelmatic Circle (635)
NSS-4A: network share switcher; routes single local CATV source into four satellite-delivered CATV channels; interface for titles, computer graphics, other sequential sources; four DTMF decoders.
8-Ball: rack-mount monitor switcher; IC-design provides audio, video unity gain; vertical interval switching; stereo audio.
ADCART2+2: automated, random access commercial insertion; automatic 2-channel stereo; status on front panel or CRT.

Columbine Systems Circle (652)
News Management System: features Assignment Desk, Producer's Desk, Archive, Personal/Equipment Inventory, News Wire Management, News Scripting, Indexing, Financial Management; system packages include IBM hardware.

Comsat/Communications Circle (663)
Satellite Corp
CTVS scheduling database: satellite, earth station transmission paths and configurations; allows customers to order satellite type via Intelsat system.

Concept Productions Circle (666)
New Programming System: computer-controlled voice-tracking production system; 24-hour walkaway possible; auto logging to

floppy disk; for music on DAT or 1/4" tape; may be subsystem to present cart/reel equipment or stand-alone system.

Cycle Sat Circle (682)
Cyclecypher decoder/controller: monitors satellite transmissions for control code; upon reception, starts local VTR to record commercial spots tagged for a station.

Data Center Management Circle (687)
DCM election reporting: update, display election returns quickly, efficiently; capacity for 998 races, 20 candidates per race, 36-terminal entry, data access.
DCM newsroom: multi-user system based on DEC mini computer; 86Mbyte hard disk; accommodates 60 terminals; tape archiving; rundown lists; story preparation; electronic still store, tracking; wire monitor.

Datacount Circle (688)
DARTS software: integrated station business computer system.

Dataworld Circle (690)
GWAVE software: calculates extent of predicted AM groundwave contours; conductivities retrieved from FCC database; new propagation curves (previous curves also available); populations within contours.
Free services: Codist, Intercept, AtlasScan programs on-line to users.
FCCSCAN: program produces specialized listings of master FCC release database.

Dynatech NewStar Circle (716)
Advanced Performance software: forms generator; advanced rundown; copy flow management; multiterminal; on-air control; Betacart interface option; security system.

NEW!

Stereo Audio In A Rack-Mountable Console



THE Logitek STEREO RACK

- 11 balanced stereo sources, 2 stereo outputs
- Up to 7 assignable mic inputs
- Stereo pan control on each input channel
- Low-noise, low-distortion circuitry for excellent audio performance

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for the name of your Logitek *Instant Action Dealer*

Circle (111) on Reply Card

Archive: hard disk system; up to 50,000 scripts accessible via IBM, compatibles.

EEG Enterprises Circle (722)
VDR-1 VBI data receiver: stand-alone unit; tunes 139 VHF, UHF, standard, HFC CATV channels; produces RS-232C output of corrected data with FEC technology; operates at 5.72Mbit/s, with appropriate baud rate for service of interest.

FloriCal Systems Circle (1188)
TimeShifter: computer-driven tape delay; system includes computer, audio/video switcher, tape controllers, software, manuals; you supply video tape decks; three fast 1" machines required for short delays; 3/4" or 1" decks for longer delays.

Generic Computer Systems Circle (763)
IBMisLOG software: traffic & billing package; daily logs; sponsor, product separation; spot priority; horizontal, vertical rotation; schedule editing; traffic reports; much more; for XT or clone 2.1 or greater.

IGM Communications Circle (797)
IGM-EC: production models of the economy automation controller; control interface connects between host PC programmer and Go-Cart or other audio decks.
IGM-SC enhancements: expansion blocks, each block allows connection of an additional 16 audio sources to automation unit; improved control software; satellite interface, time announce cards.

See ad on page 139

Jefferson Pilot Data Services Circle (817)
AutoSelect-III: upgrade generation of Auto-Select music rotation software.
BuyLine Invoice: electronic transfer capability of station invoices to advertising agencies.

Lake Systems Circle (839)
LaKart ALS: automated library system; for 500, 1000, 1500 cassettes; use with 3/4", Beta/SP, M/M-II, 19mm cassette formats or type C; mixed format playback of short commercials to long programs; 6-deck system allows 10s continuous throughput.

See ad on page 11

Merlin Engineering Circle (883)
ME-438 Barkeeper: software management, ID, control for Betacart; function by color display aids label making; playlist check searches for missing cassettes in library.
Q-driver: links Barkeeper, Betacart, traffic, automation computer; filters log to control Betacart or compatible equipment.
ME-388: computer systems; IBM PC compatible; rack-mounted.
ME-988/-998: airborne data acquisition PCM/video multiplex system; -988 encoder, -998 decoder; modification to VCR not required.

MPO Videotronics Circle (904)
M-POP 1300: integrated video point-of-purchase system; 13" playback only model inserts messages when VCR is not running; memory for four attention messages.
718-MM: video presentation system; 7"

monitor with 8mm deck in 14.8-lb package; ac, dc operation.
VHS-784LW: portable business video presentation system; 7" color monitor; 4-head VHS deck; single frame advance, visual search, 3-speed VCR; ac/dc; 19.8 lbs.
VHS-1010: integrated video system with 10" monitor, VHS player.

Norpak Circle (925)
TTX-6A receiver: teletext decoder for priority E-mail, computer data distribution; input is NTSC video with encoded NABTS data; Centronics parallel printer interface; RS-232C port; video out for RGB analog, composite monitors; includes NAPLPS graphics.
TTX-6 data receiver: decodes VBI 2400-baud data; various printers.

Odetics Circle (931)
The Cart Machine: M-II version of computer-controlled cassette playback/record automation system for broadcast; management system software handles 280-cassette library; 4 or 6 deck system includes IBM-AT and robotic manipulator.

See ad on page 61

Panasonic Broadcast Systems Circle (944)
M.A.R.C.I/II: M-II cassette automation systems; robot unit picks M-II cassette from current and expansion libraries; -I for news production, -II for commercial and program application from 4s to 90min +; multiple AU-650 studio VCRs; barcode cassette IDs; IBM PC/compatible controller; data-

NOISE REDUCTION FOR UNDER \$10.

MIXING CONSOLES
SWITCHES
MICROPHONE CONNECTORS
SNAKE CABLES
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ALL PLUGS & JACKS (XLR, PHONE, DIN, MIDI, ETC.)
PATCHBAYS
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Even the finest equipment in the world cannot guarantee noise-free operation. One "dirty" connection anywhere in the electrical path can cause unwanted noise or signal loss.

"MORE THAN A CONTACT CLEANER"

CRAMOLIN® is a fast-acting, anti-oxidizing lubricant that cleans and preserves all metal surfaces, including gold.

When applied to metal contacts and connectors, **CRAMOLIN®** removes resistive oxides as it forms a protective molecular layer that adheres to the metal surfaces and maintains maximum electrical conductivity.

CRAMOLIN® - USED BY THOSE WHO DEMAND THE BEST:

Bell & Howell	Hewlett Packard	MCI(Sony)	Nakamichi
Boeing	John Fluke Mfg.	Motorola	RCA
Capitol Records	McIntosh Labs	NASA	Switchcraft

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Circle (112) on Reply Card

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SPECTRUM RPU LINKS



SCT500 RPU Transmitter

TX FEATURES

- VHF & UHF Units
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- Built-in AC Supply
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- FCC Type Accepted. Parts 74, 90

The Spectrum SCR500 & SCT500 are a series of high performance broadcast quality RPU Receivers and Transmitters. They incorporate the latest advances in solid state technology—brought about by Spectrum's more than a decade of experience in the two way radio field. These rugged units use the highest quality components & construction for high reliability in either fixed or mobile applications.

RX FEATURES

- VHF & UHF Units
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- High Rejection of IMs & strong local signals
- 4 IF Bandwidths Available
- Very Low Distortion
- Full Panel Metering
- Built-in AC Supply
- Many Advanced Features



SCR500M RPU Receiver

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Circle (113) on Reply Card

base management; RS-422 bus; automatic program delay mechanism.

See ad on page 91, 93, 95

Pegasus Systems Circle (948)
Pegasus automation: computer-controlled on-air presentation system; for commercials, programs; interface to traffic computers, master control switching, routing, VTRs, VCRs.

Pinzone Communications Circle (957)
Timeslot Personal Scheduler: computer software by Microtek Computer Consultants; generates weekly, daily schedules; for MS-DOS, PC-DOS, Xenix OS.

RAM Broadcast Circle (976)
Monroe remote control: tone signalling equipment for automation, commercial insertion, CATV applications.

Register Data Systems Circle (982)
DataScan: sales software; includes demographics; includes cost per point and cost per thousand calculations.
MusicMaster software: music library program; 168 clock locations; 99 daypart clocks; 14 user defined music categories; 8 user defined music style specifiers; 8 values per style per selection.

Sony Broadcast Products Circle (1023)
Library Management System: automation system prototype for Betacam SP; 1,200 cassette library; external computer for library management, traffic control; 4-deck.
See ad on page 24-25, 98-99

Systemation Circle (1055)
8mm random access: digital audio cassette automation system; play any of 150 songs from one cassette with X-7D control computer and interfaced desks.
SuperTrack: satellite automation system; links satellite audio source and three tape decks with SuperSwitch controller.
PC Playlist: playlist rotation software.
SalesForce: sales management software.

3M Broadcast/Related Products Circle (1085)
ESbus machine control: for broadcast, production, duplication facilities; based on SMPTE/EBU serial communication standard.

Townsend Associates Circle (1095)
DC-80 EP: economy commercial insertion system; automatic video signal processing.
See ad on page 200

Video Associates Labs Circle (1124)
Streamline music scoring: software by Off-beat Systems; for PC and compatibles; synchronizes music with film, video.

Videomedia Circle (1128)
Q-Star IIA: automated playback system for broadcast, CATV; distributed intelligence control unit; VSIO computer interlinks control unit with 10x1 switcher and four VTRs for basic system; expandable to 16 additional VTRs.

Cable, connectors, fiber optics, wire

ADC Telecommunications Circle (507)
I.C.O.N.: integrated cable organization network; terminations and cross-connections audio cabling; QCP insulation displacement.

Artel Communication Circle (551)
T3065 laser: adjunct to SL3000 broadcast system; low-power laser transmission of RS-250B video/audio signals on single mode fiber to 25km; 1,300nm laser source.
2016/2017: desktop modems for HDTV opto-fiber transmission to 1,000 ft.
WDM-3001 system: Wavelength Division Multiplex; transmits multiple independent signals on single fiber; wavelength separation extends system capacity.
Series-3100 cards: high-fidelity audio response, $\pm 0.1\text{dB}$ 20Hz-20kHz, 70dB SNR, >1% THD.

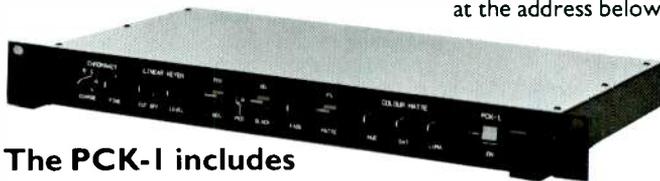
Belden Wire & Cable Circle (585)
Type-8241 coax: RG59 material, available in seven colors.
Type-1163A coax: more flexible version of Type-8281 video cable; available in seven colors.
Conformable cable: 50 Ω and 75 Ω coaxial cable; replacement for semirigid coax.



Unique chromakey and linear downstream key

The new PCK-1 is a chromakey and separate linear DSK. Each section can be used independently, but by combining the two sections it is possible to achieve a visual performance that is altogether more pleasing than conventional chromakey. And when you consider the price, it simply defies comparison.

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The PCK-1 includes 7 major features:

- Any colour backing
- Programme fade to black
- Key reversal
- Preview Output
- Foreground fade
- Totally variable colour matte
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POLARVIDEO
Polar Video 2-5 Powis Mews London W11 1JN



Circle (114) on Reply Card

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Circle (115) on Reply Card

Cam-Lok Circle (617)
Series-2001: field-attachable connectors; 4- to 61-pole, 18gA to 4/0gA cable; rated greater than 200A, 600V continuous; for power and control.
Ground neutral interlock: electrical safety design; 600V, 400A.

Cambridge Products Circle (618)
CPI-series: twist-on BNC connectors for RG-58/U cable with teflon; *UG88-11*, male plug; *UG89-11*, female jack; *-RA-11*, male right angle plug.
CPTX-1 series: plugs, jacks for twinax cable.
Coaxial balun: interface connector converts from coax to twisted pair wiring.

Canare Cable Circle (620)
Type-4S: quad/4-conductor unshielded, twisted double pair speaker cables; 14-, 16-, 20-AWG conductors; PVC jacket, cotton filler, paper separator tape.
MR-202-AT mic cable: multichannel, 2-conductor audio material; 2-, 4-, 8-, 12-, 16- and 24- types; Al-foil shield, drain wire, individual channel jacketing.
F-10 series: cable-mount plugs; includes RCA, ¼" phone, miniature and 3-circuit ¼" phone types.
VAC-FB patch cables: Kings BNC plugs, Canare LV-61S 75Ω cable; 3-, 25-foot lengths; black, blue, red, green colors; custom colors, lengths.

[See ad on page 183](#)

Chester Cable Circle (636)
6BR cable: component analog video signals; three coaxial cables in common jacket; connector compatible with Kings KP-9212-090-100, 9221-090-100 series; reduced diameter.

Control Concepts Circle (670)
ISLATRON filters: expanded line of active tracking filters for power protection; transient rise times of 2.5kV/μs reduced to less than 5V/μs; 5kVp-p transient attenuated to less than 10Vp-p.

Current Technology Circle (681)
Power Siftor: power conditioning systems; balanced system of electronic filtering, bidirectional spike suppression; four series handle differing load requirements.

Dialight/Neutrik Circle (702)
NC3F-X series: cable connectors; screwless, assemble body parts without tools; XLR; improved locking system.
NC3FX-HD: waterproof XLR connector design.
NTE-series: miniature audio transformers; red 1:1, yellow 1:4, orange 1:3/1:10 ratios; bandwidths 30Hz-40kHz or greater; for microphone level work.
GNS-18 sets: black gooseneck mic holder; 7", 14", 20"; female XLR with locking ring; ⅝" thread.

[See ad on page 129](#)

Gentner Engineering Circle (764)
EasyTerm/FB: wiring termination panel, rack-mounted; swings open for easy access; equivalent of 3.2 punch blocks in two rack-units; 160 terminals, 4 connections per terminal.
EasyTerm/PU: wiring terminal with 3x50 connections on telco type-66 punch block.

[See ad on page 56, 196](#)

Kings Electronics Circle (832)
Video connectors: analog video component connectors, per SMPTE proposed interconnection standard.

LEMO USA Circle (853)
Audio connectors: 2-, 3-circuit; quick-connect/disconnect devices; self-latching; handles to 50Vdc, 3a; ⅜" and smaller diameters.

McDonnell Douglas Astronautics Circle (879)
VF-series: video, audio, data fiber-optic transmission equipment, meets RS-232; multi-/single-mode.
16x16 switch: non-blocking fiber-optic switch.
Airlink: atmospheric light-based communications.

Selco Circle (1006)
Fuseholders: high, low profile types.
Fiber optic: components.
Meter Modification Center: custom meter faces for analog meters per drawing or sketch of face currently used.
Thermostats: miniature thermal sensors; SPST make-break contacts.

Switchcraft Circle (1049)
Z15P/Z15J: high-power speaker jack and plug; 15A continuous operation.
IBS push-buttons: miniature single, multiple switch configurations; horizontal, vertical orientations; various terminal lengths.
QG-connector: train relief.
Black shell: connectors, gold contacts.

[See ad on page 149](#)

Trim Circle (1098)
Coaxial jacks: miniconnectors for DSX 3/4 application.
TPS-series: minicoaxial plugs and jacks.

Veam Div/Litton Systems Circle (1118)
Expanded beam connector: eliminates potting and polishing of fiber-optical splice; collimates beam for assembly with only a cleaved fiber end.
Single fiber splice: environmentally sealed multimode or single mode detachable splice; cleave and butt method without epoxy; buffer collet and Kelvar assembly provide strain relief.
Multifiber optical splice: joins multifiber, jacketed cable; loss <0.5dB; strain relief for each fiber.
Backshells: Mil-C 28876 spec fiber-optic connector backshells.

Whirlwind Circle (1139)
CX-series: microphone cable; PVC jacket with conductive plastic shielded cabling; lower capacitance; eleven color choices; stock lengths 5, 10, 25, 50, 75, 100 ft.

Cases, racks, equipment carts, studio furnishings, machinery

Aarmor Cases Circle (501)
RackPod: rack-mount equipment case;

molded polyethylene; O-ring seals against air, vapor, water; lighter than standard ATA cases; exceeds MIL specs.

Alpha Audio Circle (523)
Sonex-I: acoustic materials made from melamine.

[See ad on page 203](#)

AMCO Engineering Circle (528)
Vertical console enhancements: optional expanded color selections, glass doors available for the rack/conssoles.
BDS-5 blower: panel-mount air circulator; variable speed, provides to 33% greater airflow than previous units.

Andiamo Circle (538)
Aerospace transport cases: 1-piece, solid injected-molded shell, molded-in handles, hinges; no valance or metal frame; water-, air-, vapor-tight, air pressure relief valve; security padlock.

Anvil Cases Circle (543)
Equipment cases: expanded line of EIA rack-mount and Anvil Design series, ATA-approved and MACC case products.

Arben Design Circle (546)
Graphics carts: storage cabinet on wheels for studio set dressing materials; includes rear projection/chroma-key screen, Helvetica Bold Leterset, color paper, matte board, art supplies, LEBENSET paints.
Stage turntable: electric drive, variable speed, reversible, for loads to 300 lbs; rotates 0-9rpm; in neutral, white, high-gloss black formica.

Arrakis Systems Circle (549)
Modulux II: studio furniture products.

[See ad on page 21](#)

Audltronics Circle (569)
Express Group: Series 1000, 3000, 4000 studio furniture systems; ¼-turn fasteners for access panels; leveling feet; installed rack rails, integral wire pass; hardwood structural members; plastic laminate surfaces, solid-oak trim.

Calzone Case Circle (616)
Ultima series: cases for video, cinematographic and lighting equipment.
Improved: outer laminates on all cases.

Hardigg Industries Circle (780)
Containers: 19" rack-mount; double-end opening rack-mount.
Skid-Mate-Plus: cushioning for palletized loads.

Hoffend & Sons Circle (789)
Light Lifter: motorized lifter for individual lighting fixtures; locks to grid; use with trolley beams for horizontal movement.

K&H Products/Portabrace Circle (822)
Model TM: cordura-padded, nylon tripod cases; pockets for accessories.
BP-2: belt-pack with slip-on accessory cases.
SC-series: shoulder cases for professional camcorder units.
MO-5863: Leader LVM-5863A video waveform monitor/vectorscope package.

Kangaroo Video Products Circle (825)
KVP-6400: case for Panasonic AG-6400.

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KAC-500: case for Panasonic AG-500 monitor.
KAC-8020: case for Sony PVM-8020 monitor.
KRP-KK Kangaroo Klips: detachable cable organizers.

Merlin Engineering Circle (883)
Zootcase: soft-box travel case; sandwich of foam and metal sheet flex within tough nylon skin.

Morton Hi-Tek Furnishing Circle (900)
Cabinet: boardroom VTR/monitor unit; all oak finish.

Nalpak Video Sales Circle (914)
Dry-Pak: equipment transportation container; plastic construction; O-ring for airtight, watertight seal; 3-piece foam set keeps equipment in place.
Tri-Pak cases: 9"x36", 11"x44".
Roto-Kase: rotationally molded cases.
TK-500: video-to-go production cart.
Vertex: test charts.
Rack-n-Go: molded instrumentation cases; shock-mount design.

Peerless Sales Circle (947)
Jumbo Junior 1542-000: A-V equipment cart; tapered toward top for improved anti-tipping safety with load; 8" pneumatic wheels.

Radio Systems Circle (975)
Custom cabinetry: various styles; tables, equipment racks, cart/CD storage units; turntable pedestals; reel-to-reel deck cabinets, overbridges.

Rosco Laboratories Circle (993)
1500 smoke machine: remote-controllable smoke generator; output from small puff to room-filling clouds; programmable sequencer for preset smoke intervals; non-toxic smoke fluid.
Video Paints: formulated for chroma-key and Ultimatte.

RPG Diffusor Systems Circle (996)
DIFFUSOR: broad bandwidth, wide-angle sound diffusor material.
ABFFUSOR: broad bandwidth absorbing material with NRC = 1.
TRIFUSSOR: triangular, variable acoustics module; sides contain diffusive, absorptive, reflective materials; allows quick adjustment of acoustic environment for a particular project.
LDF prototype: low frequency diffusor material.

Stantron Unit/Zero Circle (1036)
VTR monitor: bridge consoles.
VC-1800 series: security consoles; sloping front console and wedge sections.
VSSF-series: 3", 5", 7" spacers add space between cabinets to allow mounting 1" VTRs side-by-side, cable storage between racks.
VC-series: fabric covered chairs; available in various colors; with/without arms, castor-base, tubular base.
VCVIP enclosures: standard 19" widths, smaller dimension cabinets for portable, tabletop, stacked, tilted, racked units.

See ad on page 124

Star Case Circle (1037)
Series F-5: equipment flight cases; removable fronts, tops for easy loading; meets airline spec.

Status Cabinetry Circle (1038)
Custom furnishings: interior design services for duplication facilities, control room consoles, equipment enclosures.

Telepak San Diego Circle (1066)
T-80: transport-protection soft bags for video products; fits EVM-8010; BVM-8021; PVM-8020; heavy-duty nylon fabric.

Theatre Vision/TVI Circle (1080)
Unican: portable stages, easy-riser systems, platforms.
Unican: raised exhibition, computer flooring products.
Vario-King: portable 4x8-foot stage; adjustable heights without changing legs; by North American Stage Manufacturing, Canada.

Thermodyne International Circle (1081)
MINI-RACK: instant-access, shock-mount cases; decreased height, weight from standard RACK-PACK units; 19" width, 20" depth; various height sizes.

See ad on page 122

UniSet Circle (1104)
DBS cabinet: caster-mounted cabinet; holds 25" video monitor; storage for tape; shelf for 3/4" VCR; integral ventilation, ac plug strip; locking doors.
Improved set modules: 3-foot height for small studio settings.
News-set: U-shaped units with 30" tables; front insert panels; chromakey windows; upholstered keystone blocks, slanted tablet panels.

Wheellit Circle (1138)
Model-6000: video transporter, cart for 25" diagonal video monitor and VCR.

Winsted Circle (1141)
H8597-L: editing console for Sony BVE-900.
G8753: mini editing cart.
Storage: system for 1/2" Betacam cassette tape.

See ad on page 204

Recording tape, degaussers, conditioners, tape loaders, winders

Agfa-Gevaert Circle (514)
PEM-469 mastering tape: 5"/7" reel, 1/4" audio formula; high-output, low-noise; available in 1/2", 1" and 2" widths.
PE-649/949 bulk tape: for audio cassettes; high-output, low-noise, premium ferric oxide with IEC Bias I; binder with lubricants.
King Instrument 2500: in-cassette VHS videotape loader; capacity for 100 T-120 cassettes/hour; dual supply reel changer.
PEV-192: bulk HGX VHS hi-fi pancake videotape for loaders, duplication; improved luminance and chrominance SNR.

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Slide File grants you instant access of up to 400 digitally stored stills and the ability to grab a frame from any live video source. Images are stored on Winchester-disk to CCIR 601 standard.

The Rank Cintel Slide File/Art File can also be used in conjunction with Logica's Galley 2000 system, giving you a storage capacity of up to half a million frames.

Graphics

The addition of comprehensive software and a graphics tablet brings to Slide File the capabilities of a full graphics workstation.

Art File

This graphics-enhanced system allows the artist/operator to paint and draw on existing stills, to manipulate the whole, or part of the picture, to compose using cut-and-paste techniques . . . or even to create entire pictures on a blank screen. So now you can rapidly compose or retouch in seconds before going On Air. Rank Cintel's Art File/Slide File provides On Air Graphics Instantly.



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Rank Precision Industries Inc. 411 East Jarvis Avenue, Des Plaines, Chicago, Illinois 60018, U.S.A. Tel: 312-297 7720 Telex: 646998 Fax: 312-6990581



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California 91605, U.S.A.
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Ampex MTD Circle (534)
19mm D1S tape: videocassettes for 601/4:2:2 and 4xFSC digital applications; 4:2:2 tape, 850 Oe gamma ferric oxide; 4xFSC, metal particle.
Shipper/hanger: for 1/2" cassettes; injection molded, with dust seal; vertical stabilizers; easy stacking.
Ampex-198: 30-minute length 1/2" cassettes; formulation uses high-energy, cobalt-doped gamma ferric oxide.
Ampex-298: Betacam-SP; 1,500 Oe metal particle; 30-/90-minute lengths.

See ad on page 50-51

Audico Circle (560)
Takeup modules: interchangeable for cassette loader/reloader systems for 8mm, M-II, Betacam and 19mm.
Model 609: rewinder, cyler, counter for U-matic, VHS and Beta.

Bradley Broadcast Sales Circle (596)
Intraclean S-711: cleaner solution for tape heads, capstan/pinch rollers; halogenated hydrocarbon formulation; no alcohol to dry out pinch roller.

Capitol Magnetic Products Circle (622)
Bulk pack: audio cassette tape.

Eastman Kodak Circle (717)
Pro Format II: videotape cassettes for Betacam, M cameras/recorders.

Elcon Circle (274)
EA1200: tape cleaner, profiler system; for 1" B, C magnetic media; optional optical inspection on all units.

Fidelipac Circle (746)
Dynamax Cobalt: cartridge tape; cobalt-doped formulation; phase, bias compatible with Master Cart II; optimize for high-output; may require reduced high frequency EQ to restore flat response and improve SNR.

Fife-Pearce Electronic Circle (747)
2PT5FP eraser: automatic video tape bulk degausser; for continuous duty; 40FPM belt through active area; sound alert feature; by Electro-Matic Products.

Fuji Photo Film USA Circle (756)
H521E/H521EBR: 3/4" videocassettes for professional/broadcast; improved SNR over H521 formula; 640 Oe intrinsic coercivity; 3-hour still play.
S-VHS tape: super-fine grain, optimized coercivity tape with 80% higher magnetic energy than Super XG tape.

International Tapetronics/3M Circle (811)
DCM-1: dynamic cartridge monitor; identifies failure-prone carts before they fail on-air; tone on unused portion of tape senses minute changes in tape speed.

Leader Brac Industries Circle (844)
Leader-Brac accessory: stores leader tape at the ATR; keeps tape static and dust free; cutting blade adjustable to four cutting angles with push-button operation; hands never contact the leader tape.

Maxell of America Circle (876)
R-120DM tape: DAT format audio cassettes;

metal partical tape for higher output, high C/N, low dropouts.
SuperVHS: permits resolution to 400TVL; improved magnetic oxide material.
TF20-5000/-2134: pancake tape for in-cassette or sprinter duplication applications.
Album boxes: for BQ, HG tapes, beige container with colored labels; colors represent the format; red, KCA/KCS BQ series; blue, KCA/HG series; gold, VHS/Beta HQ tape.

See ad on page 81

Quantum Audio Labs Circle (970)
Weircliffe 1524 degausser: 70-75dB erasure level to 850oe; belt speed 37 ft/min; for U, Beta, VHS, D-1-10, D-1-30 video cassettes; by Amos of Exeter (UK).
Weircliffe 29: video cassette eraser, for tape exceeding 450 Oe coercivity; 85dB erase level, 5s per pass; for all video cassettes; by Amos of Exeter (UK).

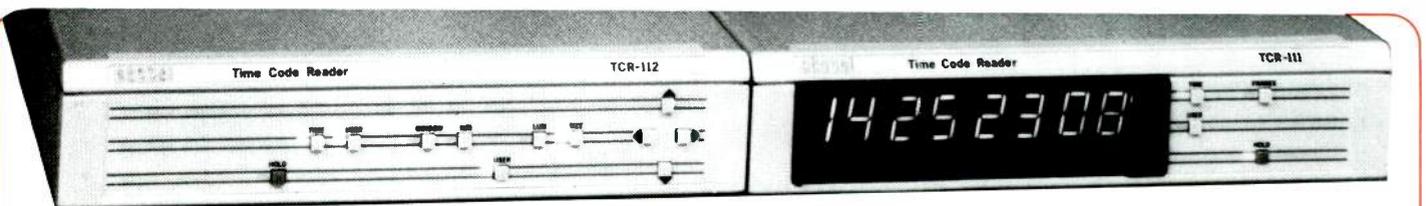
RAKS Circle (1173)
Professional: 5-30 minute Betacam, 8mm tape cassettes.

Sony Tape Products Circle (1024)
BRS/XBR cassettes: U-matic tape; Vivax formulation; FCL flexible crosslinked binder; Carbon Mirror backing; anti-static shell; improved luminance/chrominance SNR, reduced dropout.

See ad on page 73, 145

Storeel Circle (1041)
RS-storage: RS-II, for M-II format cassettes; RS-VHS, for either M-II or VHS; RS-CD, high

Continued on page 194



Two new Time Code Readers from skotel

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All new... from front panels to advanced reader and error checking electronic circuits. Enhanced full reader features and performance... read from 1/40 up to 80X play speed... small, smart packaging designed for desk or rack mount (1/2 rack width).

For all those who told us... "All I want is an LTC reader with a video display for window dubs." **It's the TCR-112 at \$1350.** (F.O.B. Destination)

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For those who say... "I only need an LED display." **It's the TCR-111 at \$1100.** (F.O.B. Destination)

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- Reshaped code output (also TCR-112).
- Dual standard SMPTE/EBU (also TCR-112).

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Circle (120) on Reply Card



TRUTH...

OR
CONSEQUENCES.

If you haven't heard JBL's new generation of Studio Monitors, you haven't heard the "truth" about your sound.

TRUTH: A lot of monitors "color" their sound. They don't deliver truly flat response. Their technology is full of compromises. Their components are from a variety of sources, and not designed to precisely integrate with each other.

CONSEQUENCES: Bad mixes. Re-mixes. Having to "trash" an entire session. Or worst of all, no mixes because clients simply don't come back.

TRUTH: JBL eliminates these consequences by achieving a new "truth" in sound: JBL's remarkable new 4400 Series. The design, size, and materials have been specifically tailored to each monitor's function. For example, the 2-way 4406 6" Monitor is ideally designed for console or close-in listening. While the 2-way 8" 4408 is ideal for broadcast applications. The 3-way 10" 4410 Monitor captures maximum spatial detail at greater listening distances. And the 3-way 12" 4412 Monitor is mounted with a tight-cluster arrangement for close-in monitoring.

CONSEQUENCES: "Universal" monitors, those not specifically designed for a precise application or environment, invariably compromise technology, with inferior sound the result.

TRUTH: JBL's 4400 Series Studio Monitors achieve a new "truth" in sound with

an extended high frequency response that remains effortlessly smooth through the critical 3,000 to 20,000 Hz range.

And even extends beyond audibility to 27 kHz, reducing phase shift within the audible band for a more open and natural sound. The 4400 Series' incomparable high end clarity is the result of JBL's use of pure titanium for its unique ribbed-dome tweeter and diamond surround, capable of withstanding forces surpassing a phenomenal 1000 G's.

CONSEQUENCES: When pushed hard, most tweeters simply fail. Transient detail blurs, and the material itself deforms and breaks down. Other materials can't take the stress, and crack under pressure.

TRUTH: The Frequency Dividing Network in each 4400 Series monitor allows optimum transitions between drivers in both amplitude and phase. The precisely calibrated reference controls let you adjust for personal preferences, room variations, and specific equalization.

CONSEQUENCES: When the interaction between drivers is not carefully orchestrated, the results can be edgy, indistinctive, or simply "false" sound.

TRUTH: All 4400 Studio Monitors feature JBL's exclusive Symmetrical Field Geometry magnetic structure, which dramatically reduces second harmonic

distortion, and is key in producing the 4400's deep, powerful, clean bass.

CONSEQUENCES: Conventional magnetic structures utilize non-symmetrical magnetic fields, which add significantly to distortion due to a nonlinear pull on the voice coil.

TRUTH: 4400 Series monitors also feature special low diffraction grill frame designs, which reduce time delay distortion. Extra-large voice coils and ultra-rigid cast frames result in both mechanical and thermal stability under heavy professional use.

CONSEQUENCES: For reasons of economics, monitors will often use stamped rather than cast frames, resulting in both mechanical distortion and power compression.

TRUTH: The JBL 4400 Studio Monitor Series captures the full dynamic range, extended high frequency, and precise character of your sound as no other monitors in the business. Experience the 4400 Series Studio Monitors at your JBL dealer's today.

CONSEQUENCES: You'll never know the "truth" until you do.



JBL Professional
8500 Balboa Boulevard
Northridge, CA 91329

Circle (121) on Reply Card

Inside monitor loudspeakers

By Brad Dick, radio technical editor

Today's listener won't tolerate poor audio quality. Be sure you can hear the difference.

Most engineers would cringe at the thought that the audience might have better monitoring facilities than their stations. To put it another way, it's not uncommon for today's quality-minded listeners and viewers to spend considerably more money on their home entertainment systems than radio and TV stations do on studio monitoring systems.

Stations often go to great lengths to purchase high-quality audio consoles, turntables, CD players and cart machines. But, sometimes, when it comes to installing equally good monitor systems,

they drop the ball.

The final quality-control check—the monitor system—is sometimes selected on the basis of brand loyalty or minimum cost. Even if a relatively high-performance speaker system is selected, the critically related elements of power amplifiers and mounting location may not be given proper consideration.

Objective considerations

Today's audio requirements place more demands on monitoring equipment than ever before. The music often relies on sound sources that didn't exist a few years ago. Computer-generated sounds, wideband and digitally mastered audio require up-to-date and high-performance monitoring equipment. The most obvious new audio source for the broadcaster is the compact disc (CD). For some stations, the advent of the CD marked the first time they were able to originate high-quality audio. Stations must not only be able to *originate* high-quality audio, but also be able to *hear* it.

One of the problems with selecting a high-quality monitor system lies in the difficulty in defining quality. If you ask the typical DJ what is expected from a speaker system, the first response may be "volume." To many people, loudness means quality.

Other not-too-scientific descriptions may develop from discussions, even with

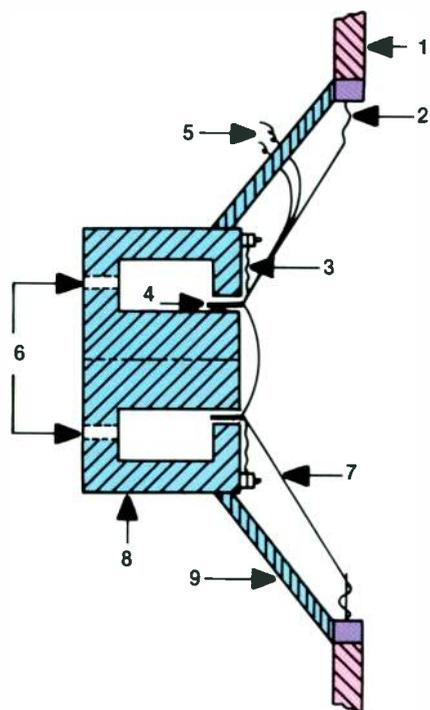
knowledgeable authorities. Terms such as "solid bass," "smooth highs," "tight" or "clean" all may be mentioned as monitor system requirements. Trying to incorporate these subjective requirements into a working system is almost impossible. No sane engineer would attempt it.

On the other hand, selecting a speaker on the basis of frequency response and harmonic distortion is likewise inappropriate. It is difficult to equate either scientific measurements or subjective considerations with how "good" or "bad" a particular speaker system sounds.

Back to basics

For this discussion, the term *speaker* will refer to a single transducer. *Monitor* or *monitor system* will refer to an assembly of speaker(s), enclosures and, where appropriate, crossovers and amplifiers. In fact, it might be best to consider a monitor system as having at least three major components: source driver (amplifier), transducer (speaker) and mounting assembly (cabinet).

Speakers, unlike electrons within a tube, don't operate in a vacuum and provide that important link between electronics and acoustics. Speakers cannot produce acoustic energy without being driven by an electronic source; they require enclosures to properly couple the acoustic energy into the listening environment in a controlled manner. Even



1. INFINITELY LARGE BAFFLE
2. FLEXIBLE EDGE SUSPENSION
3. FLEXIBLE CENTER SUSPENSION (SPIDER)
4. VOICE COIL
5. ELECTRICAL CONNECTIONS
6. HOLES FOR AIR RELEASE
7. CONE (DIAPHRAGM)
8. PERMANENT MAGNET
9. OPEN WEB SUPPORTING STRUCTURE

Figure 1. Cutaway drawing of a direct-radiator speaker.



Note how these monitors are mounted away from the walls and ceiling, to avoid reflections that can affect the frequency response.



a leading manufacturer of audio and video switching, master control, automation, machine control, and distribution equipment, headquartered in Salt Lake City, Utah, proudly announces the acquisition of the products and operations of

VTA Technologies, Inc. . . .

creators of the famous daVinci™ Color Corrector and other advanced products for the teleproduction industry.

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Utah Scientific Advanced Development Center, Inc. . . .

and are relocating it from 2040 Sherman Street, Hollywood, Florida, to:

5440 N.W. 33rd Avenue, Suite 108
Fort Lauderdale, Florida 33309

where it will continue to operate under the able management of Michael L. Orsburn, Vice President & General Manager of the Advanced Development Center; and Robert L. Hemskey, Operations Manager.



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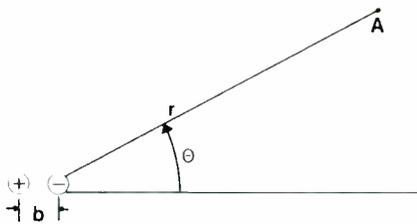


Figure 2. Speakers are both directional and frequency-sensitive. Obtaining the maximum performance requires carefully designed enclosures.

the most expensive speaker, if set on a shelf without an appropriate enclosure, will perform poorly.

A speaker is really an electromagnetic transducer, which converts electrical energy into acoustic energy (sounds). There are two principle types of speakers. The first uses a vibrating surface, called the *diaphragm*, to couple the sound directly into the air. The *direct radiator* type is used in most broadcast applications. The second type of speaker uses a horn attached near the diaphragm to couple the sound into the air. The horn type often is used in larger monitor systems and sound systems that need high volume levels or that cover large areas. Horns also are used with high-frequency speakers. This discussion will be limited to diaphragm or direct-radiator speakers.

The principle advantages of the direct-radiator speaker are threefold: small size, low cost and satisfactory performance over a comparatively wide frequency range. The disadvantages include: low efficiency, narrow directivity pattern at high frequencies and irregular response curves at high frequencies.

Construction

The cross-section of a typical direct-radiator speaker is shown in Figure 1. The diaphragm or cone is generally composed of paper or other stiff material. The cone is supported at the outer edge by the *suspension* and near the voice coil by material called the *spider*. These permit the cone to move only in an axial direction.

In the simplest of analogies, the speaker is a motor whose motion is directed in a straight line forward and backward. The cone's motion is dependent upon the current flow through the coil, the length of the conductor in the magnetic field and the strength of the speaker's magnetic field.

Most manufacturers honor the convention that application of a positive voltage to the positive speaker terminal produces a forward movement of the cone. If an ac current is applied, the cone will then move forward and backward at the same rate as the current changes. In the case of a simple sine wave, the applied cur-

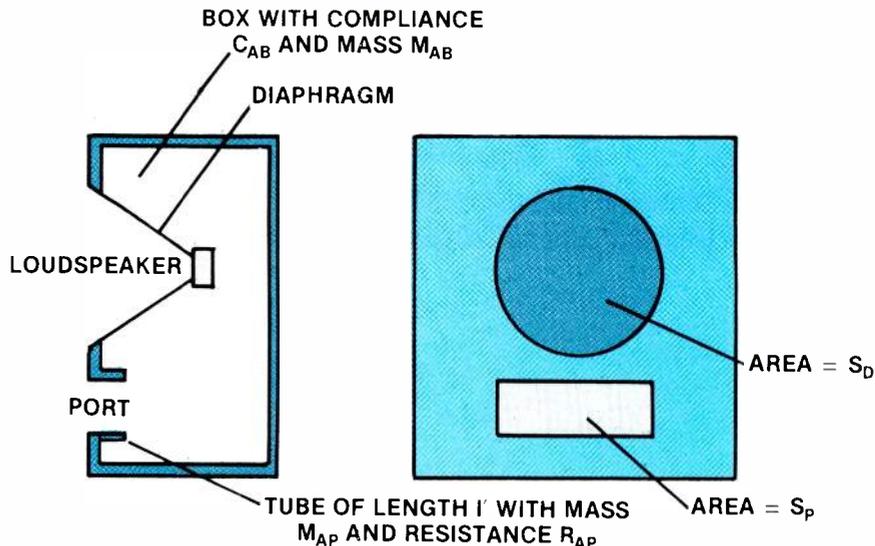


Figure 3. The simplest form of ported or reflex enclosure uses a hole to create a second diaphragm for increased efficiency and extended low-frequency performance.

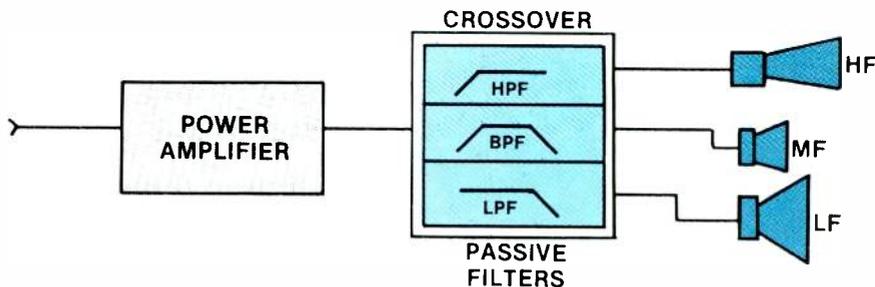


Figure 4. Block diagram of a passive, high-level crossover, sometimes called a 3-way system.

rent will reverse direction from positive to negative or vice versa, and pass through zero volts during the transition. Therefore, in one sine wave, the current applied to the speaker will reach one positive peak, one negative peak and three zero points. The speaker cone follows the current by moving forward and backward and returning to the center (rest) point three times.

Speakers contain springs in the form of the flexible edge suspensions surrounding the outer edge of the cone and the spider around the diaphragm. These springs resist the force of the speaker's motor (the coil and magnet) and return the cone to center rest position after it is driven forward or backward by an electrical signal. This is called *restoring force*.

Speaker oscillation

A speaker also is capable of storing energy. This takes place when the speaker cone is displaced from rest. When the drive signal is removed, the cone tries to return to its natural resting state because of the springs. However, the springs have a limited ability to accelerate the cone's mass. This means that after the cone is extended, it slowly starts to return to the resting point. However, as the

cone begins to move, the cone's velocity increases. The inertia that develops forces the cone to traverse past the resting point, and the cone is again displaced from the center resting point. The stored energy (springs) again attempts to return the cone to the center resting point.

In a world without mechanical or electrical resistance, this oscillation would continue indefinitely. However, the laws of physics apply, and after a period of time, the cone comes to rest. From an acoustical standpoint, this oscillation or ringing must be limited or *damped*. Otherwise, the ringing becomes a source of distortion.

One way to dampen the cone motion is to apply a counter EMF (electromagnetic force) to the speaker voice coil by shorting the voice coil terminals. Shorting the speaker voice coil causes the coil to generate a counterforce. This force opposes the cone movement and is produced by the motion of the coil through the magnetic field. This braking effect is called *back EMF*.

Amplifier damping

Proper control of a speaker's movement requires current to put the cone in motion. As already noted, once the cone



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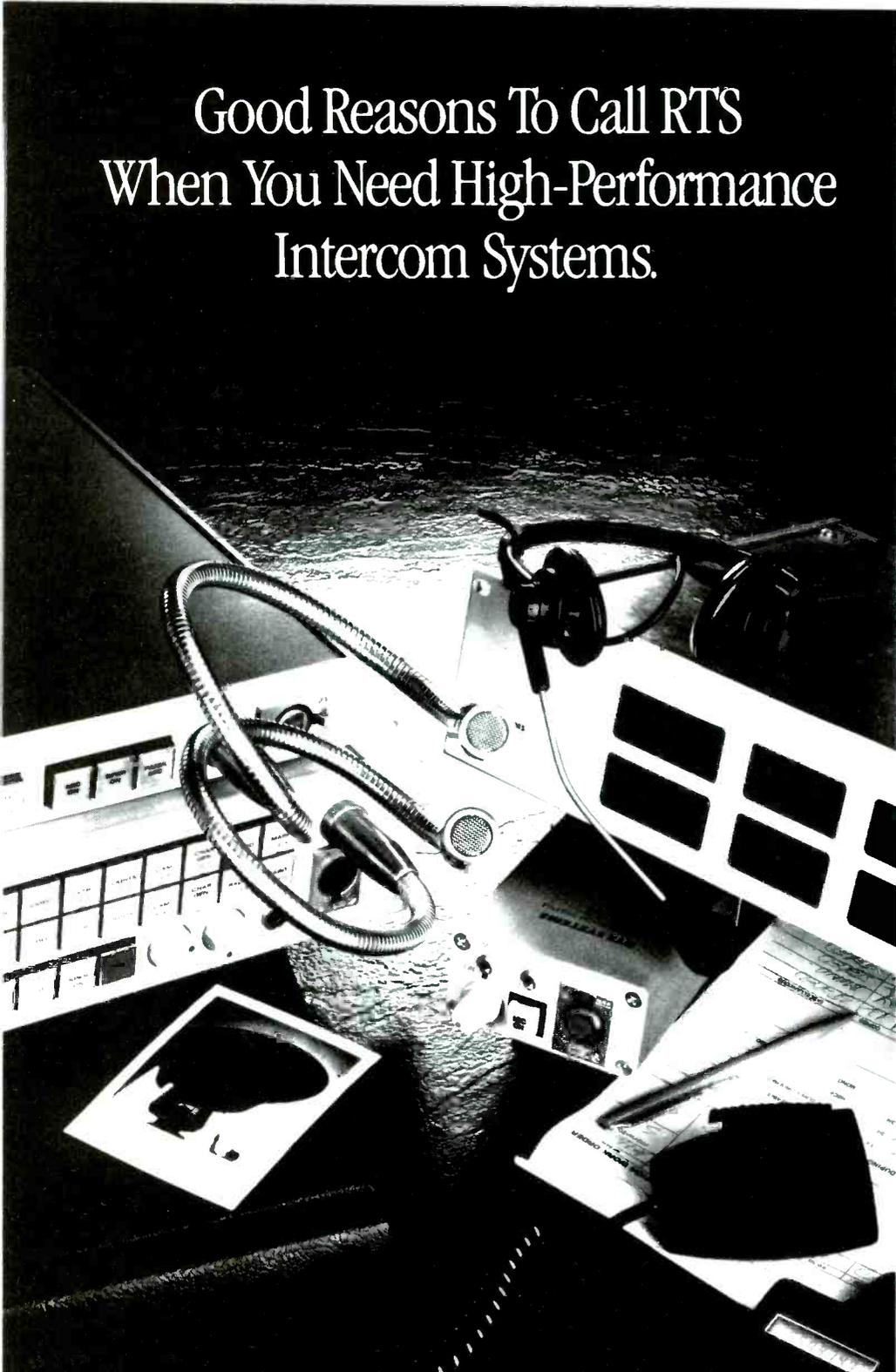
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is in motion, it must be stopped if ringing or oscillation (distortion) is to be prevented. If the amplifier can apply a sufficiently low impedance path, then the back EMF will be developed, and cone ringing will be limited. The low-impedance path often is referred to as *amplifier damping*. Amplifier damping refers to the ability of a power amplifier to electronically brake this excessive diaphragm motion. How well a speaker performs depends, to a degree, on the damping applied by the amplifier.

Amplifiers usually are rated by a damping factor. The amplifier's damping factor is: $Z_L \div Z_o$ in ohms, where Z_L is the amplifier's rated load impedance, and Z_o is the amplifier's actual output impedance. Simply put, the lower the amplifier's output impedance, the more like a "dead short" it will appear to a speaker when the output voltage is zero. For example, with a rated load impedance of 8Ω and an output impedance of 0.04Ω , the damping factor is 200.

The damping factor can be changed drastically by the addition of resistance to the circuit. For instance, with these values, using a speaker cable with only 0.04Ω resistance effectively cuts the damping factor in half.

Damping factors also change with frequency. Manufacturers often specify a range of frequencies for which the damping factor is correct. It is wise to inquire how an amplifier's damping factor is derived. Because resistance is such an important factor, even relay contacts or low-value resistive components can affect the result. The size of speaker wire can, therefore, have a significant effect on system performance.

Enclosures

Speaker enclosure design elicits probably as much controversy as any broadcast subject. Both professional and audiophile literature is noted for the various and sometimes comical theories on enclosure design.

The confusion has come about partly because the behavior of enclosures has not, until recently, been clearly understood. Also, by fostering the idea that "magic" is involved, some manufacturers have only added to the confusion.

Part of the problem in designing a speaker/enclosure system is that psychoacoustic factors involved in the reproduction of speech and music are not fully understood. Any four listeners may rate differently four identical speakers mounted in four identical cabinets. The engineer's task is to find some way to equate subjective criteria with objective specifications.

Why mount the speaker in an enclosure anyway? As already mentioned, the speaker cone moves forward and back-

ward in relation to the applied signal. At low frequencies, the speaker can be represented by a pair of sound sources of equal strength, located near each other and pulsing out of phase. The back of the speaker represents one of these sources, and the front, the other. Figure 2 depicts this situation with a point-source sound (speaker) and a monitoring location A.

In mathematical terms, the sound power level at point A (P) can be represented by the following equation:

$$P = \frac{\rho_0 f^2 U_0 b \pi \cos \theta}{rc}$$

Where:

- U_0 = rms strength of each simple source in cubic meters per second
- b = separation between the sound sources in meters
- ρ_0 = density of air in kg/cubic meter
- r = distance in meters from sources to point A
- θ = angle shown in Figure 2
- c = speed of sound in meters/second.

What emerges, upon examination of the equation, is that for a constant-volume velocity of the speaker diaphragm, the pressure P measured at a distance r is proportional to the square of the frequency f, the cosine of the angle θ , and is inversely proportional to r. In terms of decibels, the sound pressure P increases at the rate of 12dB for each octave (doubling) in frequency.

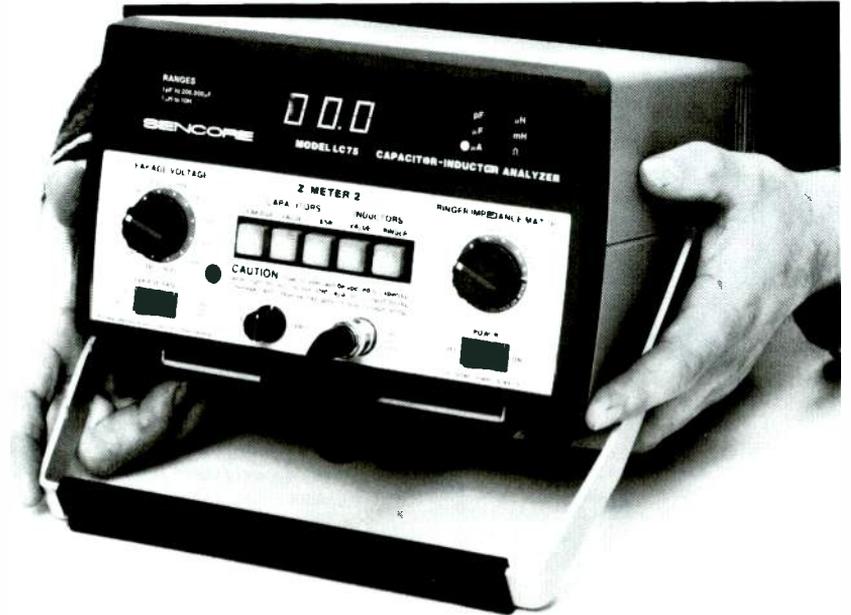
This increase is not constant and changes depending upon factors such as operation below or above speaker resonance. Below the first resonance, the increase is +18dB. Above the speaker's first resonance, the sound pressure P increases by only 6dB per octave.

In less complex terms, as the cone moves forward, the air immediately in front is compressed. The tendency of this compressed air is to rush in to fill the rarefaction created by the opposite action behind the cone. It is only at high frequencies, where the speaker assembly is large in relation to the wavelength of the sound, that there is appreciable sound radiation.

Placing the speaker in a large baffle will improve the low-frequency response, because the distance from the front to the back of the speaker is increased greatly. The term *infinite baffle* often is used to describe mounting the speaker in a wall of infinite size, which prevents the energy from the front of the speaker from reaching the back of the speaker.

Infinite baffles are not practical in the real world, so other designs have been developed to address the problem. Early solutions involved using boxes or flat

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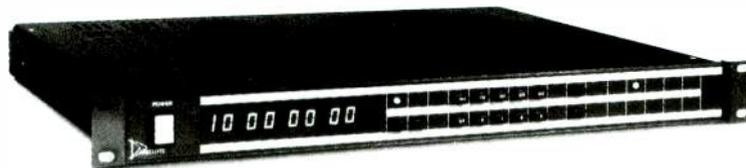
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planes to shield the speaker. Designers quickly discovered that the boxes resonated at various frequencies, causing even more problems, and that sound leaked around the flat planes.

One of the early successful solutions is shown in Figure 3. The original closed box has been modified by the installation of a carefully designed and located opening in the front mounting plate. The vented or ported enclosure, or bass-reflex speaker system, provided a method to couple the energy radiated from the back of the speaker with that radiated from the front of the speaker.

If the port size is carefully designed, it becomes a second diaphragm, driven by the back side of the speaker. At low frequencies, the port is equivalent to a short length of tube with an acoustic reactance and a series acoustic resistance. A carefully designed port can add an octave or more to the system's low-frequency response.

One key to the successful design of a ported design is to match the enclosure resonance to that of the speaker alone. The process effectively reverses the phase of the backwave at the port, which results in a radiated sound that is in phase with the speaker's sound. This design method allows the system to produce substantial radiation below the speaker's own free-air resonance frequency. Many other designs have been developed over the years, but this one remains a favorite with manufacturers.

Integrated systems

Up to this point, the discussion has been limited to single-speaker systems. For a number of reasons, high-quality systems usually rely on several speakers of different characteristics mounted within a single enclosure. They often are called 2-way, 3-way or even 4-way systems.

Even if it were possible to solve all of the design problems that exist, there are still valid reasons for using multiple speakers in a single enclosure. The most often-mentioned advantages are increased acoustic output and wider sound dispersion. A related factor, reduced IM distortion, will be discussed in this article.

If you elect to use multiple speakers, then some way must be found to split the various audio bands into separate speakers. *Crossovers* provide a way to route the low frequencies to the low-frequency speakers and the high frequencies to the high-frequency speakers. Three-way systems rely on three crossovers for signal routing.

Crossovers are designed as either high-level or low-level networks. High-level crossovers (see Figure 4), located after the amplifier and prior to the individual speakers, are passive devices. Low-level crossovers may be either passive, as shown in Figure 5, or active, as shown in

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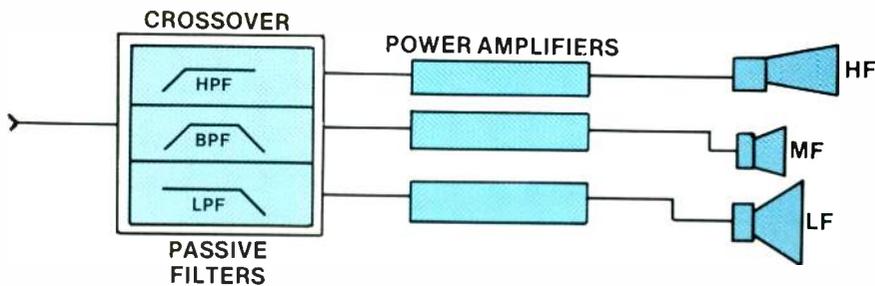


Figure 5. Block diagram of a passive, low-level crossover.

Figure 6. These crossovers are located prior to the amplifiers. Low-level crossover systems require an amplifier and speaker for each band of frequencies. Low-level crossover systems often are referred to as bi-amplified (2-way systems) or tri-amplified (3-way systems).

As mentioned previously, adding any resistance between the amplifier output and the speaker affects amplifier damping. Therefore, using a high-level crossover carries with it a design penalty. Because the crossover is in series with the signal, the amplifier becomes less effective in controlling speaker ringing, possibly causing increased distortion.

Another drawback to high-level crossovers centers on cost. Even if only one amplifier is needed per speaker cabinet, one crossover still is needed for each cabinet. In a stereo monitoring environment, this may not be critical. However, in sound reinforcement applications, the requirement of one high-quality crossover per speaker cabinet can significantly increase system cost.

Performance improvement

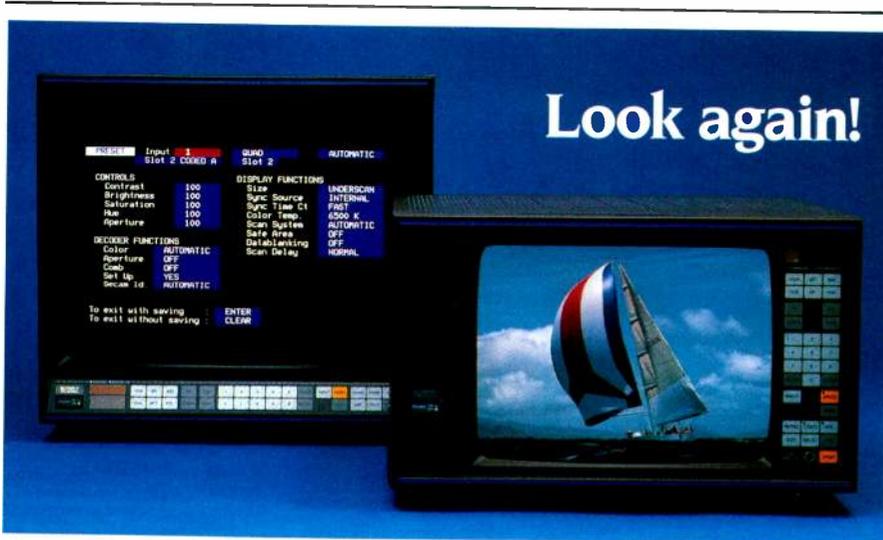
A number of important factors must be taken into consideration when multi-driver systems are selected. The crossover shown in Figure 4 is, by application, passive. Typically, such devices rely on first- or second-order Butterworth designs. Such crossovers produce a relatively slow rolloff of 6dB or 12dB per octave, respectively. One problem with this approach is that out-of-band energy can be delivered to the separate speakers.

Active crossovers, on the other hand, often are designed with third-order, 18dB/octave rolloff characteristics. Some installations even use fourth-order, 24dB/octave active crossovers or crossovers connected in series. A faster rolloff characteristic results in out-of-band power being delivered to the two speakers.

Another important reason to consider multidriver systems is reduced distortion. Once the decision is made to use multiple amplifiers, certain operating failures cease to seriously degrade system performance.

Take the case of a single amplifier feeding a passive crossover. When the amplifier is driven into distortion by a low-frequency signal, the entire output is transferred to the single crossover. All speakers receive the distorted signal, either as a fundamental waveform or as higher-order harmonics (harmonic distortion). Conversely, in a multiway system (as shown in Figure 5), if the low-frequency amplifier distorts, the remaining two amplifiers will theoretically continue to operate independently.

One drawback of multi-amplified system design is the greatly increased cost. The designs in Figures 5 and 6 require



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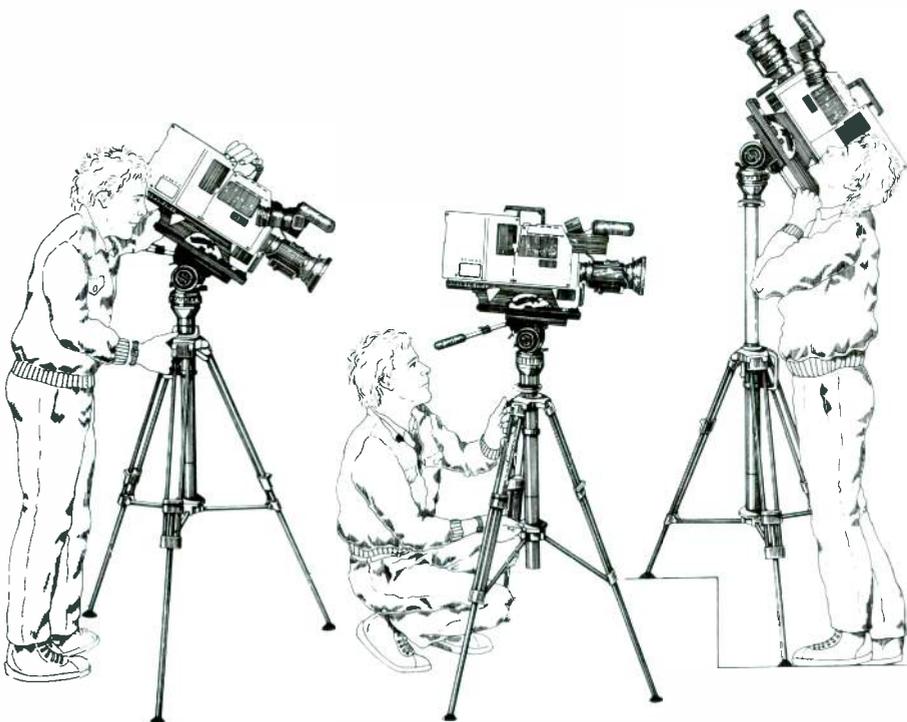
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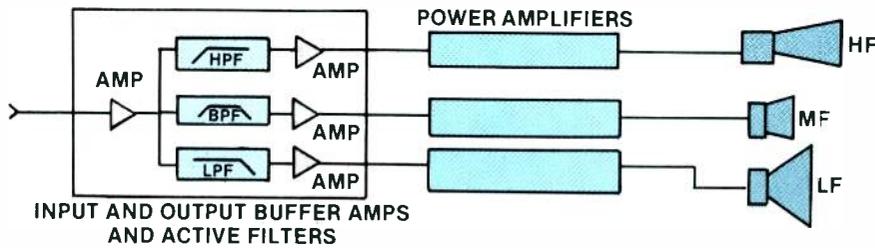


Figure 6. Block diagram of an active, low-level crossover. It contains loss in the crossovers and gain from internal amplifiers.

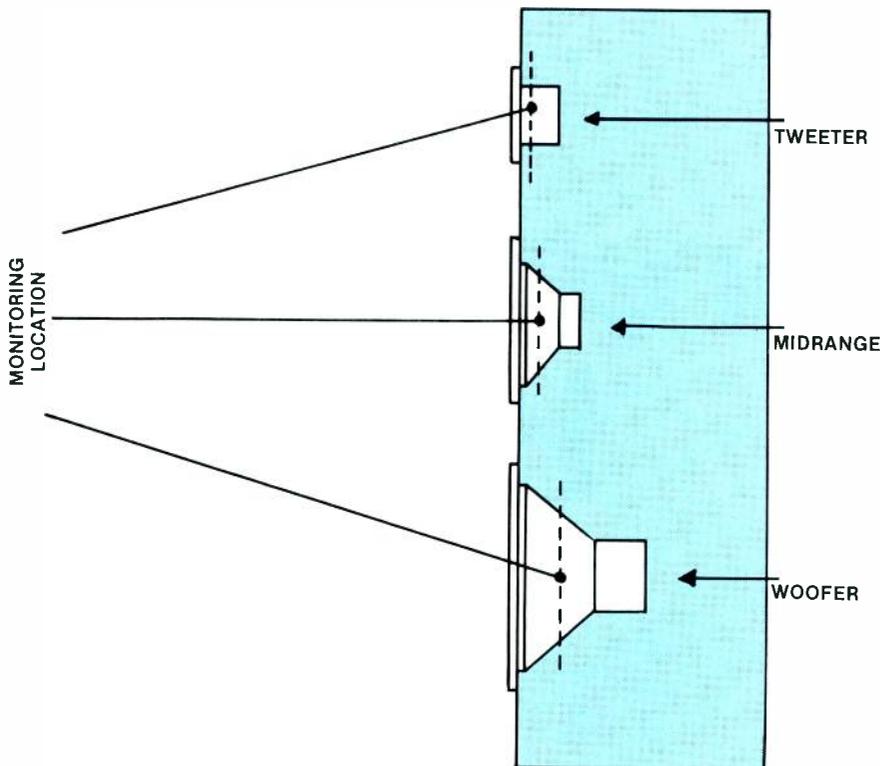


Figure 7. In a multidriver speaker system, any difference in the acoustical center of the drivers causes phase shift or time delay. Whether it is a problem for most monitoring systems is a point of controversy.

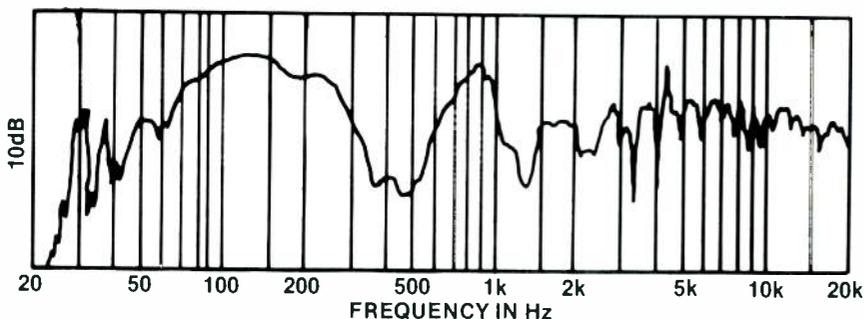


Figure 8. Effect on the frequency response of a speaker that is mounted next to a reflective wall.

two amplifiers instead of one. Cost factors and design goals must be weighed against possible sonic improvement.

Phase response

Modern technology has helped identify

speaker performance characteristics, which previously remained unknown. The phase response recently has been quantified by several methods, and can now be measured by various techniques. The term refers to the alignment, in the

time domain, of sound coming from a speaker. The attempt is to ensure that the relationship between the fundamental and overtones of a complex signal remains unchanged, and they arrive at the listening position at the same time.

Figure 7 shows a typical speaker cabinet with three speakers mounted on the front panel. The acoustical center of each speaker is marked by a dotted line. Notice how the speaker's center lines don't match. According to some experts, this misalignment of centers can cause phase distortion.

Some manufacturers address this problem by using a stepped enclosure facing. The technique physically positions the acoustical center of each speaker on the same plane. Phase-delay networks also could be used to compensate for the delay.

Various studies have been undertaken in an effort to identify the audibility of such phenomena. One Denmark study showed that phase shifts as low as 15° in midrange frequencies were audible. Other studies show that, although many top-grade monitor systems produce delays, these delays are inaudible.

Speaker environment

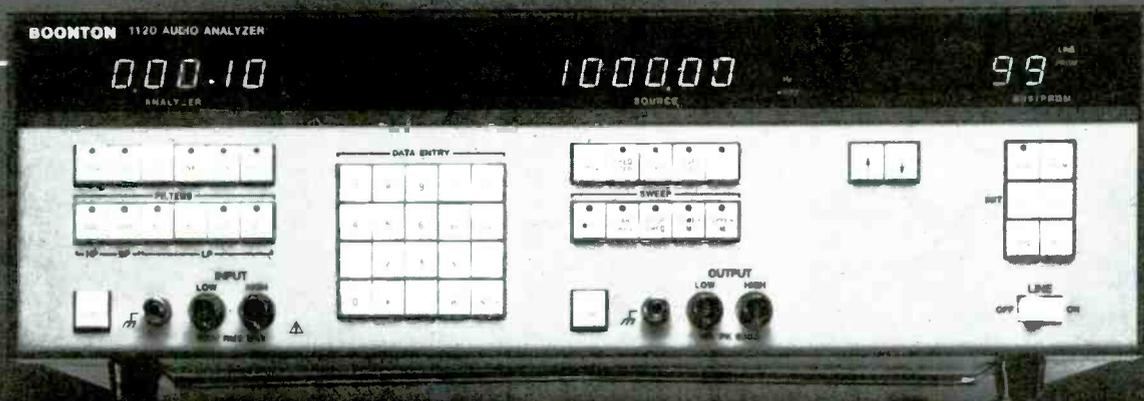
It's apparent to most engineers that the performance of even the best speaker systems are dependent upon the environment. The way in which a monitor system interacts with its environment is complex, and volumes of data have been developed on the interaction between sound sources and rooms.

One of the first things an engineer must realize is that the closer a speaker is mounted to the walls, ceiling or floor, the more bass it produces. For instance, if the speaker is mounted in the center of a room, the low frequencies are radiated in all directions. If the same speaker is mounted next to a wall, the low-frequency output increases by 3dB. Moving the speaker into a corner further increases the low-frequency output because the energy is concentrated in one-quarter of the original space. See Figure 8.

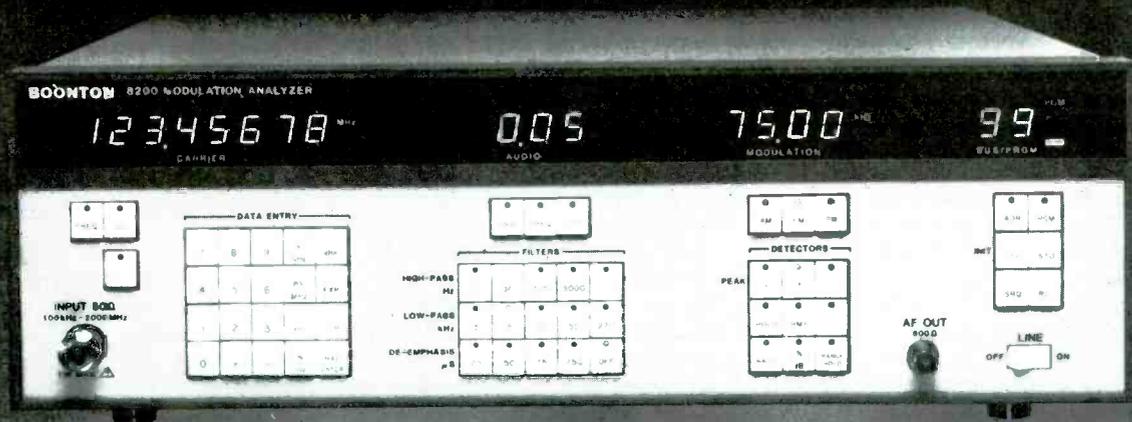
A related problem exists when speakers are mounted next to walls and ceilings. The low-frequency sounds can reflect from the back wall or ceiling, as shown in Figure 9, and combine with the sound from the front of the speaker. This results in phase cancellations producing a comb-filter effect.

Typically, the solution is either to locate the speakers near the monitoring position or to isolate the speaker from the effects of the walls.

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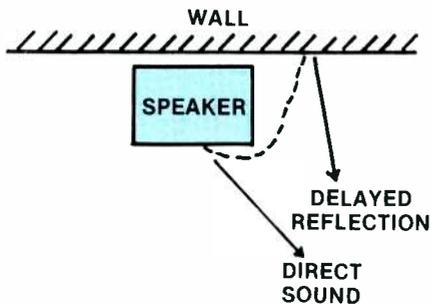


Figure 9. Placing a speaker near a wall may produce a comb-filter effect as the low frequencies from the back combine with direct sounds from the front.

level, near the listening position. This method allows the operator to hear primarily the direct sound from the speakers. Reflections from other surfaces are minimized, which results in fewer cancellations within the monitoring area.

With the second technique, the speakers are flush-mounted and isolated within the control-room wall. This isolates them from resonances and reflections that the wall might produce and reduces problem-causing low-frequency reflections.

It is important with both techniques to not allow the speaker to be physically connected to the wall or supporting structure. To do so may cause the wall or surface to act as a low-frequency radiator. Use damping materials such as rubber or isolation mounts when installing monitor systems.

Equalization

Room equalization is an often-discussed, yet seldom-understood technique. Contrary to its name, room equalization is not an attempt to modify the room. Rather, the monitor system is pre-distorted to match the deficiencies of the room. Room equalization is not expensive; usually, only an additional pair of 1/3-octave equalizers is required.

The problems come in when those attempting to equalize a room don't understand the intricacies involved. For instance, engineers sometimes attempt to equalize by ear, rather than by instrument. The result may be that they end up trying to equalize for standing-wave problems or poor room acoustics. An equalizer is not an alternative that permits the use of inexpensive (poor frequency response) speaker systems. Equalizers cannot make an inferior speaker system equal to a well-designed model.

Figure 10 shows the frequency response for a speaker mounted next to a wall. The solid line shows the frequency response prior to room equalization and relocation of the speaker. Notice the low-frequency bump at about 150Hz. Although an equalizer could help smooth

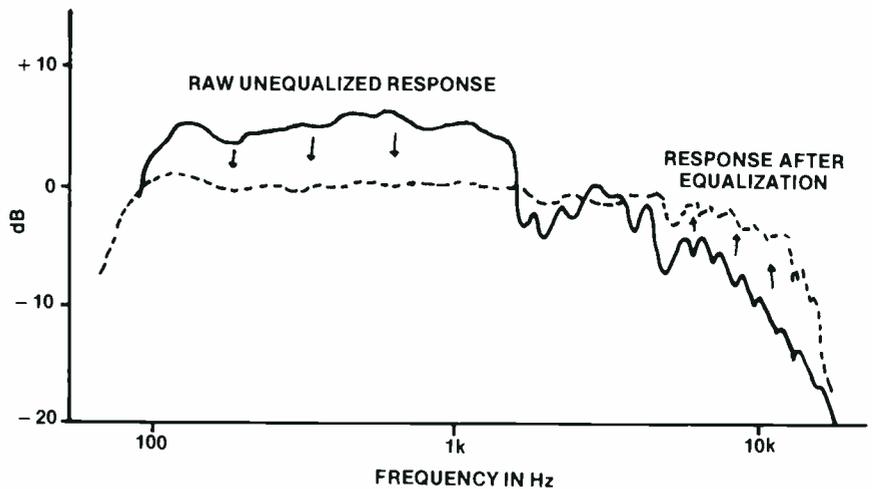


Figure 10. The solid line represents original frequency response. The dotted line shows the frequency response after the speaker was moved and room equalization had taken place.

out the bump, the irregular peaks and notches in the upper range would be more difficult to correct.

The improvement that can result from moving the speaker and using an equalizer is shown by the dotted line in the graph. This example points out the occasional need to combine techniques to obtain satisfactory performance. And, again, the simple addition of an equalizer may not be the solution.

Keep in mind that a 1/3-octave equalizer recognizes just that. If your system has a problem at any non-1/3-octave frequency, then it may be masked by the analyzer. You could end up chasing a minor problem and adding excessive amounts of equalization.

Don't forget that equalizers also can add phase shift. This is especially the case if large amounts of gain and boost are used. The low-pass Butterworth filters, typically used in equalizers, contain large amounts of phase shift (see Figure 11). If you are concerned about time-alignment of your speakers, then adding phase shift from an equalizer does not make sense.

Speaker selection

So where does all of this leave the engineer who needs to purchase monitor systems? First, define your particular requirements. Don't plan on using a small bookshelf monitor system to supply sound to a large studio. Conversely, you may not need a 700-pound 4' x 6' monster to power the typical FM radio studio.

Don't be misled about the degree of sophistication needed in the typical radio or TV control room. If the room will be used only to monitor off-air signals, there may be no need for a monitor system with a flat response from 10Hz to 20kHz.

Look for low distortion, flat acoustical response and (probably) bi-amplified or tri-amplified systems. Separate amplifiers

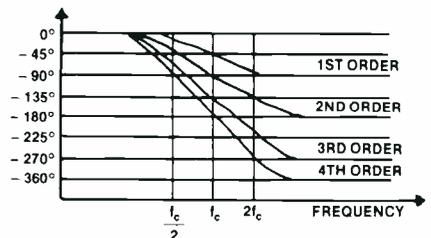


Figure 11. The phase shift produced by some equalizers can be significant. The graph shows the low-pass filter phase response for various orders of Butterworth filters.

provide maximum headroom and transient-handling capability. Also, as described previously, distortion often is reduced through the use of a multi-amplifier system.

Many top-quality monitoring systems are available today. If you have the time, make a detailed evaluation of them. A suggested testing procedure, outlined in the May 1986 issue of *BE*, contains guidelines to unbiased evaluation. The testing procedure will help eliminate any preconceived notions.

It is no longer advisable to purchase amplifiers and speakers as though they make no difference to the listener. In the strictest sense, they don't. However, if you and your staff cannot properly monitor your transmitted audio, the listeners may stop bothering to call when they hear a problem. They may simply tune out your station.

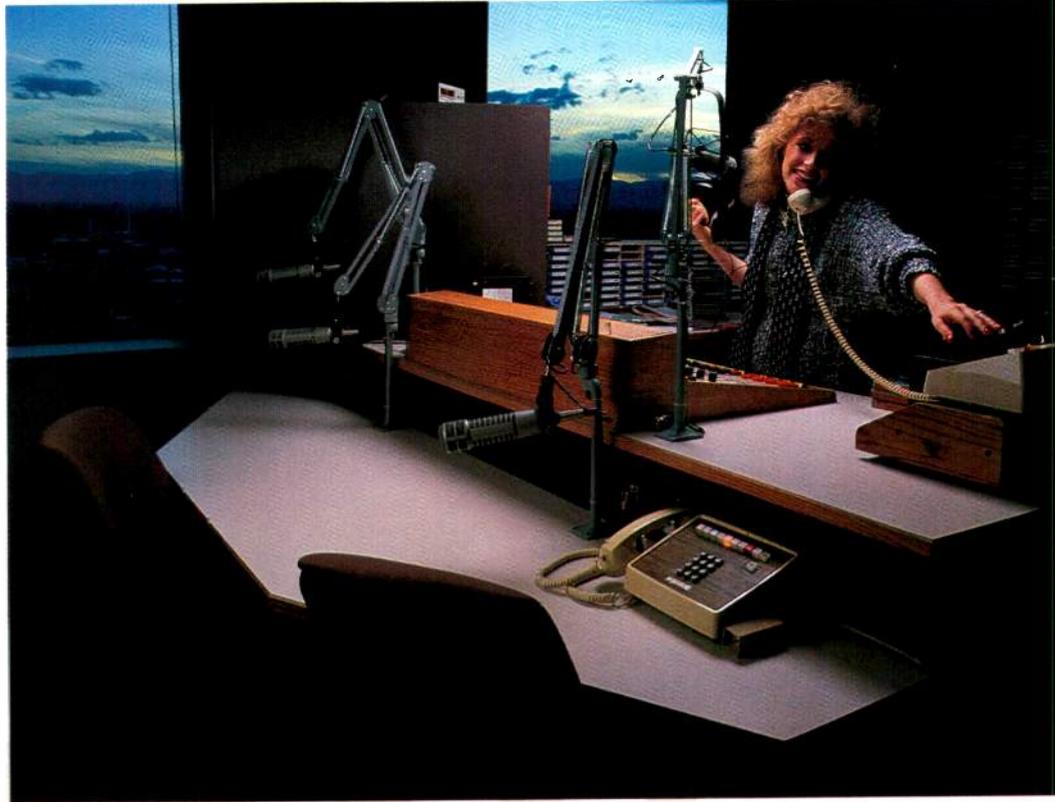
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Return of the synchronous amplifier

By Chip Behal

Many broadcasters are looking to the synchronous amplifier as an effective way to improve signal coverage and to reach new markets.

It's been more than 50 years, but broadcast technology is finally coming full circle. Synchronous AM transmission was first used in the 1930s as a way to lock stations together on the same frequency. Today, that same idea is being used to extend the coverage of stations into areas that are poorly served or are not served at all.

The technique is well suited to extending the primary groundwave service area of many stations. The original experiments in the 1930s were directed at reducing the effects of skywave interference. Instead, tests showed that multiple

radiation sources with significant geographic separation merely produced additional interference.

The Europeans have used synchronous transmitters for many years. Most of their installations rely on equal-powered transmitters to maximize station coverage. Because of the many years of practical experience, the European installations have been fairly successful.

In the United States, synchronizing techniques typically are applied to transmitters operating at different power levels. Here, the primary signal often completely overlaps the signal from the secondary transmitter. As you might expect, the combination of these two signals holds the potential for interfer-

ence. The key to effective implementation of the technique is controlling the location and severity of the interference produced.

Historical perspective

In the early 1930s, WHO-AM, Des Moines, IA, and WOC-AM, Davenport, IA, used independent oscillators to lock their transmitters on the same frequency. These oscillators provided a precision level unheard of in those days—one part in 100 million. The apparatus was complex and required a full vertical rack at each site. The stations synchronized their frequencies by using a monitor receiver placed halfway between the two stations. WHO was designated as the reference station. WOC then adjusted its frequency to that of WHO. The reference station relied on remote indicators from the monitor station to make the frequency adjustments. Although this method could be used today, modern technology provides other alternatives.

Another scheme, tested in the United States in the 1930s, relied on a radio transmitter located midway between two broadcast transmitter sites. The synchronizing transmitter broadcasted a reference carrier of one-half the actual broadcast frequency. This carrier was received at each broadcast site and doubled, thereby creating the on-air frequency. The choice of the first subharmonic for the reference carrier took advantage of the inherent stability of the lower frequency oscillator and that of the doubler circuit. The system was abandoned later because of its spectrum inefficiency.

The Germans used an audio-lock system for a 3-station synchronous group in January 1930. This technique relied on two separate telephone lines, one for program audio and another for synchronization and voice communications. The reference carrier, an audio frequency, was centrally generated, then multiplied to the proper frequency at each trans-

Behal is the former chief engineer of WLLH-AM, Lowell, MA.

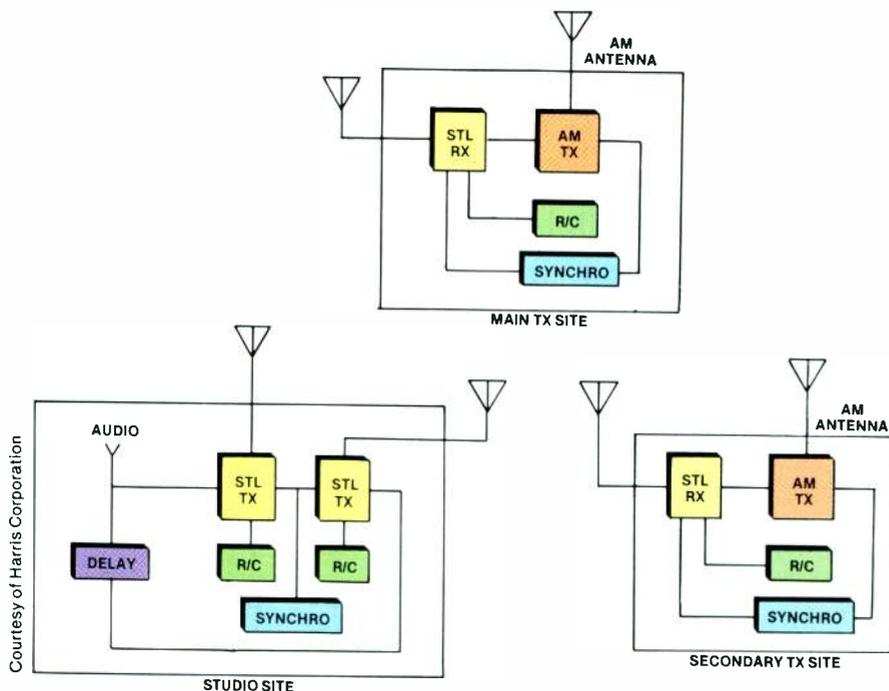


Figure 1. Synchronous operation relies on two transmitters operating on the same frequency. The carrier frequencies are locked together through some form of reference signal.

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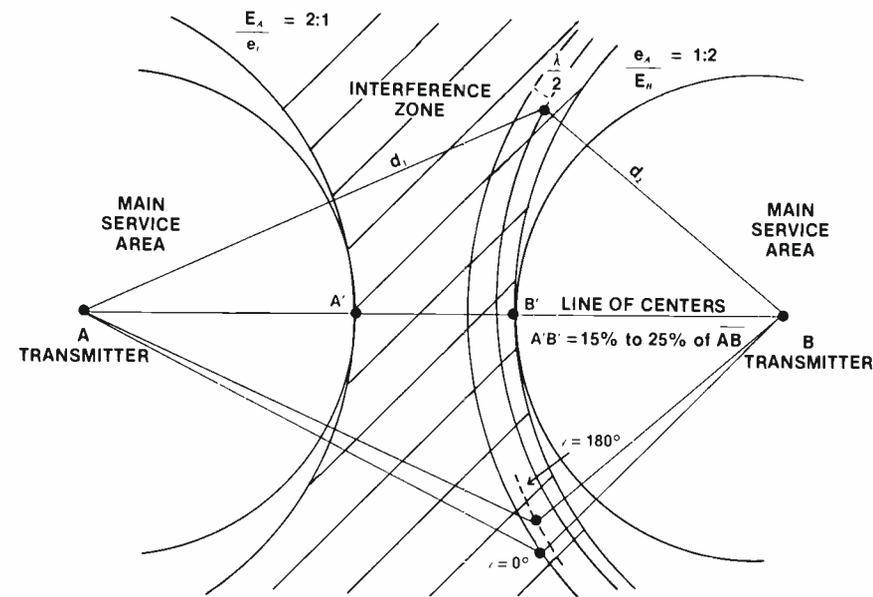


Figure 2. When the signals of two equal-powered synchronous stations combine, an interference zone is generated between them. Points where the carriers meet in phase form hyperbolic lines.

mitter site.

The multiplexing scheme was achieved by limiting the voice communication bandwidth to 1kHz. The reference carrier frequency was contained within the range of 1.5kHz to 2.5kHz. A low-pass filter of 1kHz and a high-pass filter of 1.2kHz provided the needed isolation between the two signals.

Today's systems

Today, only a few stations operate with synchronized transmitters. In 1986, KROL-AM became the first new station to begin synchronous operation in the United States. The station has a 10kW primary transmitter located in Laughlin, NV, and a synchronous site located in East Las Vegas, NV, 60 miles away. The synchronous station operates with a power limit of 300W during the day and 500W at night. (See Figure 1.)

KOB-AM, Albuquerque, NM, soon will begin operating a synchronous operation in Santa Fe, NM. Although the station originally signed on with a non-directional pattern, it later was forced to begin directional nighttime operation. Unfortunately, the directional pattern prevented the station from serving the Santa Fe community after dark. A synchronous 230W transmitter, when authorized, will operate only at night, once again providing service to the city.

WLLH-AM, Lowell, MA, has operated a synchronous transmitter for many years. The synchronous transmitter is located approximately 10 miles east of the primary transmitter location, in the business district of Lawrence, MA.

Prior to the installation of the synchronous transmitter, the Lawrence market was not served at night because of the 250W power limit of the Lowell transmitter. Even with daytime power of 1,000W, the Lawrence market was difficult to cover properly. Placing a synchronous amplifier in Lawrence solved the coverage problem.

On the surface, the installation of a synchronous transmitter might seem to be a simple answer to a station's coverage problems. The improved coverage, however, comes with a drawback.

Performance restrictions

Somewhere between WLLH's two transmitter sites lies an area of signal overlap where the signal strength of one

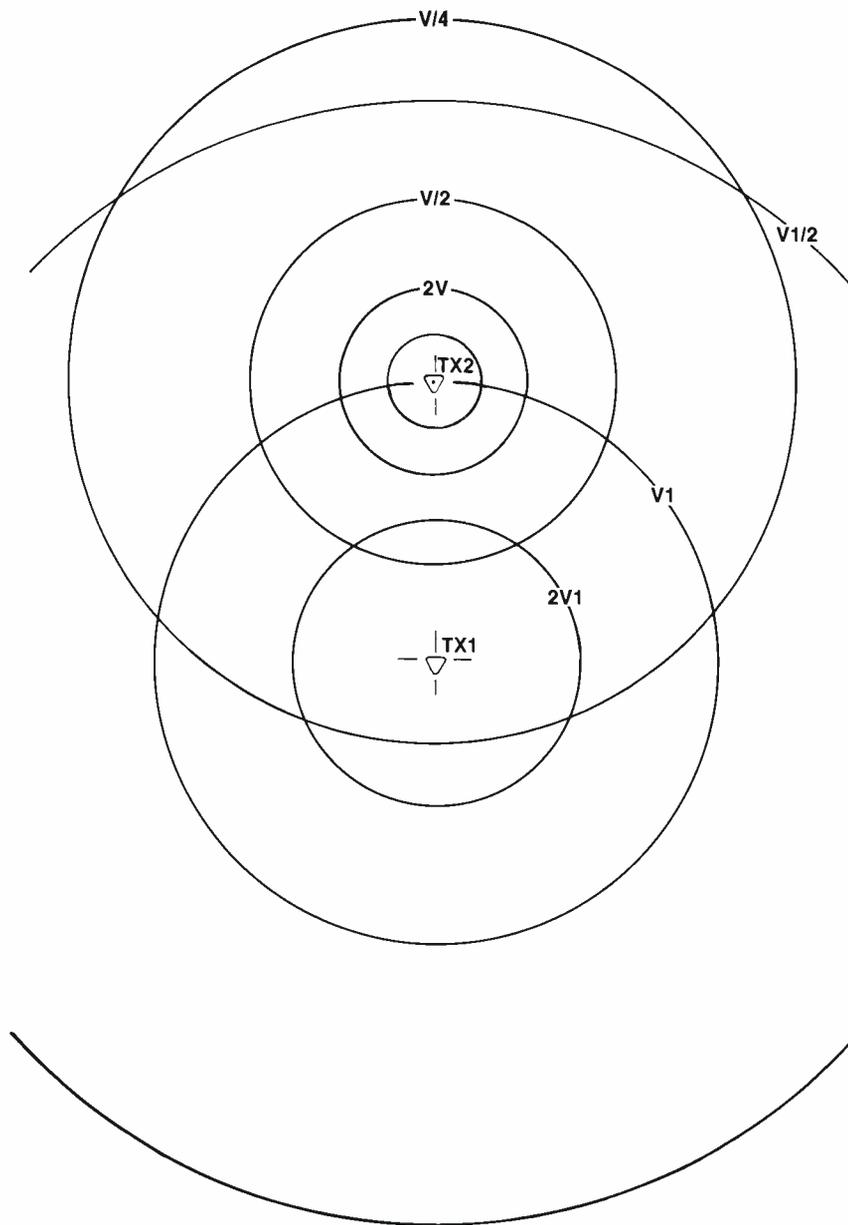


Figure 3. A general case example of two unequal-powered synchronous stations shows the secondary site completely covered by a signal from the primary station.

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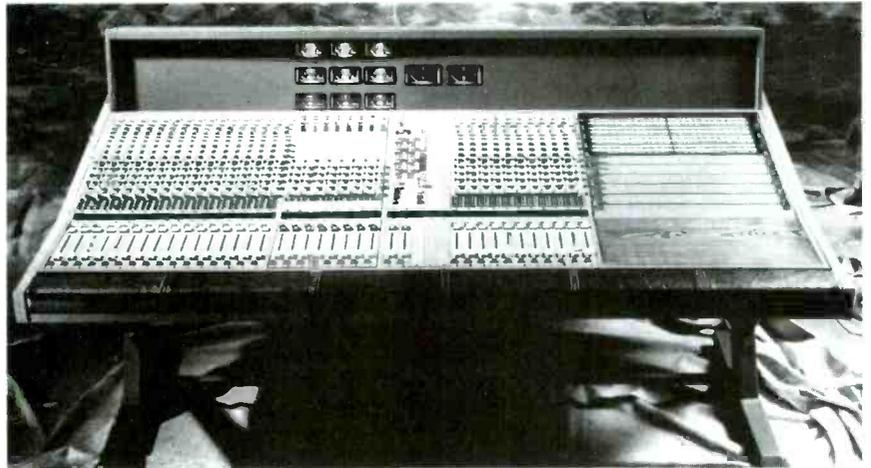
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transmitter exceeds the other by less than a 2:1 ratio. In that overlap area the two carriers interfere with each other so that listening can be difficult, if not impossible.

Figure 2 depicts the interference zone produced by the two transmitters, both of which now operate at 1,000W, 24 hours a day. Along a straight line between the transmitters, the overlap area is approximately two miles wide. This distance increases both north and south of this line. One of the key elements to consider when planning synchronous operation is where the interference will fall. Be careful that you don't place the overlap area on top of a major roadway, an important secondary market or the general manager's house.

Interference prediction

Using data presented in a Harris Corporation engineering paper by Robert Weirather, we can better understand how the interference areas may be identified. A general case example is shown in Figure 3. Here, the secondary site is located within the signal of the primary site. The transmitters have a power ratio of 10:1. The severity of interference depends upon the carrier levels relative to each other, not the actual power levels.

Research shows the following ratios to be important:

Signal Power Ratio	Importance
1:1 (0dB)	Zone of maximum interference
1:1 to 4:1 (0dB to 6dB)	Zone of some interference
4:1 to 100:1 (6dB to 20dB)	Zone of little interference
100:1 and greater (20dB)	Zone of virtually no interference

The contours of any signal-strength ratios are a circle. Using a bit of math and allowing for some assumptions, we can predict the general locations of these interference zones.

- Let P1 = power of transmitter No. 1 in watts;
- P2 = power of transmitter No. 2 in watts;
- V1 = signal strength of transmitter No. 1 in volts per meter;
- V2 = signal strength of transmitter No. 2 in volts per meter; and
- D = distance between sites in miles.

Using the following formulas, it is possible to calculate the circles of equal strength.

$$R = D \sqrt{\frac{k}{1-k} + \left(\frac{k}{1-k}\right)^2} \text{ (miles)}$$

$$Y = \frac{-(kD)}{1-k} \text{ (miles)}$$

$$k = \left(\frac{V2}{V1}\right)^2 \frac{P1}{P2}$$

Where:

- R = the radius of a circle with its center at point Y;
- Y = distance from site No. 1 on a line drawn through site No. 1 and site No. 2; and
- k = ratios of interest.

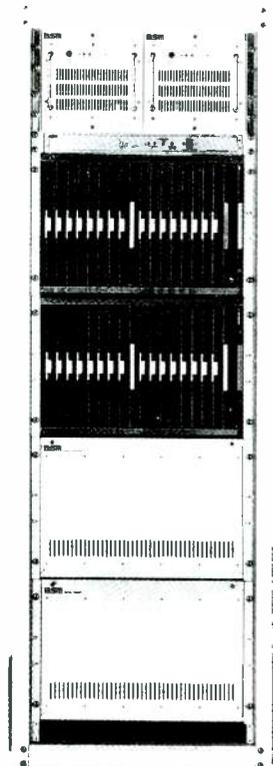
Figure 4 illustrates the case of the two separately located transmitters from Figure 3 operating with a 10:1 power ratio. For simplicity in calculations, let's assume flat terrain, omnidirectional patterns and perfect conductivity. The signal contours from transmitter No. 1 are drawn in dark blue. Transmitter No. 2 contours are drawn in light blue. The interference zones are represented by the shaded areas.

Frequency control

When the carriers combine out of phase, they cancel more completely than do the sidebands. When this happens, the sidebands can be as much as 300% to

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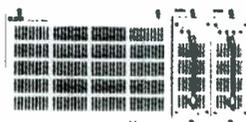
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400% higher in level than the carrier. This phenomenon produces severe over-modulation in the receiver. In order to minimize this effect, it is important to maintain precise control of both transmitter frequencies.

The standard AM frequency tolerance of 20Hz is far too wide for synchronous operation. The FCC rules require synchronous-operated transmitters to maintain carrier frequencies to within 0.2Hz of each other. This can be accomplished using today's technology, albeit the process does require some work.

European stations sometimes use independent cesium clock oscillators, which drift approximately 1Hz in 8,000 years. Don't expect to see many of these devices in use at U.S. stations. There are several other adequate and less expensive frequency-control methods.

At WLLH, the main and synchronous transmitters typically are adjusted to within 0.03Hz of each other. The oscillators were installed in 1966 and continue to provide reliable operation today. Following one particularly careful oscillator alignment, the beat period increased from 25 seconds (equal to a frequency difference of 0.04Hz) to a period of 44 minutes. This beat period represents a frequency difference of 0.00038Hz.

At any given point, the carriers will change their phase relationship at a period based on the reciprocal of their frequency difference. If the carriers are 0.05Hz apart, the listener will hear one or two seconds of distortion every 20 seconds. If the carrier frequencies are closer together, the length of the period between carrier beats is increased. Unfortunately, the length of the time the distortion is audible during the beat also is increased. A compromise must be developed between these two phenomena. The compromise usually is based on where the interference falls relative to the location of the station's listeners.

If the two carriers are locked precisely on the same frequency, the interference will remain stationary along hyperbolic lines. To a certain extent, these interference lines can be positioned by adjusting the phase of one of the carriers. If the carrier frequencies are only close, the interference lines will roll through the overlap area.

Synchronizing techniques

A number of methods can be used to synchronize two or more transmitters. Some of the early methods have been improved upon. Other techniques have been made possible through the advent

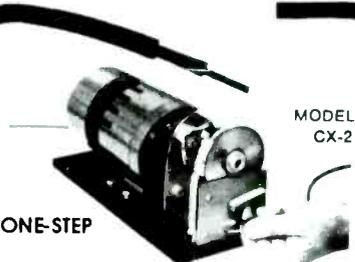
of new technology such as WWV transmitters and satellite signals.

A master oscillator located at the main transmitter (or studio) could be used to drive both transmitters. The primary frequency might be divided by a factor of 100 or 1,000 to transform it into the audio range. This signal could then be sent over a telephone line or STL to the synchronous site. At the synchronous site, the audio frequency could be multiplied up to the proper carrier frequency. See Figure 5.

Both the reference signal and the program audio easily could be transmitted on a phone line or STL. By band-limiting the program audio to less than 12kHz, a 14kHz reference signal could be transmitted along with the program material. This reference signal could then be multiplied to 1,400kHz for a proper carrier frequency signal. The primary drawback is the effect sharp filtering can have on the group delay characteristics of the audio signal.

To avoid the effects of the sharp filters, a separate audio line could be used to carry the carrier reference frequency. This line could be another phone line, an FM SCA or an STL SCA. As you will see, however, this method has its problems.

If a wideband link is available, the out-



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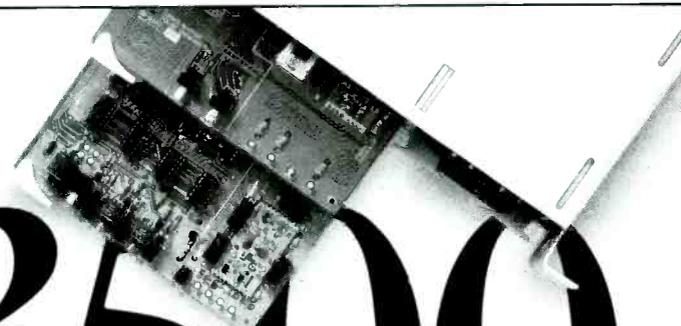
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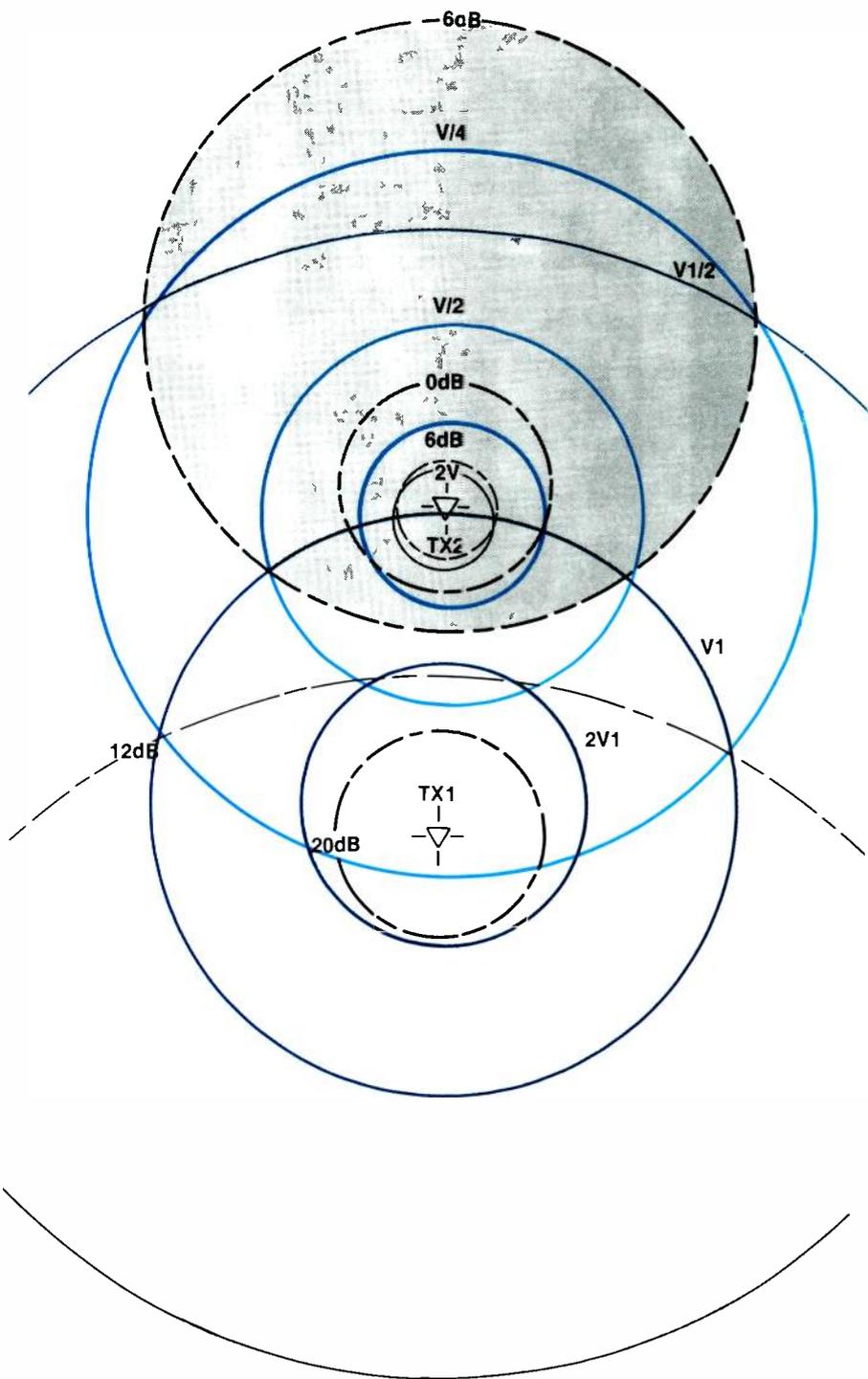


Figure 4. The interference zones are shaded for clarity. The zones are based on the carrier levels shown in Figure 3.

put of a master oscillator could be sent directly to the synchronous site, thereby avoiding any frequency conversion. The same wideband link also could be used to send fully processed audio to the synchronous site. In this case, only a peak limiter would be needed at the synchronous transmitter location. Such a link would have to operate in the 2GHz or higher frequency range.

A more complex method could create a complete AM signal at a central point.

The entire signal would then be distributed via equal-length wideband circuits to both transmission sites. The signal could be sent at a lower power level and linearly amplified at the broadcast site.

The frequency information provided by WWV could be used to synchronize both transmitters. A less precise method might reference the transmitter carriers to the color burst of a nearby TV station. See Figure 6.

Despite the numerous possibilities, in

most cases, the best alternative is to provide an accurate oscillator at each site. The oscillators can then be locked to an external reference. This procedure also provides the safety feature of proper operation if the reference signal fails.

Distortion effects

Having discussed several RF carrier generation methods, let's examine the effects that a listener might encounter within the overlap area. In general, the distortion sounds much like co-channel interference or null area distortion in a directional pattern.

In this case, the co-channel signal originates at the station's synchronous transmitter, not another faraway station. Under these conditions, the receiver's output will be the sum of these two signals. These two signals can be described as:

$$E(1 + M \cos Pt) \cos \omega t + e(1 + m \cos(Pt + \beta)) \cos(\omega t + \gamma)$$

Where:

- E represents the stronger signal carrier;
- e represents the weaker signal carrier;
- M is the modulation percentage of the stronger signal;
- m is the modulation percentage of the weaker signal;
- P equals 2π times the modulation frequency;
- ω equals 2π times the carrier frequency;
- β describes the phase relationship between the audio portion of the two signals; and
- γ describes the phase relationship between the two carriers.

β and γ can be further explained as functions of the phase relationships of the carriers as they leave their respective transmitters and the distance they have traveled through space before they meet.

$$\beta = \beta_0 - \frac{PD}{c} \quad \text{and} \quad \gamma = \gamma_0 - \frac{\omega D}{c}$$

Where:

- β_0 is the audio phase difference at one instant as the signal is radiated;
- γ_0 is the difference between the two carrier waves at one instant as they are radiated;

D is the difference in distance between the receiving point and each transmitter ($d1 - d2$ in Figure 2); and

c is a constant, the velocity of propagation (3×10^8 m/s).

By strict interpretation, even changing the loading-coil tap position will affect β_0 and γ_0 as the RF path length changes. This change will, however, probably not make much difference.

Don't get bogged down with the math. The importance of these equations lies in that they define the four major factors that affect reception in the overlap area. These factors are: signal strengths, E and e; modulation percentages, M and m; au-

dio phase, β ; and carrier phase, γ . Changes in the output power of either transmitter will change the ratio of E:e at any given point. This change moves the entire overlap area back and forth slightly between the two sites. The other factors address the signal's fidelity, more than interference locations.

Within the overlap area, the distortion products generated within the receiver will vary with the phase relationships of the carriers and audio. In addition to the rolling effect (changes in signal strength as the carriers add and subtract, which is caused by frequency differences), a beat note equal to the frequency difference is produced. Because of its low frequency, the beat note will probably go unnoticed unless the beat frequency exceeds 2Hz. If an error of this magnitude develops, the effect will appear as an intermodulation product mixing with the audio. Therefore, if the described error develops, it is a symptom of a greater problem.

Even after proper carrier synchronization is obtained, there are several other important factors that can affect γ , the carrier phase difference at the receiving point. If the carrier frequency is generated at a large subharmonic such as $1/1,000F_c$, and delivered by wire lines to the synchronous site, phase shifts in the

line can cause problems. Any phase shift occurring on this line shows up as instantaneous carrier phase modulation (ICPM).

Consider the analogy of two flywheels on opposite ends of a rubber shaft. Although the rotation frequencies over time are identical, the flexing of the shaft causes a slight difference in angular rotation at any given instant.

Any ICPM within the transmitter can produce the same distortion just described. Reducing ICPM in AM transmitters is a common practice among AM stereo stations. Synchronous transmitter operation is another application in which reducing ICPM can improve the quality of the received signal.

Audio adjustments

Assuming your transmitter sites are not equal distances from your studios, the audio may need to be delayed at one site. The delay compensates for the difference in distances the program audio must travel. A 10-mile path difference requires approximately $54\mu s$ of delay. To put this delay into another perspective as it relates to audio, $50\mu s$ equals 180° at 10kHz. If you elect to delay the audio in order to match the sidebands for all transmitters, the measurement point

must be at a location where the signal-strength ratio is 1:1. Such a point is not necessarily equidistant from both transmitters.

Adjust the programming delay so that the audio is in phase at the monitoring point. Then, using the same audio signal, adjust each transmitter to the same percentage of modulation. The objective is to adjust the audio so that the sidebands cancel in conjunction with the carriers, thereby minimizing distortion products.

Audio-processing equipment can add phase shift to an audio signal. Because the audio processing is often frequency-dependent, group delay characteristics are important considerations. Even two identical devices may process the signal slightly differently because of manufacturing production tolerances.

It also is important to defeat any polarity-flipping circuitry unless the changes occur simultaneously. Unless your STL is capable of transmitting square waves and other complex waveforms, the audio should be processed at the transmitter site. Even with wideband transmission, some peak limiting and shelf equalization probably will be necessary because of the difference in each transmitter's audio section.

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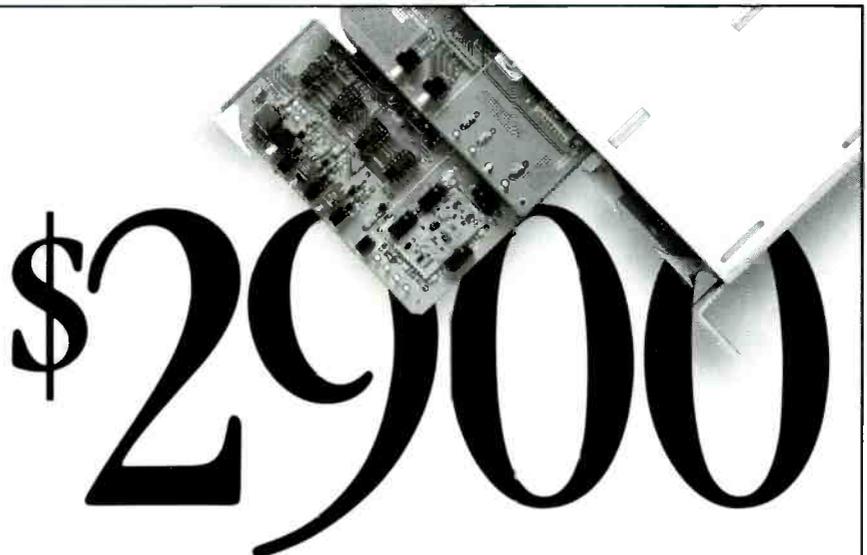


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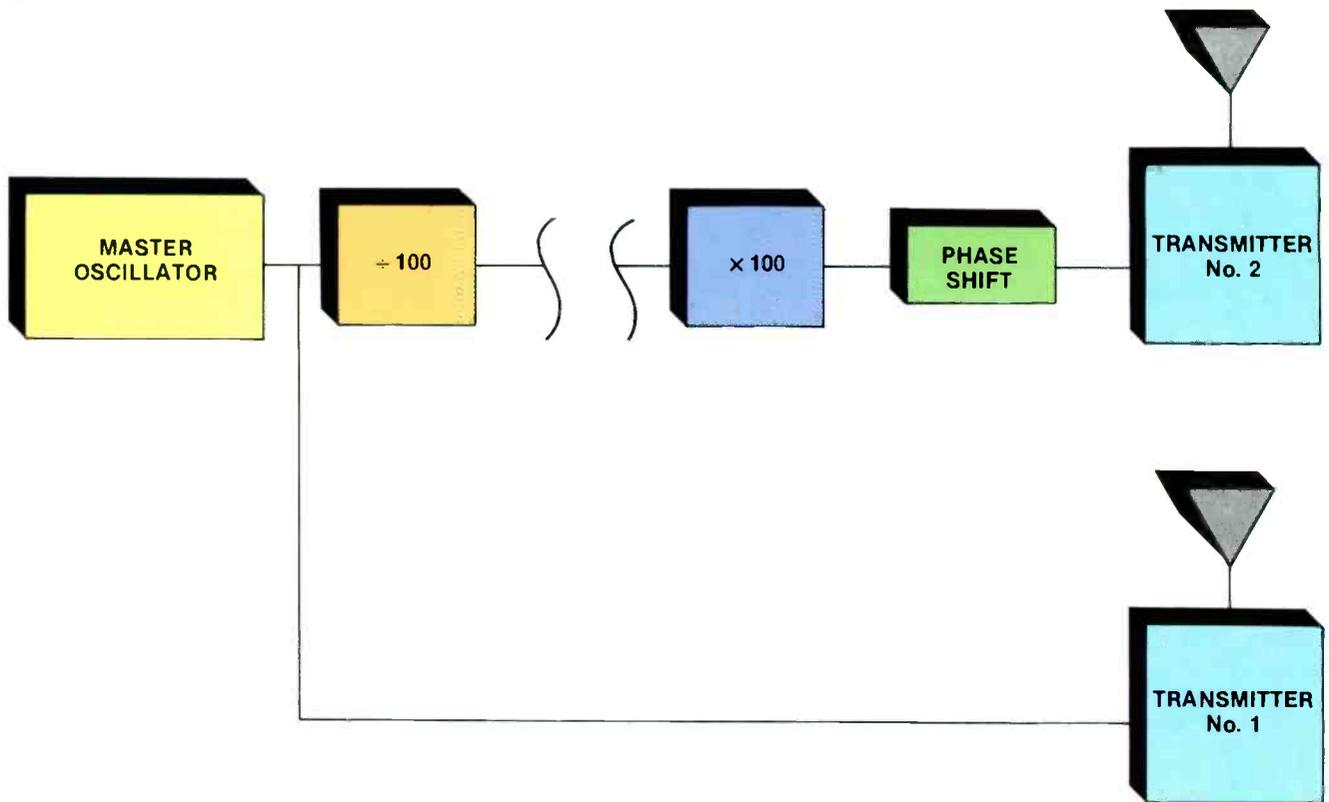


Figure 5. A master oscillator generates the signal for both transmitters. The signal is transmitted to the transmitter sites over an STL or wireline.

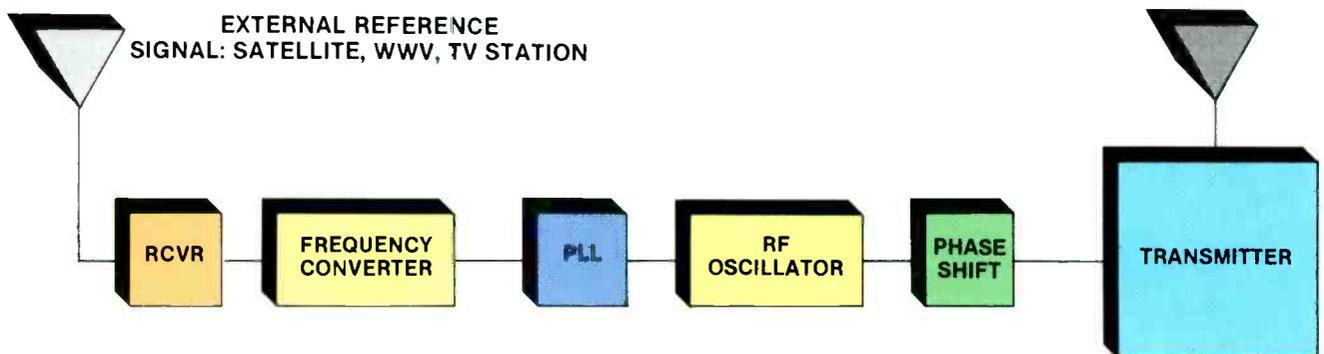


Figure 6. External signals can be used to phase-lock the local transmitter oscillators. Reference signals might include satellite-delivered signals, WWV or TV frequencies.

modulation at each transmitter site ($M=m$) also will help to reduce the distortion products at the receiver. This consideration becomes more important at those receiving points where the carriers are nearly equal in strength ($E=e$) and the carrier phase γ exceeds 120° . As γ approaches 180° , the modulation adjustments are even more critical.

Because of the many elements involved (STL systems, digital delays, audio-processing equipment and transmitter audio circuits), audio-phasing adjustments may be difficult or even impossible to maintain in actual practice. Even so, it is imperative that each element be properly adjusted as a part of the entire system. Simply adjusting each device separately

and then plugging them together will not work.

Monitoring performance

Monitoring the synchronous amplifier presents its own challenges. For stations whose studios are co-located with one transmitter site, a remote-modulation meter and audio return line from the other site may be desirable. If your studios are remotely located from both transmitter sites, be careful when installing the modulation monitor. It is important that the modulation monitor track only one transmitter. If the receive antenna allows more than one off-air signal to reach the monitor, the accuracy will be severely impaired.

Each transmitter's output frequency should be checked regularly with an accurate counter. The readings should be identical. After this test has been performed, locate a point in each overlap area and listen for the carrier beat period. The inverse of the period represents the frequency difference. If the carriers are precisely matched, there will be no beat.

A note of caution is in order regarding troubleshooting. In the event an oscillator malfunctions, it can be difficult to determine which oscillator has drifted by 0.4Hz if the frequency counter's display is limited to $1\text{Hz} \pm 1$ count. Having access to a highly accurate frequency counter is an absolute necessity.

Stereo operation

Synchronous operation and AM stereo compatibility are of concern to many stations. Tests seem to indicate that both types of AM stereo systems can work properly with synchronous transmitters. However, the necessity to precisely lock together the carriers is even more critical than when operating monaurally. You may even find it necessary to phase-lock the stereo pilots at both transmitter sites in order to keep some receivers in the stereo mode within the overlap area. It's best to contact the manufacturer of your stereo generator for specific guidelines on synchronous operation.

Other applications

Synchronous amplifiers might be used for more than just increasing coverage areas. Null-fill is one often-mentioned application. This technique could include the use of directional antennas or separate nighttime parameters.

So far, this discussion has considered only synchronous systems that broadcast the same programming on all transmitters. The question of broadcasting different programming on the synchronous transmitters also is in order.

Generally, the use of synchronous transmitters in this manner seems to be

ineffective. When the synchronous stations broadcast the same program, the carrier ratio necessary to prevent most of the interference ranges from 2:1 to 4:1 (6dB to 12dB).

In a case in which two stations broadcast different programs, the ratio of field strengths needed to overcome interference products is much higher, on the order of 300:1 or 50dB. For systems with separations of 30 miles or less, acceptable signals might be received within only a mile or so of either transmitter. Such a situation would be entirely unacceptable. Adding more stations to the system would probably jam the frequency to such an extent that reception would be impossible over large areas. Besides, current FCC rules prohibit such operation.

A synchronous amplifier is not a cure-all for coverage problems. Judiciously used, it can, however, significantly improve the marketability of a station. A synchronous transmitter can return that city to your nighttime audience or fill a null while still providing the needed protection. Keep in mind that the mixing of the two carriers will produce some interference. The key to the effective implementation and operation of a synchronous installation is to restrict the interference to lightly settled and moderately

traveled areas.

This article is based, in part, on information from the sources listed in the bibliography. The author recommends that you read the source articles in the order in which they are listed, because one led to the next as the experiments were performed. Because some of these articles are more than 50 years old, finding them may be difficult, but the most likely resource center is the periodicals section of a university or technical college library.

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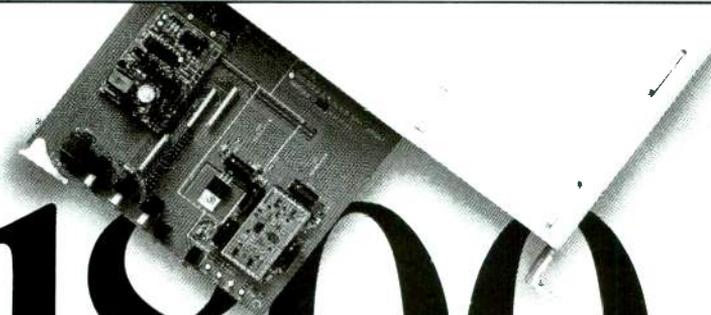


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NEC SP-3A CCD camera technology

By S. Ikeda, H. Nakajima, E. Oda, K. Umise, M. Shimizu and R. Deinhart



Image pickup devices used in video cameras designed for both broadcast and general-purpose applications are in the midst of a dramatic watershed. In the past two years, significant improvements have been realized in the non-tube-type solid-state sensors, specifically, the charge-coupled device (CCD).

Solid-state cameras intended for non-broadcast use have been available for several years, and have been incorporated into machine-vision, security and scientific applications. In the broadcast environment, use of solid-state cameras has been limited to telecine and other relatively narrow graphics tasks.

Full acceptance of the CCD camera as a legitimate broadcasting tool has de-

The authors are with NEC Broadcast and Video Equipment Division, Tokyo.

pended upon overcoming a number of characteristics that were common in early chip design. One of the more objectionable of these characteristics is the vertical smear encountered when shooting high-brightness objects. Considering typical shooting environments of ENG cameras, vertical smear can often interfere with the generation of acceptable video.

The vertical smear phenomenon was effectively addressed in 1985 with the introduction of the interline frame transfer chip, the μ PD3517 anti-smear CCD chip. This chip was incorporated in the NEC model SP-3A camera, which offered the virtual elimination of vertical smear and greatly improved performance characteristics in highlight scenes over previous models.

In 1986, NEC developed a step-variable, high-speed electronic shutter as an integral part of chip design. The electronic shutter provides improved dynamic resolution in the imaging capability of the camera. This improvement is realized both in the normal operating range of the camera (1/60 of a second) and in the high-speed shuttered applications for sports and motion analysis, where the shutter operates up to 1/2,000 of a second.

Full remote control of the electronic shutter functions in both multicore and triax remote-control camera control units have allowed electronically shuttered cameras to be used in a wide range of video production applications, news gathering and sports programming.

Improving dynamic resolution

The performance advantages of electronically shuttered CCD cameras draw on and amplify the already well-known operational characteristics of solid-state image sensor technology. Namely, no burn-in or sticking, no comet tailing, resistance against shock and vibration, stable permanent registration, high-contrast handling capabilities, high sensitivity, high signal-to-noise ratio, low running cost and virtually unlimited CCD life.

We are all familiar with the image blurring that results when recording fast-moving objects. Conventional scanning methods used in tube-type image sensors provide the equivalent shutter speed of 1/60 of a second. In the past several years, various methods have been proposed in an attempt to address this phenomenon. They include: camera heads or lenses using mechanical shutter assemblies, optical shutters, as well as non-standard high-rate scanning systems. All of these methods have their own disadvantages.

Mechanical shutters may have problems with reliability, power consumption and added weight. In the case of lens-shuttering systems, scanning inversion is necessary. Optical shutters tend to lack transparency. Non-standard high-rate scanning systems tend to be both physically large and expensive.

The use of an electronic shutter as an

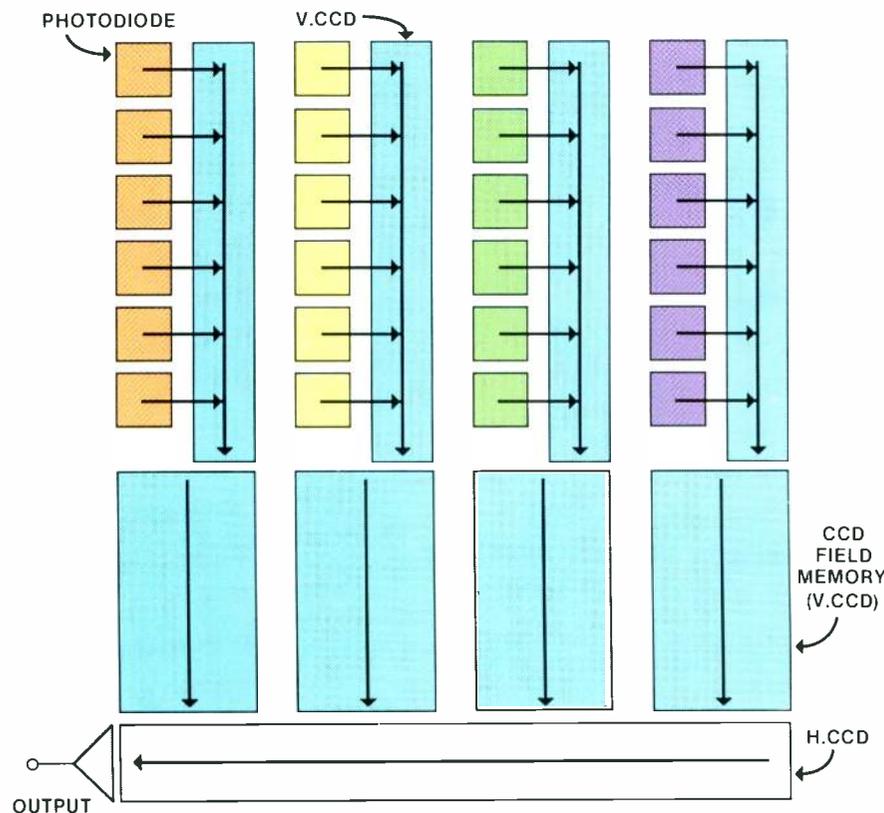


Figure 1. In the interline frame transfer CCD, photodiode charges are stored in the V.CCD during vertical blanking and transferred line by line to the H.CCD memory.

integral part of CCD chip design remained the only viable, acceptable alternative to provide the shuttering function necessary to achieve better dynamic resolution efficiently and cost-effectively.

CCD electronic shutter

CCD image devices can be classified into two groups according to the construction of the vertical register: interline transfer and frame transfer.

In the interline transfer CCD, photo diodes and vertical registers are arranged alternately. Electrical charges stored on the photodiode during the vertical blanking interval are transferred to the vertical register, and then transferred, line after line, to the horizontal register to be

read out as the picture signal. See Figure 1.

The CCD used in the SP-3A camera is an interline frame-transfer device provided with a field memory between the vertical and horizontal registers. During the vertical blanking interval, the electrical charges on the photodiode are transferred to the vertical register and immediately transferred at high speed to the field memory. The high-speed clock drive is 100 times faster than the normal line transfer rate. This high-speed transfer significantly reduces the time during which the vertical register section may be affected by smear. This technique reduces the smear phenomenon in the SP-3A camera to 1% of its previous design. Thus, vertical smear will not occur when

bright objects such as headlights at night, or sunshine through leaves, become a part of the frame.

When the anti-smear chip is coupled with the advantages of CCD technology, the camera operator is provided with a tool that opens up an entire range of creative possibilities. Scenes previously considered difficult or impossible to shoot (because of extremely bright highlights) now become manageable.

Electronic shutter function

The electronic shutter developed for the SP-3A takes advantage of the interline frame transfer CCD chip.

In the interline frame transfer sensor, the smear component in the vertical reg-

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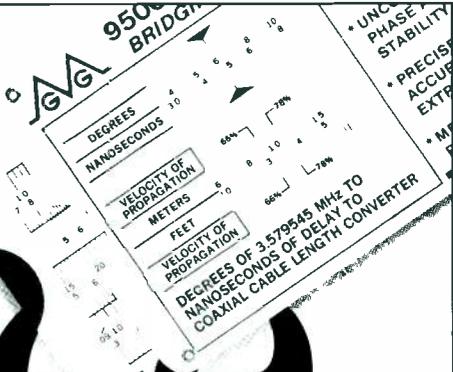
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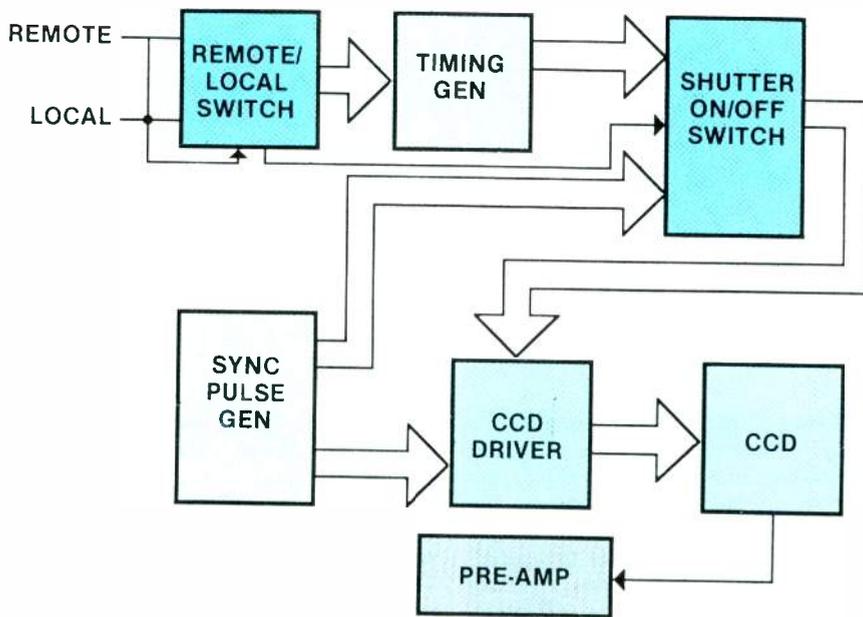


Figure 2. The electronic shutter of the SP-3A operates as pulses from the timing generator are inserted in the picture interval. This causes premature dumping of photodiode charges into the vertical shift register.

roduced into the energy path. The electronic shutter function sweeps out a portion of the electrical charge (together with the smear component) from the vertical CCD during the off-time of the shutter interval. Variable shutter-speed control is accomplished by varying the charge storage time in the light-receiving section.

As the block diagram in Figure 2 indicates, the shutter control is initially determined as local or remote. Transfer gate pulses at the timing generator are inserted in the picture interval, which causes a premature dump of the photodiode charges into the vertical shift register. The sync pulse generator references the CCD driver that controls the CCD itself. Picture output is then channeled out of the horizontal CCD to the source follower FET pre-amp on the chip.

The charge storage time controlled by the electronic shutter theoretically can vary as an integerⁿ times the horizontal driving period according to the formula: $(\frac{1}{2})^n \times 1/60$ (where n is an integer). In the SP-3A, the charge storage time is set at 1/60, 1/125, 1/250, 1/500, 1/1,000 and 1/2,000 of a second. The storage time at 1/60 is equivalent to one vertical interval in the normal operating range of a video camera. In effect, the electronic shutter is off.

ister is transferred at a high speed to the horizontal register. It is then absorbed by the overflow drain in that register. A new charge is then transferred from the

photodiode to the vertical register. It is at this point of transfer, from the photodiode to the vertical CCD register, that the electronic shuttering of the camera is in-

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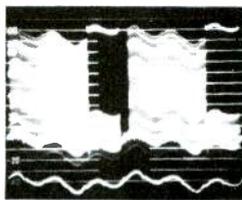
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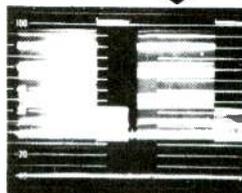
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Figure 3. The charge storage time in the sensor is directly related to the shutter speed. The letter H does not refer to lines, but to the time period related to the number of lines scanned.

Shutter Speed and Charging Time	
SHUTTER SPEED	CHARGING TIME
1/2,000	8H
1/1,000	16H
1/500	32H
1/250	64H
1/125	128H
1/60 (OFF)	1V

When the electronic shutter is set at 1/2,000, the storage time has been reduced to the time period equivalent of eight horizontal lines. It is important to note that in Figure 3, which illustrates the relationship between the shutter speed and the charge storage time in the sensor, the expression of the letter H does not refer to the number of lines scanned, but to the time period related to the number of lines shown.

In the SP-3A, the scanning interval rate remains fixed at the field rate. The electronic shuttering function controls exposure time, with the faster shutter speeds and shorter exposure times yielding the highest dynamic resolution and the greatest stop-action clarity. Every doubling of the shutter speed reduces the signal level by one-half. When the lens iris is opened by one f/stop, light admitted into the lens is doubled and the initial signal level is obtained.

Although the fastest shutter speeds may not always be acceptable for night-time or indoor sports use, speeds of 1/250 are typical. Beyond the obvious sports applications, many users find the improvements in dynamic resolution to be useful as an effective new production tool.

Editor's note: This article was adapted from an article that appeared in the NEC Synchronizer, Volume 3, No. 2, Winter 1986/87.

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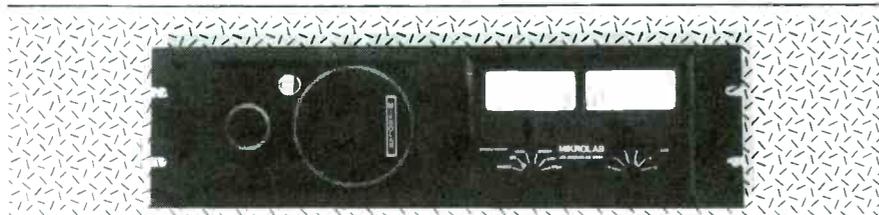
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See ad on page 59

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See ad on page 9, 181, 183, 185, 187

ICM Video Circle (796)

RS-400 series: passive routing switchers; -400, 12-in/1-out for video and stereo audio; -410, 6-in/1-out stereo audio; -420, 6-in/1-out video; video connections are 75 Ω BNC, audio are RCA 600 Ω unbalanced.

Image Video Circle (800)

VDA-980: video distribution amp, loop through 75 Ω differential input; selectable ac- or dc-coupling; trimpot gain adjustment to +10dB flat; back porch clamp jumpered; surface-mount devices; response to 50MHz.

ADA-990: audio distribution amp; two circuits per card for stereo application, or strap for more mono outputs; 1-in/12-out to +24dBm; response from 20Hz to 20kHz.

COMPARED TO OUR NEW APOCHROMATIC ZOOM, OTHER LENSES ARE A LITTLE ROUGH AROUND THE EDGES.



Chromatic aberrations. They can cause loss of picture detail. Color fringing. Poor color registration.

The introduction of broadcast CCD and high quality tube cameras means compromises like these are no longer acceptable in zoom lenses. To meet these new and demanding camera specifications, Schneider introduces the TV-56 APO-VARON 14X ENG/EFP Zoom.

The TV-56 is a major leap forward in TV zoom technology. Its true apochromatic design focuses the image formed in the three primary color channels in precisely the same image plane.

The result is rather eye-catching. Both longitudinal and lateral chromatic aberrations are significantly reduced. MTF is increased, and picture quality is greatly enhanced.

Lightweight and compact with a sturdy weather-proof housing, the TV-56 is the type of rugged performer you'll value for other reasons, too.

It has a 2X extender, macro focus, and a unique servo iris control built into the zoom pistol grip. The TV-56 is available with positional servo focus. And the lens accepts a wide range of EFP accessories, including an aspheric attachment for superwide fixed focal length.

So if you're concerned about your image, do something about it. Get Schneider's new TV-56 APO-VARON Zoom.

For more information or a demo, contact: Schneider Corporation of America, 400 Crossways Park Drive, Woodbury, NY 11797, (516) 496-8500.

Western U.S.A. Service: 861 Production Place, Newport Beach, CA 92663, (714) 631-7430.



Schneider
KREUZNACH
SHOOT FOR THE BEST.

Circle (150) on Reply Card

International Tapetronics/3M Circle (811)
Switcher: audio routing for radio; self-documenting; remote controllable; integral security, fail-safe memory; salvos; 16x16 mono, expansion to 128x128 stereo.

Leitch Video Circle (852)
ADA-881: audio distribution amp; 8-output modules; 100dB SNR; flat response; controlled roll-off; low distortion.
[See ad on page 77](#)

Lenco Circle (854)
PVA-352: VDA; 6-output/module, 75Ω, BNC connectors; $\Delta\phi < 1^\circ$, $\Delta G < 0.1\%$; SNR > 60 dB.

McCurdy Radio Industries Circle (878)
ADA-500: monaural audio DA; 1-in/6-out; input/output balanced; 10 modules per rack.
ADA-700: stereo 1-in/8-out DA; balanced inputs/outputs; toroidal power transformer; $< 0.01\%$ THD; SNR -121dB below max output.
[See ad on page 84](#)

Mitsubishi Pro Audio Circle (895)
ASC switcher: audio crosspoint routing, mixing switcher; 96-in, 64-out matrix; optoisolation of digital controls avoids ground loops; digital-controlled with IBM PC XT or compatible with interface card; housed in 19" rack.

Omicron Video Circle (933)
Model-470: dc-powered 1x6 A/V DAs; 5x1 AFV switcher; 11.5-17Vdc power required; video 6MHz bandwidth, audio response 50Hz-15kHz.
551-5/1-dV: component video switcher; 5x1 format.

Orion Research Circle (937)
Model 3900: A/V routing switcher; computer-control with CRT.

Pinnacle Systems Circle (956)
SX21 switcher: 2x1 video routing V1 switcher; driven by GPI output of Pinnacle 2000 series units; allows 1-channel system to simulate dual channel effects.

H. A. Solutec Circle (1021)
SOL-3450 video DA: for SOL-MODU rack series; 1-in/10-out with adjustable input levels; 75Ω, 10MHz bandwidth.
SOL-5532/-5532A: audio DAs; 1-in/7-out stereo; 20Hz-20kHz; -5532, transformer output; -5532A, active balanced output.

Southern Broadcasting Systems Ltd Circle (1182)
ADM-1067 audio switcher: modular routing system; 20x1, 10x1 stereo crosspoint cards; actively balanced in/out; for custom switching.
Alldesign amplifiers: ADM-1063 stereo audio DA, 1-in/10-out; ADM-1060 stereo line; EQ instrument, dual channels of 28 1/3-octave equalizer sections.

Utah Scientific Circle (1112)
B-spec DAs: audio/video DAs; modular system eliminates wired connections.
Video DA: dual configuration; each card contains two 1-in/4-out amplifiers; cable EQ; clamp, delay trims; allows 22 VDAs per rack with B-spec series rack frames.
[See ad on page 33, 163](#)

Videotek Circle (1129)
Times Six/Times Six Plus: six output black-burst generators for centralized control of timing; individual H, SC phase correction for each output; -Plus with digital horizontal lock with auto compensation for cable length and equipment drift.
[See ad on page 104-105](#)

Ward Beck Systems Circle (1134)
D8212 audio DA: MF-82 frame with 12 modules; dual redundant power supplies; *M8205 modules*, 1-in, 8-out; *M8206 matrix DA modules* 1-in, 6-out stereo.
Jack-field: uses QCP connectors.
RS-8024 routing switcher: 24x24 matrix, stereo.
[See ad on back cover](#)

Vehicles, video production, SNV

Dalsat Circle (685)
News vehicle: includes uplink antenna.

Giant Boom Box Industries Circle (1190)
Giant Boom Box: transportable, molded fiberglass broadcast booth; 5'x7' studio, prewired, air-conditioned; includes PA speaker systems.

Hubbard Communications Circle (794)
SNG-450 vehicle: Iveco Z-450T tilt cab; 160" wheelbase; 22,800-lb GVWR; spacious seating; easy access to electronics.

Midwest Communication Circle (891)
S-23: SNV/MSN vehicle; Iveco Z-450T chassis, 6-cylinder diesel engine; Vertex 2.6m offset-fed dual reflector antenna, 50.1dBi transmit gain meets 2° spacing spec; various TWTA options; production area; basic terminal, production equipment.
[See ad on page 1](#)

Riviera Leasing Circle (987)
Vehicular leasing: plans designed to fit broadcaster's needs.

Roscor Circle (994)
StarFleet-21: 3rd generation satellite news vehicle; E-350 Ford cutaway chassis; antenna mount, electronics racks combine to Rigid-Rack support system; current electronics packages.

Shook Electronic Enterprises Circle (1014)
Model 24-31: mobile production vehicle; 6-camera system; full complement of equipment for network quality requirements.

Television Engineering/TEC Circle (1069)
Remote vehicles: video production/ENG trucks; *TEC-18* based on GMC Sierra, 8,600-GVWR, V-8 engine; *TEC-19* based on Ford E350 Super Cargo Van, 138" wheelbase, 9,000-GVWR; both with 42 foot Will-Burt pneumatic mast, power generator, equipment racks, custom electronic packages.

Toshiba America/OEM Circle (1093)
Scooper: satellite news gathering system; portable, flyaway design.

Video Services Unlimited Circle (1126)
Scout: personal scooter unit, 1-cylinder 1.4-HP engine.

Wolf Coach Circle (1144)
ENG vehicles: lighter, smaller vehicle designs, based on Ford E-350 SuperVan, GM C-3 series chasses.
S-15 ENG: heavy-duty news car based in GMC S-15 Jimmy.

Test/monitoring equipment, tools, filters, delay lines

Allen Avionics Circle (520)
AV225B attenuator: variable for video; binary switchable attenuators from 0.1dB to 12.8dB, 0-25.5dB attenuation overall; 75W; nearly flat to 5.5MHz; usable to 30MHz.
ZL-series delays: zero-loss, rack-mount video delays; range to 2.270μs; response > 8 MHz; fine delay trim, variable gain.

Amber Electro Design Circle (527)
Model-8000: PC-based instrument controller and software; 8088, 80286 versions; one hard, two floppy drives; monitor, GPIB interface; XT/AT compatible.
5500 enhancements: software options; AudioCheck for audio measurement system; PC/XT/AT, compatible, allows GPIB instruments to be controlled with #5500; dc, phase measurements.

Audio Precision Circle (566)
System One software: APP-BTSC1: frequency response at 50% L+R modulation; main channel noise/hum; THD+N at 50% L+R; THD+N at 50% L-R; L-R/R-L separation at 10% equivalent modulation.
DCX-127 module: multifunction package for System One; 4½-digit dc VOM, two 20-bit programmable dc sources, 21-bit programmable parallel input/out, three 8-bit output ports for device or relay control.
BUR-GEN option: burst-noise-squarewave option adds tone burst, noise and square-wave generation capability to System One; allows dynamic processing, absolute polarity, transducer transient response, acoustic response and speaker efficiency tests.
[See ad on page 125](#)

B & B Systems Circle (575)
AM-2HR monitor: stereo phase measurement system, packaged in half-rack configuration.
AM-3B: real time stereo audio phase monitor; audible and CRT display of program phase, VU, peak threshold levels; L, R, L+R; aux inputs; internal headphone amp, speaker.

Broadcast Video Systems/BVS Circle (608)
EV4050 waveform monitor: A/B/C inputs, for Y/B-Y/R-Y, RGB, Y1Q, NTSC; parade, expanded overlays; Engineering Visuals, UK.
[See ad on page 196](#)

dbx Circle (693)
RTA-1 system: real-time analysis of music signals for broadcast, sound contractors, reinforcement; checks frequency response with 31-band (½-octave) system; does not require swept signals.

The Abekas A42 Video Slide Projector

With the introduction of the A-42 Video Slide Projector, we revolutionized the still store business. Now, three years and 300 units later, we let our customers tell the success story of the A-42. The widespread use of the A-42 by networks and TV stations across the country has set a new standard for the still store in the television industry.

The overwhelming acceptance of the A-42 was no accident. It was a pioneering effort from Abekas that did the job—for the right price.

This small but powerful

system is the answer for those seeking upward mobility. The A42 comes in single- or dual-channel configuration. Winchester-style hard disks provide an on-line storage capacity of up to 1050 frames/2100 fields. A digital 1/4" cartridge tape provides easy-to-handle, cost-effective, off-line storage. An optional library system gives the user simple yet sophisticated file management for up to 10,000 on-line slides.

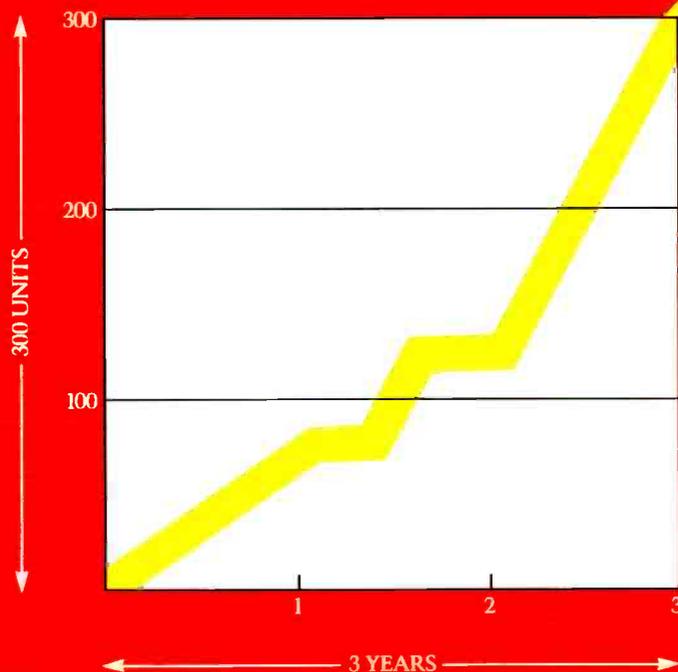
Discover the reasons behind the ever-growing list of our customers. Find out from them why the A42 can't be topped when it comes

to outstanding reliability and price/performance. For details and a complete A42 customer list, contact us at: Abekas Video Systems, Inc., 101 Galveston Drive, Redwood City, CA 94063. (415) 369-5111.

Abekas
Video Systems, Inc.

Now Anything is Possible

Setting the Standard in Still Stores



Circle (151) on Reply Card

COMPONENT ACCESSORIES

DOWNSTREAM KEYERS

WAVEFORM MONITORS

COLOR CORRECTORS

TRANSLATORS

DECODERS

ENCODERS

broadcast video systems ltd.

40 West Wilmot Street, Richmond Hill, Ontario L4B 1H8
Telephone: (416) 764-1584 Telex:06-964652

Circle (152) on Reply Card

Electronic Visuals Circle (730)
EV4050 waveform monitor: A, B, C, ext. ref. inputs; for Y/B-Y/R-Y, RGB, YIQ, NTSC; parade, expanded overlay display includes color difference signals.

Hamlet Video Int'l Circle (1191)
HVI202 videoscope: ac or battery-powered; in dual NTSC/PAL versions with top and bottom displays or single full screen; display is on video monitor, not separate CRT; information can be recorded for later analysis; RAM retains information of level changes during production.

HM Electronics Circle (788)
PAL audio test: precision wireless audio link, allows processing of signal measurement data; interface to TEF systems.
[See ad on page 157](#)

HoweTech Circle (793)
Phase Analyzer: test instrument; detects relative phase error between two input sources user selected phase compensation may be applied to either channel.
[See ad on page 175](#)

Jensen Tools Circle (818)
TELVAC: economy tool kit.
23B840: VCR alignment kit; precision tooling.
480B230: optical fiber splicing kit.

J-Lab Circle (819)
Clamper: converts triggered sweep oscilloscope to precision waveform monitor.
[Continued on page 199](#)

It's 3:55 a.m. Do you know what your transmitter is doing?

Now your transmitter can alert you to problems by phone — anywhere, anytime with the VRC-1000 Remote Control. A preprogrammed, synthesized voice quotes parameters; you make adjustments right on your Touch Tone® phone. Or you can dial from any

where with complete remote control capabilities.

- VDT and printer options
- Full automatic commands
- Fully secure
- Automatic alarm reporting and correction.

GENTNER
SOUND THINKING

Patent Pending

P.O. Box 32550 • San Jose, California, 95152 • (408) 926-3400
Telex II 510-600-1445 GENTNER RF PRDT

Circle (153) on Reply Card



Switch to the brightest displays for every TV signal!

No matter what TV signal you have to analyze, the new Philips Waveform Monitors & Vectorscopes do the job best. Work with the brightest, crispest displays – for the most effective performance.

■ **PM 5665 & PM 5667/68 Waveform Monitor & Vectorscope.** The ultimate in measuring and monitoring. Even VITS appear with greater clarity. And PM 5668 features Sc-H phase.

■ **PM 5661 Waveform Monitor/Vector-scope.** Two instruments combined in one lower priced unit. Compact and highly competitive.

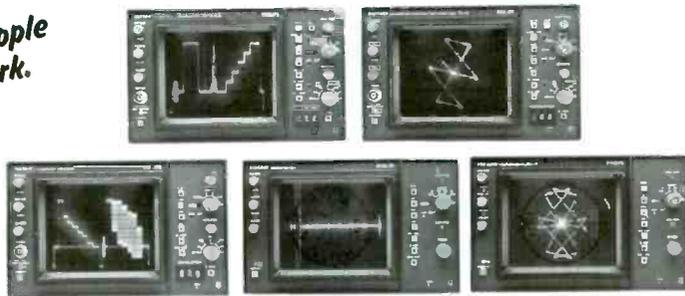
■ **PM 5662 Waveform Monitor/Vector-scope.** A combined, portable unit with Sc-H phase display. Ideal when space and power are limited.

A whole new range of Philips Waveform Monitors & Vectorscopes are now ready to fill all your TV-signal monitoring and measuring needs, no matter where you have to work. With, of course, worldwide Philips service guaranteed for a unit's entire product lifetime.

Test the difference

All over the world, in broadcasting, program production and set manufacturing, Philips Professional Television instruments are used when state-of-the-art technology is needed to ensure the highest test and measuring standards. That's why we say with pride ...

*Every day,
over a billion people
watch us work.*



Test the difference and you'll also agree that Philips wins on price and performance!

Philips Test & Measuring Instruments, INC.
85 McKee Drive, Mahwah, New Jersey 07430
(201) 529-3800 TWX 710-988-5348

For the Philips Sales Office or Representative nearest you call Toll Free 800-631-7172



**Test &
Measurement**

PHILIPS

Circle (154) on Reply Card



PESA

The "NEW SWAT PLUS"

Best Stations and Production Houses Assistant

automatic analysis of all sync parameters of the video signal * video monitor output * local liquid crystal display * two independent video inputs * manual/automatic testing modes * alarm indicators for parameters out of tolerance * self-test software * RS 232 output to feed printer or PC * PAL/NTSC version.

Standard Measurements

Watcher-Analyzer:

- * sync and burst amplitude
- * horizontal sync width
- * number of cycles in burst
- * breazeway
- * number of vertical sync pulses
- * equalizer width
- * vertical pulse width
- * SC/H phase up to two degrees
- * SC frequency error up to 0.2 Hz

PLUS

- New * Horizontal Blanking Width
- New * Vertical Blanking Width
- New * Front Porch Width
- New * Amplitude in mV (PAL)
- IRE Units (NTSC) measurements also
- New * VITS Information detection

Timer:

- * H and V lock
- * PAL lock
- * H delay and SC phase delay between Inputs A and B
- * S ync
- * W atcher
- * A nalyzer
- * T imer



Pesa Electrónica, S.A.

Albalá, 12 - 28037 Madrid (Spain) - Telex 48449 PESAE E - Tel.: 754 00 78

Pesa America Inc. 6073 NW 167th St.-Unit C-4 Miami FL 33015 (USA) - Telex: 6712435 PESAM - Tel. (305) 556 - 9638 - Toll Free: 1-800-USA-PESA (USA, Canada, South America, Caribbean)

Pesa International Ltd. The Paddocks 347 Cherry Hinton Road, Cambridge CB1 4DJ (U.K.) - Telex: 81678 PESA I G - Tel.: (223) 24 26 42 (UK, Europe, Middle East, Africa, Far East, Australasia)

The affordable hi-tech.

Circle (155) on Reply Card

Continued from page 196

LEA/Dynatech Circle (843)
Kleen-line 2: redesigned surge eliminator; 120V lines at 10A, 15A, 30A ratings; four circuits available; for solid-state equipment transient protection.

Leader Instruments Circle (845)
LCG-420 modules: -U02 pulse, bar generator; -U03 linearity module; for NTSC test signal generator.

LCG-410 generator: digital test set; NTSC/SMPTE bars, staircase, modulated staircase, multiburst, 2T/12.5T pulse/bar, window, dot/crosshatch, red/white raster; 10-bit to analog.

LCG-409 NTSC source: battery-operated portable pattern generator.

LVG-1604 programmable: video generator; high resolution raster scan CRT displays; dot clock rate to 131MHz; battery-backed RAM, EPROM memory of display conditions; RS-232C.

LMS-238 generator: low cost MTS source; complements LMS-237; for test, alignment of stereo, SAP decoders; on-screen displays indicate selected stereo or mono operating mode.

LBO-315 oscilloscope: 60MHz ac/dc test unit; 10-lb with battery; dual time base, calibrated delay, alternate expanded sweep.

See ad on page 5

Leitch Video Circle (852)
ATG-880: audio tone generator, switch-selectable frequencies from 400Hz to 1kHz; four dual 600 outputs at -10, 0, +4, +8 dBm output levels.

ITG-3400N generator: inserts eight standard NTC-7, CCIR, FCC signals into vertical interval; signals from integral 12-bit digital waveform generator.

See ad on page 77

Magni Systems Circle (866)

2015PL enhancements: programmable signal generator; test signals for NTSC, PAL, Betacam, M-II, SMPTE-RGB, HDTV, DV-422 digital, SMAC and others; PAL, versions B, G, H, I, N are included; upgrade option for 2015 system owners is available; DV-422 meets CCIR 601.

1515 enhancements: video signal generator; upgrade includes dual timing pulse, component analog signals encoded to NTSC; bowtie with 10ns incremental timing marks.

Matthey Electronics Circle (875)

Matthey VSA series: low cost video filters.

Matthey-4.22LC: 3-stage filters, for pre/post-filtering in digital video systems; video frequency, low pass.

Merlin Engineering Circle (883)

MVW-200 multiscopes: Snell/Wilcox multi-standard waveform, vector monitor, decoder; RGB outputs; electronic graticules; 3-input, with auto selection from six standards; portable or rack-mount.

ME-178: central air package; Kellogg Hydrovane compressor; quiet operation; 100psi air flow for four quad VTRs.

Microsonics Circle (888)

Components: video data filters; oscillators

(VCXO, TCXO, OCXO); crystal filters.

Minolta Circle (893)

CS-100 colorimeter: for spot metering of light source or surface color; non-contact tristimulus spot unit; SLR viewing system; center circle shows what is being measured; LCD displays show luminance value, x/y chromaticity coordinates.

PESA Electronics Circle (953)

ASC-4652-C SWAT Plus: analyze sync, blanking parameters of video signal; EIA, CCIR versions via TV standard PROM; out-of-tolerance alarms; status on B/W monitor or 40-character LCD panel; RS-232 port; timer mode; comparison of A, B signals.

See ad on page 198

Philips T&M Circle (954)

PM5661 combo: waveform, vector monitor functions in single unit reduces space, power requirements; 1-button control transfer from waveform to vector display.

PM5662 combo: waveform, vector and SC/H phase monitoring includes flat, luminance, chroma and $\Delta\phi/G$ measurements with a single instrument; dual video and external sync inputs; line selection.

PM5665 separates: waveform monitor instruments; push buttons select vertical channel mode; A, B and probe inputs; improved CRT brightness ΔG , X-magnified and line selector; pairs with PM5667.

PM5667/PM5668 separates: companion vectorscopes for PM5665; high brightness CRT; push-button selection of standard display, +V, PAL, $\Delta\phi$ and references (internal,

INTRODUCING TWO NEW BULK ERASERS THAT WILL WIPE OUT YOUR VIDEO TAPE LIBRARY.

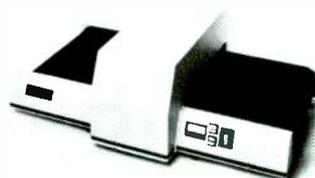
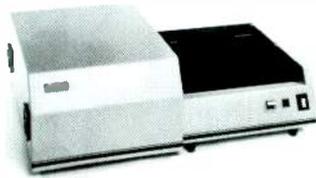
Data Security's Type II — the revolutionary bulk eraser for 1500 Oe metal particle video tape.

The new Sony Betacam SP and Panasonic MII are using an advanced 1500 Oe metal particle video tape that presents a new challenge to degaussing equipment. For rerecording integrity, tape manufacturers specify a minimum erasure level of -60dB on tape saturated with a square wave signal of 25kHz at 30ips. At best, conventional erasers will erase to only -40dB.

Data Security's new Type II is the only eraser on the market which will erase this signal to manufacturers' specifications. And then some. The Type II actually erases 1500 Oe metal particle video tape more than -80dB.

This powerful new bulk eraser meets U.S. government specifications for erasing sensitive information on high energy tape and it has just become available to the broadcast video industry. So you can now use and reuse the advanced new high quality tape media on the market.

And wipe out expensive tape replacement costs.



The TC-14 — today's most cost-efficient eraser of conventional 700 Oe magnetic tape.

In a 15 second cycle, this machine will completely erase long wave audio and control tracks, along with short wave video tracks on conventional

cobalt ferric oxide high energy tape. A typical video signal is wiped out to -90dB.

The TC-14 accommodates reels up to 14 inches. And the conveyor belt for this eraser enables you to fully automate your degaussing stations. This transport system provides for a variety of tape formats with no adapters or adjustments.

The TC-14 offers you the best of conventional technology at the lowest price available.



DATA SECURITY, INC.

2801 N. 27th Street Lincoln, NE 68521

1-800-225-7554

402-464-5858

^{NEW} The Standard Of The Industry...Townsend

Townsend Broadcast Systems stunned TV broadcasters with the unveiling of a totally new line of products at the 1987 NAB.

Not only new looks . . . but technology with a purpose . . . to improve the on-air performance of your station. Transmitters with on-board digital control with status panels to check overall operation at a glance. Video cart automation with foolproof controls for non-technical operators. All new products built with American technology and backed by 24 years of proven support.



DC-80 Video Cart Automation System

- Up to 24 transports.
- Anti head-clog system.
- Software controlled, with host computer.
- Eliminates operator errors.
- Improves on-air video and audio.
- Stereo audio standard.



TB-30TL 30 KW VHF Low Band Transmitter

- Single tube type.
- Triode simplicity.
- Quick look status.
- Memory of last 16 faults.
- Redundancy throughout.
- On-air reliability.

TOWNSEND
BROADCAST SYSTEMS INC.

79 Mainline Drive, Westfield, MA 01085
Tel. 413-568-9581 TELEX #710-356-1521

8222 Jamestown Dr., Suite C-131, Austin, TX 78758
Tel. 512-836-6011 or 800-252-9792
in Texas or 800-531-5232

Circle (158) on Reply Card

B, external); 5668 includes SC/H phase measurement capability.

See ad on page 197

Porta-Pattern Circle (960)
BBC #64: HDTV test chart; wide tonal range in 16:9 aspect ratio; 4-step grey scale; 2, 10, 20, 25MHz response grating, three H, one V; 6500°K illumination required.

Potomac Instruments Circle (961)
QuantAural QA-100: audio program analyzer; measure peak level, processing effectiveness, tightness of sound (peak density), tonal balance, stereo image width, aural intensity.

QA-500 generator: prototype; four independent audio sine wave generator modules, one noise generator, timing module; pre-programmed tests for distortion, effectiveness, asymmetry.

See ad on page 144

RAM Broadcast Circle (976)
PS-2000: 3-channel audio phase scope.

Rohde & Schwarz Circle (991)
ODF digital TV oscilloscope: 10-bit A/D conversion; resolution to 1/1024 of the display height; evaluate video signals, band-pass filters, staircase differentiation; multiple graticules, tolerance masks electrically inserted into display; recall of stored displays and slow sweep scans.

UVF analyzer: makes automatic video measurements; 12 pre-set parameters per FCC-73.699 VITS, 16 parameters per NTC-7 specs; stores user-defined tolerances in non-volatile EEPROMs; 4-8 sampling modes evaluate different VITS lines; IEEE-488 bus.

VSF video selector: IEEE-488 or manual controlled video switch for studios, transmitter sites, test departments; bandwidth to 20MHz; select from 10 inputs; four outputs of selected signal.

UPA analyzer: automatic audio analysis; broadband level meter, psophometer, integrated frequency meter; options for synthesized generator, wow/flutter meter, distortion meter and SINAD values.

Schmid Telecommunications Circle (1002)

SZ316/SZ346 SIAT: Short Interval Audio Test transmitter, receiver; takes response, distortion, noise, phase readings on operating audio network; requires 4-5 seconds for 16 different parameters to be tested and logged; printer; RS-232 PC interface.

See ad on page 126

SESCOM Circle (1008)
AG-1: audio generator, rack-mounted.
PG-1: video pattern generator, rack-mounted.

H. A. Solutec Circle (1021)
SOL-2020 meter: inserts 3-bargraph stereo audio level display into video; L, R channels, center is L+R, L-R; adjustable positioning; NTSC compatible; audio loss alarm, overload indicators.

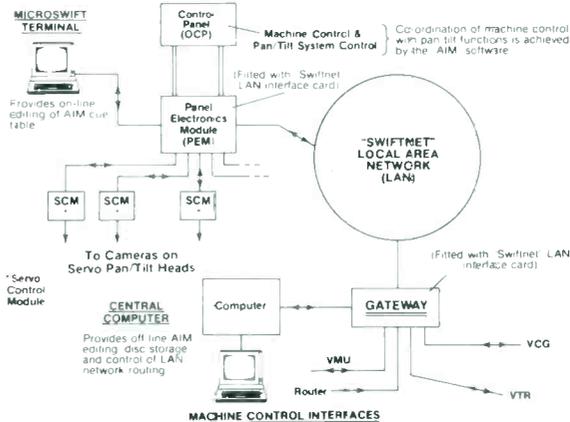
Sound Technology Circle (1026)
1530A MTS analyzer: 2-channel ac, swept frequency response, channel separation, phase error, noise wave analysis, optional IMD analysis; use with 3100A programmable oscillator for remote measurements;

Micro Swift

Remote Control with the right touch



TYPICAL CONFIGURATION OF MICROSWIFT MACHINE CONTROL



And you thought it wasn't remotely possible!

Vinten

 EQUIPMENT INC.

275-C Marcus Blvd., Hauppauge, New York 11788-2001
Telephone: 516/273-9750 Telex: 640470 Fax: 515/273-9759

Branch Office:

8115-B Clybourn Ave., Sun Valley, California 91352-4022
Telephone: 818/767-0306 Telex: 182686 Fax: 818/767-0772

Circle (159) on Reply Card

OUR FM MONITOR DESERVES A SECOND GLANCE.

BUT IT DOESN'T NEED IT.

Engineers look twice when they first see our 691 Stereo and SCA Monitor. But when they start to use it, they find the 691's meters are easily tracked in a single glance. Like everything else about the 691, its measurement displays are very well thought out.

A color-coded system ties together the associated displays, switches, and jacks for a particular function or test. Select your test by pushing a color-coded button and simply read the results on *all* of the indicators. It's as easy as it sounds.

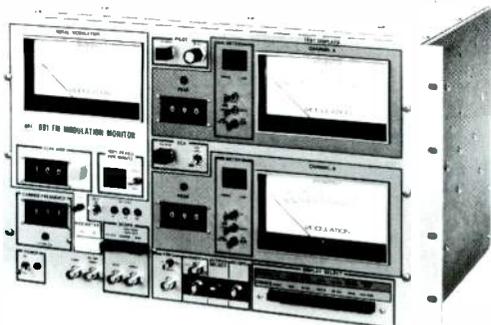
Other benefits of the 691 include over 40 proof-of-performance and signal quality measurements. Add a scope and use the 691 as a spectrum analyzer . . . or get a vector display of L/R phasing. Perform a Bessel-Null calibration in minutes. Measure clipped composite accurately and quickly.

The 691 can now be optionally ordered to measure two SCAs. There are many other features . . . write or call for complete information.

QEI Corporation

One Airport Drive □ P.O. Box D
Williamstown, NJ 08094 □ (609) 728-2020

Call Toll Free (800-334-9154)



Circle (160) on Reply Card

microwave results back to master control. *MSAT switching system:* passive relay switching for high-speed testing of multi-channel audio, video equipment and signal distribution systems; IEEE-488, RS-232 control; for systems from 8x1 channel format to 1,664 channels in 8-channel increments.

3000A test system: 3100A programmable audio generator; sinewave, squarewave, IMD, toneburst, sine-step waveforms; 3200A 2-channel analyzer measures phase, separation, response, IMD, THD; automatic remote operation; X-Y recorder, Epson printer output; units available as single package or in separate cases.

Audio Test: software allows control of 1500 series from IBM PC or compatible; measures Vac, azimuth, 2nd/3rd harmonic distortion, THD, response, separation, noise, flutter; graphic displays or hardcopy; data storage on disk.

See ad on page 37

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ADM-1051 oscillator: test signal source; manual, auto frequency sweep with selected linear, logarithmic curve; three preset ranges available from front panel, 5-LED display.

Tektronix

Circle (1063)

RSM software: Remote Site Monitoring for TekSPANS application software; links TEK 490P portable and 2750P lab spectrum analyzers with IBM PC/compatibles for remote-site measurement.

2710 analyzer: VHF/UHF coverage from 10kHz-1.8GHz; 5MHz IF bandwidth; 4-trace digital storage; full marker/delta marker control; comprehensive time domain measurements.

1735 monitor: dual standard waveform monitor for NTSC, PAL; auto 50Hz/60Hz detection; programmable setups; dual input, filter displays.

1705 spectrum monitor: for satellite news use; identify spectral pattern of satellite signal; L-band, 70MHz IF inputs; selected resolution bandwidth, span per division; center frequency with CRT readout; video filter.

VM700 prototype: automatic video measurement set; complete video monitoring, measuring; RS-232C interface to hard printer; bright displays in digital waveform, vector, picture monitor modes; freeze signal for reference; control menus, soft keys.

Model 751: BTSC aural modulation monitor/decoder, production models; graphic display of total, main, stereo, SAP and Pro modulation; pilot injection.

760 stereo monitor: CRT display of stereo signal phase; three high resolution bargraphs show left, right levels and selected sum, difference, or aux input.

See ad on page 28-29

Television Equipment Assoc.

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Matthey VSA series: low cost video filters.

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VPH-360: SC/H phase indicator; connects to any vectorscope for precise observation, measurement of timing, color framing information; generates H-phase markers; absolute indication using Field 1 ID pulse; resolution to within 1°.

TVM-620: combo waveform monitor, vec-

Circle (1129)

torscope; NTSC, PAL, PAL-M; 1/2-rack format; μP-based control, tactile membrane panel; observe one, two or three signals individually or in combination as parade or overlay; view one input in flat, low pass, chroma modes.

See ad on page 104-105

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News

Continued from page 4

tion equipment uses five to 10 times the bandwidth of an NTSC broadcast channel.

It has been suggested that the SHF band, in particular the 12GHz band, might be an alternative. Propagation data in this band, however, is limited to satellite and point-to-point usage. Whether wide-range terrestrial broadcast coverage, with sophisticated video and audio signals, can be achieved on a practical basis will be studied in the ATSC tests.

Several systems are being developed for the distribution of HDTV signals, via terrestrial and satellite broadcast, cable and video recordings. The 8.1MHz MUSE system was developed by NHK, the Japanese Broadcasting Corporation, for DBS, tape and disc, and was used by the NAB and the Association of Maximum Service Telecasters in a UHF terrestrial broadcast demonstration earlier this year. A system using two separate signals, one of which is a standard NTSC channel, is being developed by the New

York Institute of Technology. Another 2-signal system is being developed by North American Philips.

Anyone interested in participating in this work should contact the Advanced Television Systems Committee at 1771 N St. N.W., Washington, DC 20036; telephone 202-429-5345.

RTS forms American center

The London-based Royal Television Society (RTS), which celebrates its 60th anniversary this year, is forming a North American center. The decision was made at a meeting of more than 30 RTS members who attended the NAB convention in Dallas.

The RTS has more than 3,000 members and more than 100 organizations are patron members. The Dallas initiative will create the society's first overseas center.

The meeting of North American members was organized and chaired by Peter Marshall, a former chairman of RTS. He was elected as chairman of a steering committee that will be responsible for setting up the North American center and planning the initial program. The other members of the committee are: Mark Sena (Communications Equity Associates, Tampa, FL); Jim Lacko (NBC, New York); Irving Rosner (Rosner TV Services, New York); Michael Paull (Electro and Optical Systems, Toronto); Roger Carter (KAET-TV, Tempe, AZ); Nathan Hughes (Consultant, Richardson, TX); and Alan Godber (NBC, New York).

IEEE sponsors 37th Broadcast Symposium

The 37th annual fall Broadcast Symposium sponsored by the IEEE Broadcast Technology Society will be held Sept. 17-18, at the Washington Hotel, Wash-

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For more information contact L. Robert du Treil, du Treil-Rackley, 1200 18th St. N.W., Suite 607, Washington, DC 20036; telephone 202-659-3055.

BKSTS holds 10th convention

The 10th International Film and Television Technology Conference and Exhibition is scheduled for June 26 to 30. It will be held at the Metropole Hotel, Brighton, England. For information, contact the British Kinematograph Sound and Television Society at 01-242 8400 or 01-405 3560. Both numbers are in London. The address is BKSTS, 547-549 Victoria House, Vernon Place, London, England WC1B 4DJ.

The technical program will stress film, but include HDTV slide-scanner design, improved motion portrayal of film on television and developments in video-to-film transfers. Computer-generated graphics in real time and 3-D rendering also are included in the schedule.

By Howard T. Head

DBS is being pushed in Portugal

Promoters of the various Direct Broadcast Satellite (DBS) services have singled

out Portugal as an attractive new market for DBS. TV broadcasting in Portugal is provided by Radio Televisao Portugal (RTP) and consists of a choice of two channels, starting late and ending early, with much entertainment programming. Operation is financed by an annual tax of about 35 U.S. dollars on each TV receiver.

British DBS is available, but faces the handicap of being programmed only in English, although a team of linguistic experts is employed to make sure that the English language used is simple and easy for foreign-speaking persons to understand. A wide variety of programs is available on the British satellite. There have been some experimental DBS transmissions in other European countries with multiple-language soundtracks, but these are not yet available on a regular basis.

Private TV broadcasting is in ferment throughout Europe. The NAB has commissioned a study of media opportunities for U.S. broadcasters in Western Europe. The study will be run by the private U.S. Worldwide Media Group. France recently awarded two private TV broadcasting licenses to prominent French groups, and regulations to provide private television for Spain have been promised by the government before the end of the current session of Congress this spring. Private television has also been promised for Portugal.

VCRs are just beginning to catch on in Portugal, and cable television has yet to make any real start.

DBS is approved for West Germany

Direct Broadcast Satellite (DBS) service has been approved for West Germany (the Federal Republic of Germany). The satellite, TV-SAT1, designed and built by the German government with French cooperation, will be launched into space this August, using a French Ariane rocket. TV service is expected to begin shortly thereafter.

Approval came on March 13, following more than three years of debate by the West German Bundestag. The principal sticking point had been the role of the government in the regulation of content and management of private television. West Germany has been slow to adopt regulations controlling private television, which will be assigned to two of the five TV channels provided by the new satellite. Several high-quality sound channels, some with digital modulation, also will be provided.

The agreement awaits formal approval that was scheduled for April. It also must be ratified by the individual German states, but this is just a formality.

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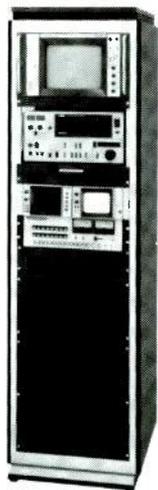
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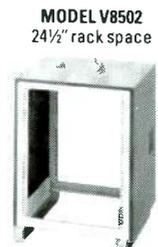
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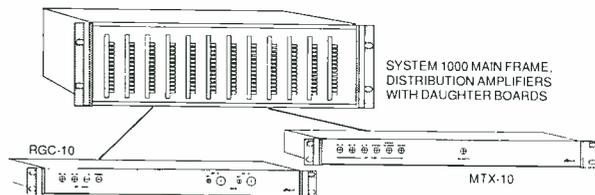
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ILLINOIS INSTITUTE
OF TECHNOLOGY
IIT CENTER
Chicago, IL 60616

Affirmative Action/Equal Opportunity
Employer M/F

UNIVERSITY OF FLORIDA AUDIO ENGINEER: Responsible for maintaining and installing audio and audio processing equipment in both the studio and transmitter site. Requires a High School Diploma and at least two years of experience in the maintenance, design or construction of Technical broadcasting equipment. Possession of a General Radio/Telephone license is highly desirable. Salary range, \$14,073-22,863 commensurate with qualifications. Send complete resume to Central Employment Center, 4th Floor Stadium, University of Florida, Gainesville, Florida 32611 by June 30, 1987. Refer to ID #11828. EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER. 6-87-11

FULL-TIME MAINTENANCE ENGINEER — studio and transmitter. Should have technical school training. Experience helpful — Strong desire to gain broadcast experience. Send resume to: Station Manager, Drawer D, Hardin, Montana 59034. EOE. 6-87-11

ASSISTANT CHIEF ENGINEER, minimum five years radio maintenance experience, FCC general and SBE certification preferred. EOE. WHBC — P.O. Box 9917, Canton, OH 44711. 6-87-11

DIRECTOR OF ENGINEERING for major university Telecommunications Center. Responsible for design and implementation of all technical facilities and compliance with all applicable FCC rules and regulations. Will supervise Center maintenance, capital expansion, and management of technical personnel and budgets. Minimum requirements: BSEE or related degree plus 7 years of progressive and related technical experience, and 2 years in an administrative capacity. Equivalent combinations of education and experience may substitute for stated qualifications. Experience in satellite systems maintenance and operation desirable. For full consideration resume should be received by July 15, 1987. Send to: Marshall E. Allen, Director, Telecommunications Center, Oklahoma State University, Stillwater, OK 74078-0585. OSU IS AN AFFIRMATIVE ACTION/EQUAL OPPORTUNITY EMPLOYER. 6-87-11

WANTED: AGGRESSIVE ENGINEER for AM/FM combo in Cincinnati-Dayton, Ohio market. Must be good trouble-shooter, hard worker, and love radio! Reply to Broadcast Engineering, P.O. Box 12901, Dept. 681, Overland Park, KS 66212. 6-87-11

REGIONAL SALES MANAGERS: Otari is seeking high profile individuals with strategic sales management skills to direct regional sales efforts for our top-line special and professional audio tape recorder products. **Mexico, Central & South America:** Fluent Spanish and sales management experience will provide the background essential for this assignment. Working closely with representatives, dealers, sound contractors and end users, you'll work all channels to ensure our aggressive sales goals are met. Part of this effort will involve attending dealer/trade shows, preparing detailed call/travel reports, and keeping a close watch on competitive activities such as technical advancements, pricing and sales policies. You will compose marketing plans for the region. Although you will be based in the San Francisco Bay area, travel will be extensive. If you are a self-motivated professional, with 4 years experience marketing to Mexico, Central and South America, and you possess an AA or equivalent, in magnetic recording technology, we'd like to hear from you. **North Central Region/Chicago Based.** In this senior level assignment, you will represent our MTR-90 Master Multi-Track — which offers the industry's most advanced tape drive system — and stands at the forefront of a comprehensive series of mastering and production recorders. Day-to-day activities involve working closely with independent representatives, dealers, sound contractors, and end users in order to reach and surpass established sales goals. You will need effective communication and presentation skills to make contacts at trade shows. Strong organizational skills are essential for preparing and updating regional marketing plans. If you are a self-motivated professional, with 3 years sales experience within the magnetic tape recording industry, or if you have 1 year sales experience and an AA in magnetic recording technology, we'd like to hear from you. Please send resume with salary history to Personnel, Otari Corporation, 2 Davis Drive, Belmont, CA 94002. (NO PHONE CALLS. PLEASE.) Equal opportunity Employer m/f/h/v. 6-87-11

TV BROADCAST TECHNICIAN for aggressive, small market NBC UHF TV station. Must have 2 years experience in TV station systems, camera, video tape machine, and transmitter repair. Will be on call. Quality workmanship a must. EE degree preferred. Send resume with requirements to Chief Engineer, 13 E. Washington Street, Hagerstown, MD 21740. EOE. 6-87-11

Advertising sales offices

CHICAGO, ILLINOIS

Tom Nilsen
Phone: (312) 887-0677
(312) 887-0684
15 Spinning Wheel Rd.
Ste. 430
Hinsdale, IL 60521

NEW YORK, NEW YORK

Diane Gottlieb-Klusner
Phone: (212) 702-3404
Josh Gordon
Phone: (212) 702-3405
866 Third Ave.
New York, NY 10022

SANTA MONICA, CALIFORNIA

Herbert A. Schiff
Phone (213) 393-9285
Jason Perlman
Phone (213) 458-9987
Chris Woodbury
Phone (213) 451-8695
Schiff & Associates
501 Santa Monica Blvd., Ste. 504
Santa Monica, CA 90401

LONDON, ENGLAND

Nicholas McGeachin
Intertec Publishing Corp.
Roseleigh House
New Street
Deddington
Oxford OX5 4SP
England
Telephone: (0869) 38794
Telefax: (0869) 38040
Telex: 837469 BES G

NORWOOD, AUSTRALIA

Haswell, Williamson, Rouse Pty. Ltd.
P.O. Box 419
Norwood 5067, Australia
Phone: 332-3322
Telex: AA87113

TOKYO, JAPAN

Haruki Hirayama
EMS, Inc.
Sagami Bldg., 4-2-21, Shinjuku
Shinjuku-ku, Tokyo 160, Japan
(03) 350-5666
Cable: EMSINPERIOD
Telex: 2322520 EMSINJC



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