

BROADCAST engineering

July 1983/\$3



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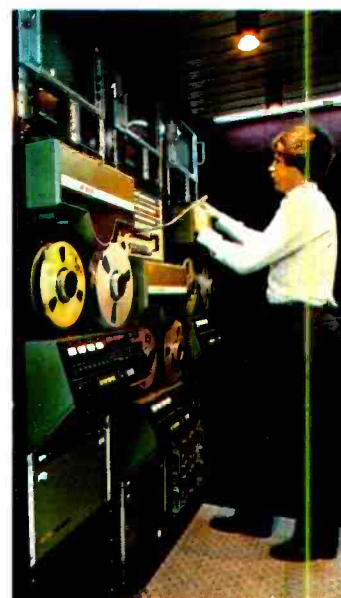
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BROADCAST engineering

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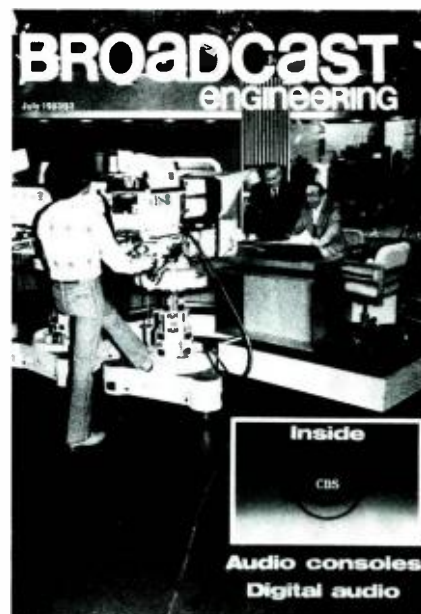
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THE COVER this month shows Studio 46, the WCBS news studio inside the CBS Broadcast Center in New York. Two engineers from CBS Operations are inspecting the studio floor plans. Standing (left) is Jack O'Donnell, director of Technical Services. Sitting (right) is Bob Hammer, vice president of CBS Operations.

Two articles, a view of the remodeling activity at CBS Operations and an interview with Hammer, appear in this issue.

WOSU Broadcast Engineering Conference

- Aug. 16-18, 1983
- WOSU-AM/FM/TV
- Ohio State University
- Columbus, OH

Time is drawing near for the Third Annual WOSU Broadcast Engineering Conference. John Battison, director of engineering, WOSU, has assembled an exciting program of papers, workshops and exhibits for this year's meeting. Details may be found on page 86.

NEXT MONTH:

- Audio processor roundup
- Modulation monitors
- Still-store update
- Montreux-'83 highlights

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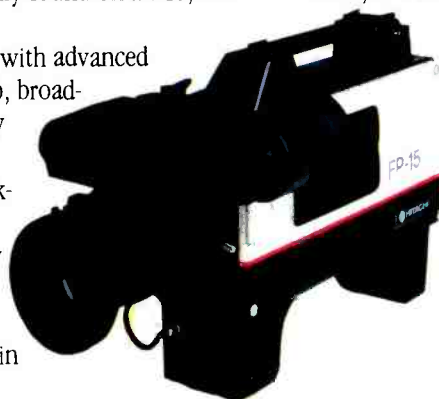
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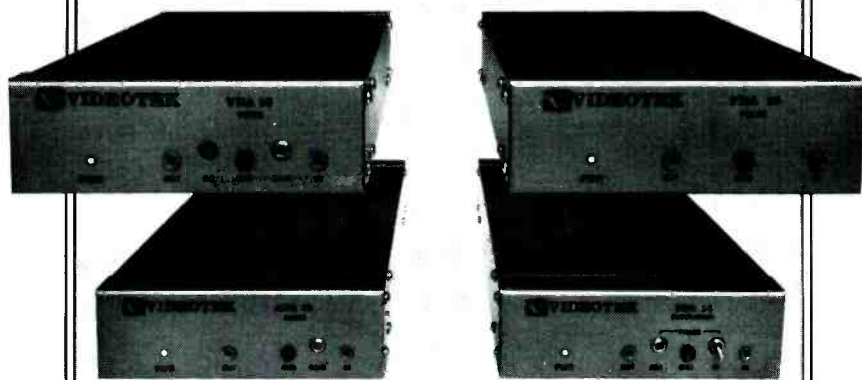
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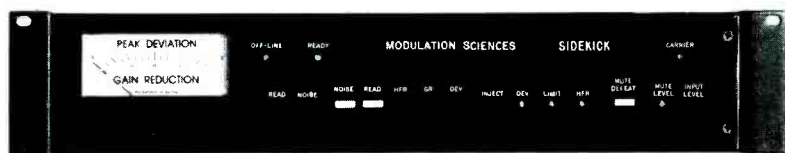
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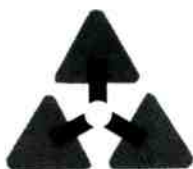
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FCC update

Harry C. Martin, partner, Reddy, Begley & Martin, Washington, DC

July 1983



FM allocation standards liberalized

In Docket 80-90, the FCC modified its FM technical rules to permit 1000 or more new commercial FM broadcast assignments. However, full implementation of the changes will be delayed until resources are available to process the large number of new proposals expected.

Under the amended rules, Class A stations will be allowed on Class B and Class C channels; distance separation requirements for existing station classes (A, B and C) will not be modified; one new class of station (B-1) will be allowed to operate in Zones I and I-A, the more densely populated areas of the country, while classes C-1 and C-2 will be allowed to operate in Zone II; existing Class B and Class C stations will have to meet minimum facility requirements within three years or be reclassified to one of the new subclasses (in other words, B-1, C-1 or C-2); a Class C station operating with 100kW ERP would have to have an antenna height above

average terrain greater than 984 feet to maintain full Class C status and the minimum height for a Class B station operating with 50kW ERP would be 330 feet; and new Class B and C stations will be required to have minimum facilities immediately.

The FCC's minimum distance separation requirements will be changed when the new rules become effective, as reflected in Table I.

Implementation of the new rules is expected to proceed as follows: At the beginning of the FCC's next fiscal year, this fall, an "omnibus" rulemaking will be initiated. In that proceeding, the FCC will propose adding new FM allocations to approximately 500 communities. At the same time, the rules establishing new station classifications and mileage separations will become effective. However, the commission will not begin to process any applications under the new standards until the omnibus proceeding is at least partially completed.

New channel assignments will be

made in stages, with the first batch coming as early as November 1984. There probably will be 5-10 separate allocation orders—each creating scores of new assignments—emanating from the omnibus proceeding over a 1- to 3-year period. In the meantime, interested parties may request the assignment of new Class A, B or C facilities to any community where the standard (pre-Docket 80-90) mileage separations would permit such assignments.

The reason for the initial delay in implementation and the phasing-in procedure thereafter is the FCC's lack of manpower and computer capability to accommodate the thousands of new assignment petitions and applications expected. Because of this shortage of resources, it is questionable whether the omnibus rulemaking will be initiated before the end of this year. The FCC is hoping Congress will allocate enough money to permit an early beginning and an expeditious conclusion to the project, but there is no guarantee this will occur. Thus, it may be three or four years before any new stations go on the air as a result of the commission's decision in this docket.

Deregulation of radio affirmed

The US Court of Appeals for the District of Columbia Circuit has upheld the majority of the commission's rules deregulating radio broadcasting, including elimination of quantitative guidelines for non-entertainment programming, formal ascertainment procedures and quantitative guidelines for commercial time. The court remanded to the commission for further consideration the elimination of the requirement for maintaining program logs. The decision did not uphold the adoption of the post-card renewal application, which remains pending.

The court held that the FCC requirement that licensees present "issue-responsive" programming, instead of prescribing non-entertainment programming guidelines, reasonably interpreted the public interest standard. The court also allowed elimination of formal ascertainment procedures and commercial guidelines.

Regarding the elimination of program logs, the court ordered the commission to revisit the question of what information concerning non-entertainment programming must be available to the public and to the commission for the new regulatory scheme to function properly.

In a related decision, the court also affirmed the exemption of commercial TV stations in small markets (population less than 10,000 and outside SMSAs) from formal procedures to ascertain community problems and interests.

Table I.
Minimum distance separation requirements

Relation	Co-channel	First adj. ch.	Second adj. ch.	Third adj. ch.
A to A	105* (65)**	65 (40)	27 (17)	8 (5)
A to B1	138 (86)	89 (55)	48 (30)	8 (10)
A to B	163 (101)	105 (65)	69 (43)	16 (20)
A to C2	163 (101)	103 (64)	55 (34)	32 (20)
A to C1	196 (122)	129 (80)	74 (46)	32 (20)
A to C	222 (138)	169 (105)	105 (65)	32 (20)
B1 to B1	175 (109)	114 (71)	50 (31)	24 (15)
B1 to B	211 (131)	145 (90)	71 (44)	24 (15)
B1 to C2	200 (124)	134 (83)	56 (35)	40 (25)
B1 to C1	233 (145)	161 (100)	77 (48)	40 (25)
B1 to C	259 (161)	193 (120)	97 (60)	40 (25)
B to B	241 (150)	169 (105)	74 (46)	24 (15)
B to C2	237 (147)	164 (102)	74 (46)	40 (25)
B to C1	270 (168)	195 (121)	79 (49)	40 (25)
B to C	274 (170)	217 (135)	105 (65)	40 (25)
C2 to C2	190 (118)	130 (81)	58 (36)	48 (30)
C2 to C1	224 (139)	158 (98)	77 (49)	48 (30)
C2 to C	249 (155)	188 (117)	98 (61)	48 (30)
C1 to C1	245 (152)	177 (110)	82 (51)	48 (30)
C1 to C	270 (168)	209 (130)	101 (63)	48 (30)
C to C	290 (180)	241 (150)	105 (65)	48 (30)

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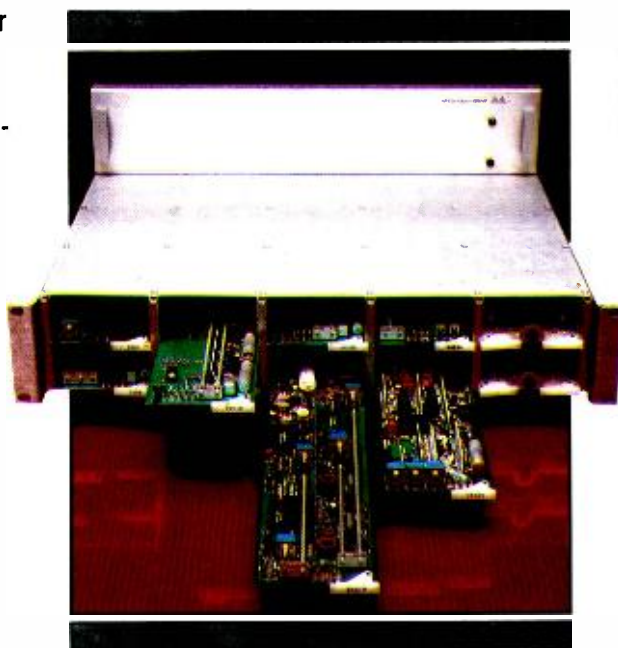
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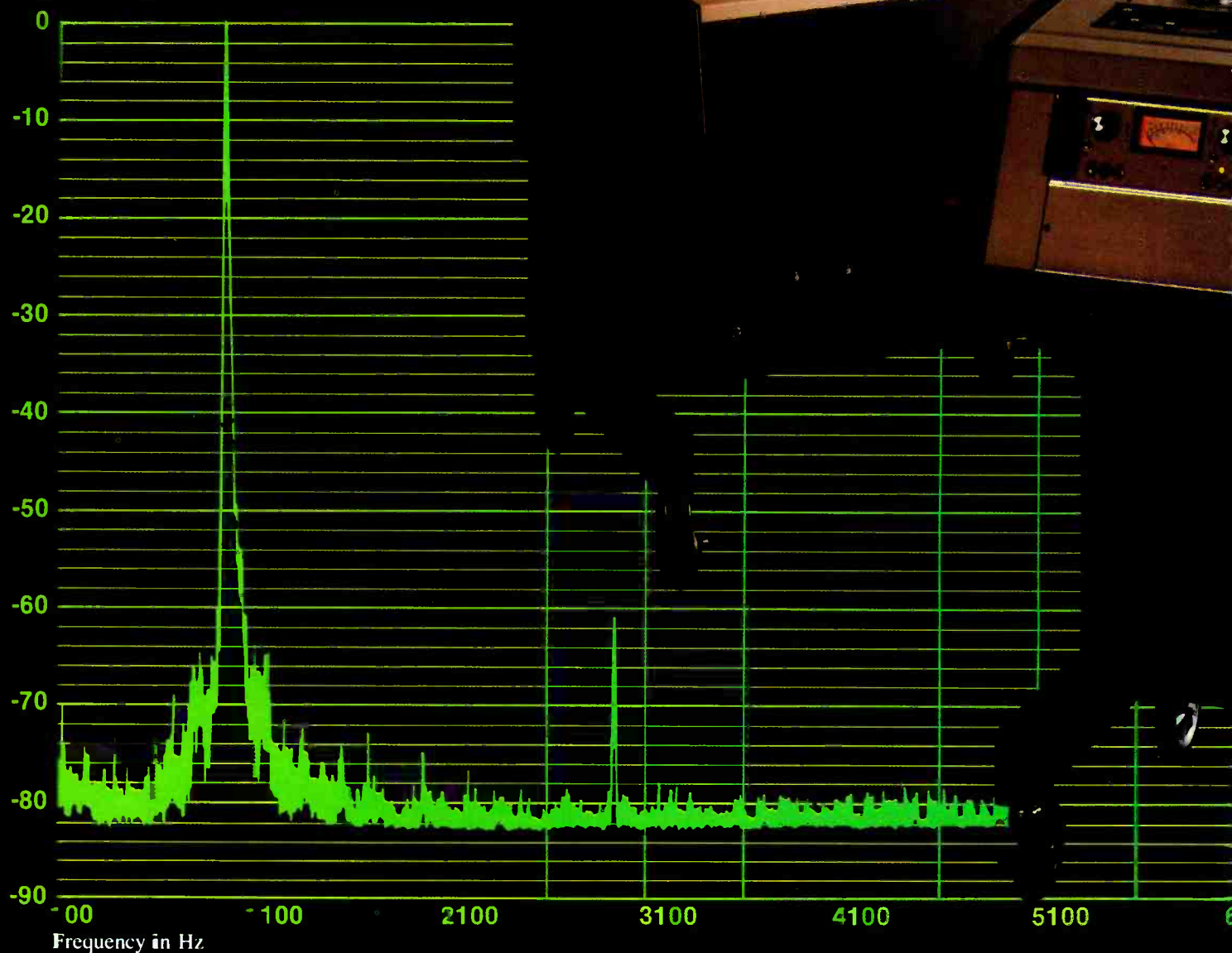
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SBE or SBCE?

A guest editorial by John Battison,
WOSU-AM/FM/TV, Ohio State University,
Columbus, OH

Twenty years ago, the Society of Broadcast Engineers (SBE) was going through the travail of conception. It was founded in sorrow—now it seems possible that it may founder in sorrow. When the IRE moved, after an alleged majority vote, to merge with IEE to form the IEEE, I resigned from the IRE and formed the SBE to fill the void left for the radio engineer.

Last winter SBE members received a seemingly innocuous memo in their mail asking their opinion of a name change. Several names were listed, but SBE was not included. Most respondents considered it to be an opinion poll. Suddenly, in a release dated April 10, 1983, the SBE management announced that a majority of SBE members favored a name change to Society of Broadcast and Communication Engineers (SBCE). This high-handed action was taken without a vote of the members and, for that reason, is probably out of order. The action exemplifies the dictatorial attitude of SBE administration in fashioning the society to suit its own schemes.

A glaring example of Star Chamber government occurred at the meeting during the recent NAB convention. At the chairman's meeting, Charles Halliman, the second president of SBE, who is worthy of respect for his intense loyalty and support of the society, asked for time to speak in support of a chapter petition to rescind the name change. His request was not granted. However, many members stayed after the meeting's official end to discuss the name change and to petition against it with Halliman. He received considerable support.

Later Halliman asked for five minutes at the annual meeting to address the question of the change. The meeting was loaded with inconsequential items until only two minutes were left for Halliman's address. Nevertheless, he received a resounding round of applause for speaking against the decision of the executive board. Incidentally, the annual meeting has traditionally been slated for 3-5 p.m. This year it started at 4:40 p.m. and ended at 5 p.m.

It seemed to me that efforts were made to keep the meeting short, sparsely attended and somewhat secret. Although members had been notified earlier of the meeting location, those who forgot or did not know the location in advance could not find it correctly listed in the NAB official program. Under these circumstances, the only way to find out was to go to the SBE booth. I wonder how many members failed to attend because they did not know where to go. In most previous years, the location and time appeared in the official convention program (courtesy of NAB). It is worth noting that the directors' meetings were listed in the program.

Many members think that a group has seized control of the SBE and is trying to meld it into a society run by executive fiat, reflecting only the opinions and needs of big stations and ignoring the needs and wishes of members.

One of the founding objectives was to give "the little man" in the small station a voice. This does not happen today. Petitions that are well-supported do not even receive the courtesy of an answer from the board.

The SBE was formed because of dissatisfaction with the IRE/IEE combine. Many members are afraid that by changing the name to SBCE, the primary objective and function of the SBE will be lost, such as occurred when the IEEE was formed. Members with whom I have spoken do not object to bringing in electronic engineers from other disciplines as associate, non-voting members, as provided in the bylaws. However, they think that the primary emphasis should be on *broadcasting*. Otherwise there is the strong risk that the primary purpose of the society will be lost in an influx of members from non-broadcast interests.

Also, many members are unhappy with the apparent lack of attention given to members' needs. No new membership directory has been issued since the '70s, and there is no professional journal. A newsletter reminiscent of a consumer magazine, with headlines such as "Georgia Peach Joins SBE," is issued at intervals. In its earlier, formative days, the SBE had a bimonthly journal filled with technical articles contributed by members, plus lively discussions of matters important to members in their daily work. Today, although the dues have doubled, less is delivered.

The SBE certification program originally conceived in the mid-'60s is off the ground and running successfully. No doubt the early costs of getting this program going were not low. However, the program should now be self-sustaining by means of the examination fee.

Continued on page 101

A NEW PORTABLE "C" VTR THAT WEIGHS ONLY 15 POUNDS.

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Satellite update

By John Kinik, satellite correspondent

RARC-'83

The International Telecommunications Union (ITU) is a UN organization open to all member states of the United Nations. The ITU sponsors, coordinates and provides technical and administrative support to conferences attended by delegates to debate issues relating to compatible technical standards and, in the case of satellites, the equitable allocation of orbital positions and frequency spectrum.

A crucial conference was held in Geneva, starting in mid-June, to determine orbit and spectrum resources for satellite broadcasting in Region 2 (Western Hemisphere). This conference, the Region 2 Administrative Radio Conference (RARC-'83), was supposed to develop a plan that would provide a segmentation of the 12GHz frequency band between broadcasting satellites (generally referred to as Direct Broadcasting Satellites/DBS) and fixed satellites (general telecommunications satellites) and to deal with the question of allocating orbital locations to broadcasting satellites. At press time, news from this conference was not yet available.

The distinction between broadcast satellite services and fixed satellite services is not as clear as it was at the last conference that dealt with broadcast satellites, the World Administrative Radio Conference on Broadcasting Satellite Services (WARC-BS), held in 1977. Various types of satellites are involved now, which complicates the picture: C-Band (4/6GHz), Ku-Band (12/14GHz) and Hybrid (both C-Band and Ku-Band).

At the WARC-BS conference, planning for Region 2 was deferred because of conflict between US and Canadian proposals for the use of the 12GHz band. This was the first instance of serious dispute between a major country such as the United States and a small country (in terms of

political power) such as Canada. This trend continued when, at the General World Administrative Conference held in 1979 (GWARC-'79), the Third World nations grouped together to force a reconsideration of the previous policy of first come, first serve. This policy had applied to frequency spectrum and satellite orbital resources, which favored the more developed nations.

RARC-'83 dealt with technical and political issues. The resolution of these issues determines the framework within which North American satellite broadcasting services will function for the remainder of this century.

Broadcast satellites

Ten years ago, when conventional C-Band satellites first went into operation for domestic purposes, the distribution of television and radio via satellite was not defined as broadcasting in the accepted sense of the word.

During this early period, the receiving earth stations were expensive (more than \$100,000 each), and it was unlikely that such services would be received by individual or private users. At the same time, a joint US-Canadian experimental satellite, the Communications Technology Satellite (CTS, later renamed Hermes), was being developed as a prototype DBS satellite. This satellite used a high power (200W) transmitter and a directional beam confined to coverage of only a portion of the United States or Canada. The design was to achieve downlink signal levels in the 11.7-12.2GHz band that could be received by small antennas of 1m diameter or less, making direct broadcast to the home feasible.

The CTS experiment, conducted during the 1976-1979 period, was successful in demonstrating the concept's feasibility. Because of the success of this experiment, organizations in the United States began to make plans for launching similar DBS satellites that could bypass local cable and broadcast distribution facilities. To date, authorizations to proceed with construction have been given to eight

organizations by the FCC, with the first system (Satellite Television Cor-

Satcom 1R launched

The second advanced RCA Satcom domestic communications satellite was launched in April from Cape Canaveral, FL.

Designated RCA Satcom 1R, the 2385-pound satellite replaces the first of the corporation's domestic communications satellites, the Satcom 1, which was launched in December 1975.

The Satcom 1 is located at 136° west longitude, 22,300 miles above the equator, in geostationary orbit. Satcom 1R has been nudged into its operations at 139° west longitude. It is expected to begin operation this month.

Developed and built by RCA Astro-Electronics, Princeton, NJ, the satellites are owned and operated by a sister organization, RCA American Communications, also of Princeton.

The new satellites are second-generation, advanced versions of the original RCA Satcoms. They are completely solid-state domestic communications satellites, which include improvements in all subsystems and provide as much as a 50% increase in capacity over existing satellites now in orbit, according to Charles A. Schmidt, division vice president and general manager, RCA Astro-Electronics.

The first advanced satellite, RCA Satcom V, was launched in October 1982, and put into operation early this year. It has been named *Aurora* by its owner, Alascom, the long-lines carrier for the state of Alaska.

A shaped-beam antenna and 24 solid-state transponders (8.5W each) combine to improve traffic capacity. The new antennas provide stronger signal coverage to all 50 states.

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poration) to go into operation in 1985-1986. These systems will, according to plans, operate in the 12.2-12.7GHz band, which has been tentatively defined as the broadcast satellite band.

The FCC has also authorized another new company, New York-based United Satellite Communications Inc., (USCI, formerly USTV) to initiate a medium power broadcast-type satellite service operating in the fixed satellite service band (11.7-12.2GHz for Ku-Band), using an existing satellite.

This interim system will initially operate five channels on Canada's Anik C2 satellite, starting this fall, with the plan to switch to an equivalent US satellite in 1984. USCI plans to serve the Northeastern United States and is posing a direct challenge to the new DBS companies with a system not requiring the immense cost and risk of launching high power satellites, but the system sacrifices a modest increase in the size of receiving antenna: 3-4 feet vs. 1-2 feet in diameter.

How well this service does in the marketplace will determine to a great extent how many high power DBS satellites will be launched in the latter half of this decade. Innovation and marketplace competition are impor-

tant factors to be considered in the allocation of satellite spectrum and orbital resources that the delegates to RARC-'83 must take into account.

Satellite orbital positions

The FCC has proposed satellite spacing as close as 2° apart for fixed satellite services in the orbital arc covering the United States. This is the arc shared with Canada, Mexico and some South American countries and, because the new broadcast satellite allocations must be introduced, the orbital position issue is complex.

Satellite spacing of 2° would be prejudicial to existing fixed C-Band satellites now delivering signals to cable systems, broadcasters and private users. In these applications, antennas as small as 10 feet in diameter are in common use. At 2° spacing, interference from adjacent satellites into small C-Band antennas is a problem; thus, it is unlikely that spacing for C-Band satellites will be made closer than 2.5° after all arguments by the industry have been considered.

Superimposed on this probable framework will be the allocations of positions for hybrid satellites, which employ C-Band and Ku-Band transponders. These satellites are awkward to locate. They cannot be

spaced closer than C-Band satellites, but they must be consistent with the possibility of closer Ku-Band spacing. The Ku-Band satellites can be spaced closer because antenna beamwidths are narrower at higher frequencies, for corresponding diameters.

The home receiving antennas used for high power DBS satellites can be so small (because of the strong signal level) that spacing of these satellites is determined by a limit imposed by the tiny antennas' much broader beamwidth. (Antenna beamwidths broaden as size decreases.) A tradeoff is, therefore, required between minimum receive antenna size at the home and minimum satellite spacing. Current proposals for spacing range from 13.5° to 20°, with co-location with other Ku-Band fixed satellites possible because the broadcast satellites will operate in a different frequency band.

Also, there is the question of the regional nature of coverage provided by DBS satellites. Because more concentrated downlink beams are required, the United States, for example, requires three to four regions to cover the continental United States. The United States is requesting four regions, consistent with time zones, and that would involve four satellites for each DBS system with full CONUS coverage. | : 7 :))) |



The image shows a black, rack-mountable electronic device with a silver front panel. The front panel features several control knobs and switches, including a 'VIDEO LOCK' switch, a 'VIDEO GAIN' knob, and a 'CHROMA GAIN' knob. The Leitch logo is visible on the left side of the panel. The device is labeled 'VPA-330N' and 'VIDEO PROCESSING AMPLIFIER'.

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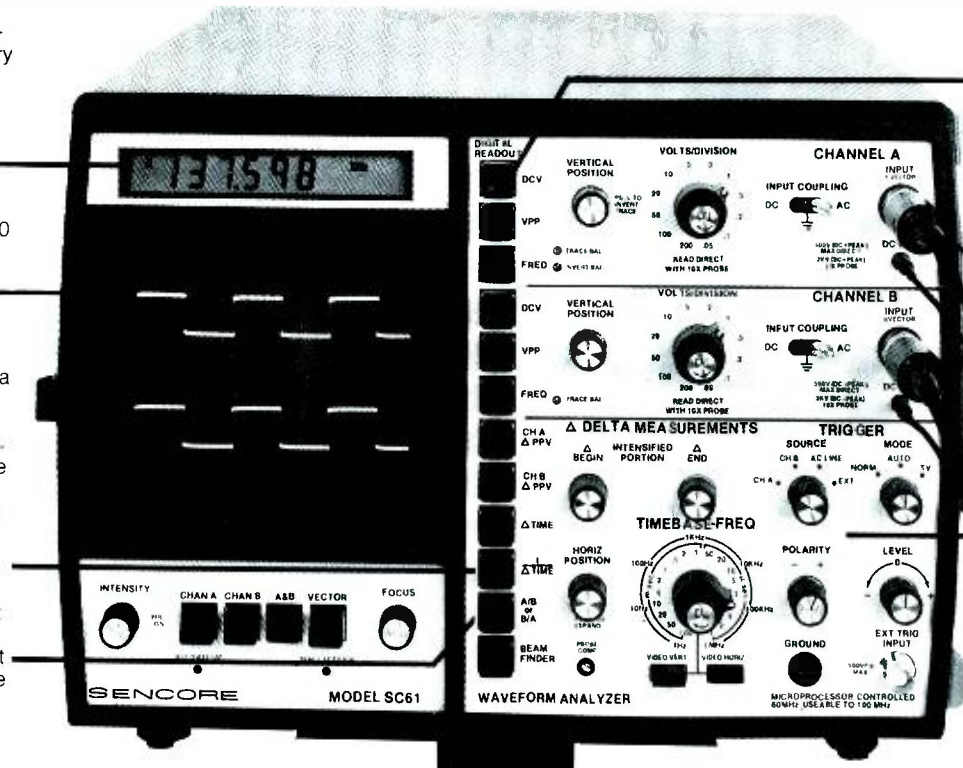
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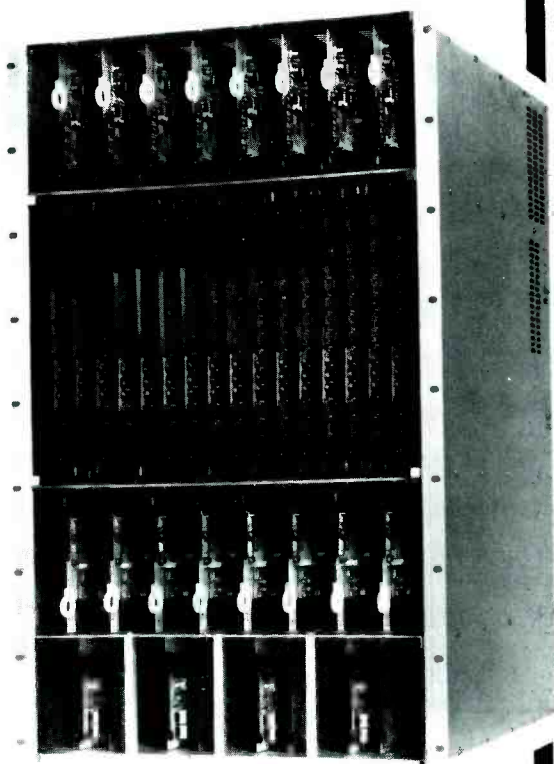
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SCA teleconference scheduled

The NAB will conduct a video teleconference in 21 cities on July 20 to allow broadcasters to explore methods of using their subcarrier channels. The FCC has eliminated restrictions that limited SCAs to broadcast services.

Topics to be covered in the 4-hour session include leasing SCAs, utility load management, background music, electronic mail, income potential, paging systems and digital data transmission.

"SCA Day-USA" will be held in Atlanta; Boston; Charlotte, NC; Cincinnati; Cleveland; Chicago; Dallas; Denver; Harrisburg, PA; Kansas City, MO; Long Beach, CA; Nashville, TN; Newark, NJ; New Orleans; Orlando, FL; Phoenix; Salt Lake City; San Francisco; Seattle; St. Louis, MO; and Washington.

Registration is \$90 for NAB members (each additional person \$75) and \$150 for non-members. For additional information, call the NAB Radio Department at 1-202-293-4955.



**Radio Television News
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Long-range communications study funded

The RTNDA has decided to do a study to learn more about the future of communications and broadcast and cable employment in the coming decade. The goal is to have the study completed in time for the RTNDA International Conference in September.



**National Radio
Broadcasters' Association**

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9871 radio stations authorized

As of Jan. 31, 1983, the FCC had authorized 4848 AM radio stations, 3779 FM stations and 1244 FM educational stations (including 279 affiliated with National Public Radio). The grand total is 9871, an increase of 709 stations since July 31 of last year.

Industry employment figures released

The 1982 employment profiles for broadcast stations having five or more full-time employees, and a state-by-state trend report for the past five years in each class of service, have been released by the commission.

Total broadcast employment for stations with five or more employees rose 3.2% over 1981 figures. Employment in the top four job categories (officials and managers, professionals, technicians and sales workers) rose 3.46% since 1981. However, female and minority employment in those jobs was largely unchanged. In 1982, women made up 25.9% of top-four employees, while minorities comprised 12.7%. The comparable figures for 1981 were 24.9% and 12.7% respectively.



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3CX10000U7	2175.00	4X150A	58.00	892R	2385.00	8806	3145.00
3CX15000A3	1350.00	4-65A	59.00	4055V1	105.00	8807	2954.00
3CX15000A7	1470.00	4-125A	69.00	5671	6500.00	8873	190.00
3CX20000A7	1850.00	4-250A	80.00	5762	670.00	8874	185.00
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3-500Z	88.00	4-400AX	159.00	5894A	55.00	8890	3053.00
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4911	850.00	BC4399 series	2100.00	8480	1365.00	XQ1415/BC4994	2420.00
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3CX3000F7	24	4CX15000A	88
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Digital audio for radio networking

By Gary Hardesty, president, Audio Digital, Eugene, OR

The advent of a major radio network application of digital audio techniques is at hand. As with any change in methods, there are questions to be asked. The author asks if we are ready for digital.

As we go deeper into our "digital decade," I think we may end up with the wonders of digital audio at a considerable compromise, unless we take a hard look at current trends. Is it possible that state-of-the-art analog techniques could do about as well, for considerably less cost? Do the consumers of digital audio technology, (for example, the broadcast stations), understand the technology, or are manufacturers and networks dictating our standards?

If our pocketbooks, not to mention our hearing, are to survive this digital decade, we have to take a broad look at some of the compromises involved, as well as a look toward the future of digital audio. Unlike the analog world with which we are familiar, the world of digital audio relies on standards, such as a sampling rate. If we make wrong decisions now, are costly changes awaiting us down the road? Are we really ready to take the digital plunge, or is the excitement of new technology dictating the changeover?

In the next few months, many stations will be using a new digital radio network system supplied by Scientific-Atlanta (S-A). I will use this system as an example, because it is the first major digital audio system in the United States. I appreciate the innovation and forethought that the company has used in developing the system.

The Scientific-Atlanta system uses a sampling rate of 32kHz, has an overall peak dynamic range of 81dB, and will handle a maximum signal level of +24dBm. From this information, I can calculate best-case frequency response, as well as S/N ratio with signal present. The Nyquist theorem dictates a sampling rate of at least two times the maximum signal frequency to be recovered. In this case, with the sampling rate of 32kHz, the limit is a frequency range no greater than

16kHz. The signal-to-quantized noise ratio, or the noise floor we hear with signal present, can be no more than 57dB.

The S-A system is described as being a 15-bit system, the 15 bits being transmitted as 11 bits (using compression), with a 12th bit being used for parity information. According to Mike Kelly, digital audio marketing manager for S-A, the decision to use the 32kHz sampling rate was a network decision, based on trade-offs between subjective listening tests and the space segment cost. Unfortunately, the higher the sampling rate, the larger the space segment costs will be.

First thoughts

I can guess what things we might hear in this digital audio format. Because this is a companded system, not unlike analog noise reduction systems, we can expect to hear a somewhat modulated noise floor. We may hear a certain amount of high-end birdies, as a result of the low sample rate. As is typical of this type of PCM systems, we may have considerable signal distortion at low signal levels (conceivably minimized by Scientific-Atlanta through the use of *dither* noise or some other randomizing function).

Because the digital recording sample rate seems to be settled around 44.1kHz*, we cannot digitally record network signals (without spending considerable dollars for a sampling rate converter). Instead, we must take the digital signal, convert to analog, then record in analog for rebroadcast of the network audio. Trade-offs exist with any technology, but with a new, important technology such as this one, we have to look closely at standards. We must think about future needs. We should consider that state-of-the-art analog technology, with noise reduction, would have little trouble meeting the specifications this digital network offers, at a con-

siderable cost reduction.

Compromises

Let us touch briefly on compromises digital technology can create. The PCM or pulse code modulation technology, which is being used for the digital audio network, was created in its basic form many years ago for instrumentation purposes. It has been adapted for audio use through some basic improvements.

The dynamic range of a linear PCM system depends on the number of bits the system has at its disposal. A 12-bit system will have 4096 steps into which it divides the audio signal. Each bit allows approximately 6dB of dynamic range. Multiplying 12 bits times 6dB per bit gives a predicted dynamic range of 72dB. Keep in mind that achieving the theoretical maximum range will be impossible because of bit errors, noise, etc.

If somehow we can make our system adaptive, as Scientific-Atlanta has done, we create a digital compression-expansion system that tricks the system into handling more dynamic range than the basic 12 bits are capable. A number of schemes exist to do this. Basically the gain stage, preceeding an A/D converter, looks at the range of the incoming audio, then adjusts the A/D gain to handle the increases and decreases. The gain adjustment information, transmitted along with the *mantissa* bits, forms an exponent representative of the system gain changes. In the D/A converter, an inverse function occurs to recreate the original signal. Using this approach, we may obtain the dynamic range of a 16-bit system (or even greater), but have the economy of an inexpensive 12-bit converter and another two or three bits to handle gain changes.

This sounds great on paper, but there are compromises. The biggest is the fact that we have not changed our signal-to-quantization noise level or the S/N ratio with signal present. We still have only a 72dB S/N ratio that may now be made worse because it will follow signal level changes. The result gives us a *modulated* noise floor.

The sample rate of 32kHz can create serious compromises. By the Nyquist theory, we must sample at a factor of

*The sampling rate of 44.1kHz is the rate that has been suggested and tentatively accepted for consumer products. Such products would presumably have price tags that the majority of broadcasters could afford, rather than the 48kHz sampling systems suggested for professional origination, processing and interchange of audio program material.

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Unequalled audio performance and specifications. Wideband input FM Noise (S/N) is 80 dB! Equally impressive are CCIF Intermodulation Distortion measurements. Using 14/15 KHz test tones, distortion products are over 60 dB down in stereo mode...over 80 dB down through the wideband mode! Wideband 60 Hz/7KHz 1:1 Intermodulation Distortion is .02%.

A truly balanced, floating composite input eliminates ground hum pickup. The exclusive adjustable hum buckler nulls out extraneous magnetic fields

unique to your installation. New construction techniques reduce susceptibility to microphonics. And at maintenance time, you'll appreciate the ease of accessibility to modules.

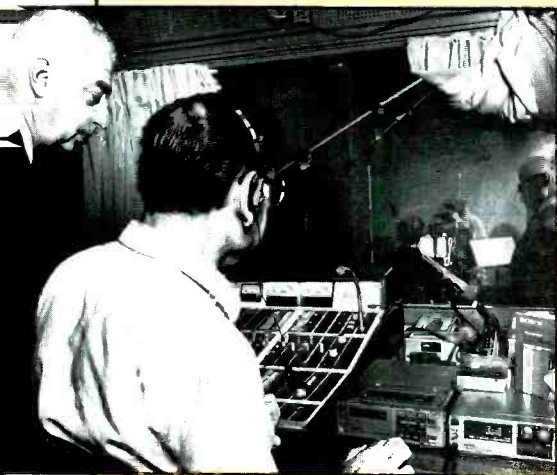
The Harris MX-15 outperforms *any* other FM exciter in these and other key performance areas. And it's the heart of Harris' complete line of FM transmitters. For more information, contact **Harris Corporation, Broadcast Division, P.O. Box 4290, Quincy, Illinois 62305-4290. 217/222-8200.**



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WQXR compares analog and digital



"Doc" Masoomian (at left) and Maurice Dicker, WQXR engineer, check the Sony digital processor and VTR before recording the Orpheus Chamber Ensemble for WQXR's Concert Theater program.

Although a number of stations have been enjoying the use of digital disc players for on-air programming, WQXR, New York, has gone a step further. With chief engineer Zvon "Doc" Masoomian in charge, and with cooperation from the Sony Corporation of America, WQXR recorded a performance of the Orpheus Chamber Ensemble. Two simultaneous recordings were made. One was in analog; the second used the Sony PCM-F1 digital audio processor and matching Betamax videotape recorder.

Comparisons of the tapes were made in the studio and later over-the-air to allow the station's listeners to hear how recorded audio may be improved.

According to Masoomian, "Direct comparisons were striking. The digital tapes were superior to all analog tapes I've heard, and that includes half-track mastering with and without Dolby A. When you record with the Sony digital unit, you don't have to worry about peaks. The dynamic range is such that it exceeds that of the microphone."

at least two times the highest frequency we wish to recover. For our digital audio network, a bandwidth of about 15kHz is probably enough. However, the story does not end there. In order to ensure that the A/D system cannot process audio above 15kHz (for the system to do so would result in serious alias frequencies created well into the audible range), we must have steep roll-off, low-pass filters with 100dB/octave slopes, typically. A filter with that type of roll-off characteristic will have considerable phase distortion, passband ripple and ringing.

At the D/A end of the system, we will need to incorporate a similar filter to reconstruct the audio signal. The receive-end filter must remove the steps, clocking and other digital remnants that have been introduced. But again, we experience phase distortion, ripple and ringing.

Although it may not be obvious to many, the higher we make the sampling rate, the wider we can make our audio bandwidth. Conversely, we could maintain the same bandwidth and reduce the filter roll-off, phase distortion, etc. All of these problems

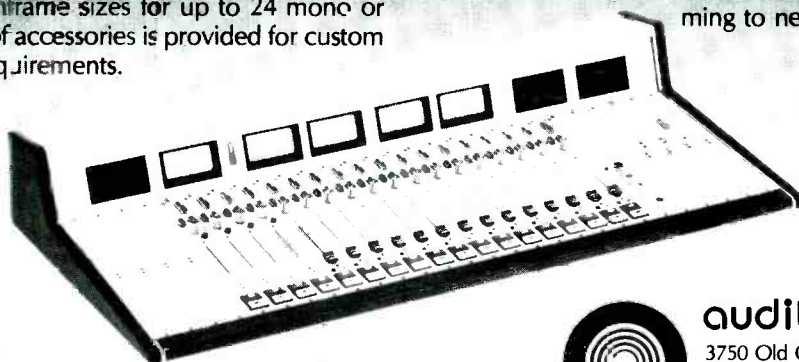
Continued on page 26

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Thanks to the Sony editing system, this scenario is rarely, if ever, played out in leading production houses like Broadway Video, Videoworks, JSL and a host of others currently using it.

The reason?

"Sony belongs to a small group of manufacturers that still think of broadcast equipment as a product, not an experiment," says Frank Herold,



chief editor of Videoworks in New York.

"When you take a piece of Sony equipment out of the box and plug it in, an amazing thing happens. It works!"

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All elements of the Sony editing system have been programmed to speak to each other fluently. And to understand each other perfectly.

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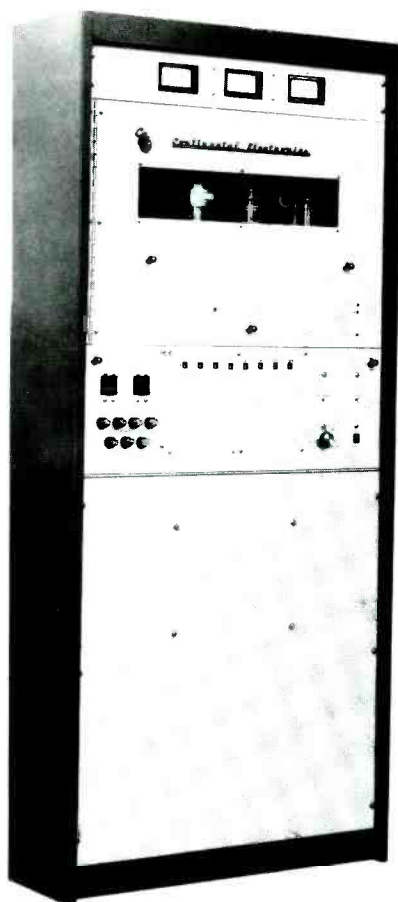
Each of which, like everything else in the Sony system, helps to push profits in a rather vertical direction.

For more information contact Sony Broadcast in New York/New Jersey at (201) 368-5085; in Chicago at (312) 773-6045; in Los Angeles at (213) 841-8711; in Atlanta at (404) 451-7671; or in Dallas at (214) 659-3600.

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Circle (20) on Reply Card

Digital audio: In transition

Anyone who has heard a demonstration of digital audio must be impressed. Just a few minutes in the Scientific-Atlanta demo room at NAB '83 convinced me of the possibilities for the near future. Even the inherent problems of terrestrial-based FM broadcast radio seem to be improved when the programming material is sourced from laser-read, digital discs, such as the compact digital audio disc systems that Sony and Denon have placed in many FM studios in the United States.

The Audio Engineering Society (AES) and its international membership has worked diligently to arrive at recommendations toward digital standards. Keeping the Nyquist theorem of a sampling frequency of twice the desired audio bandwidth in mind, the AES discussions have focused on many difficult problems. One question results from manufacturers that wish to use current design equipment with minimal changes or adaptations for digital audio uses. A sampling rate related to television's visual scanning rates on a worldwide basis became another criteria to fit into the scheme.

The AES entered into a study of sampling frequencies and related digital audio topics in November 1979 with the Digital Audio Technical Committee, chaired by Bart Locanthi of Pioneer North America. By November 1981, a Working Group on Sampling Frequencies was established under the guidance of Emil Torick of CBS. During the 73rd AES Convention in March 1983, a list of recommendations of sampling fre-

quencies for digital audio applications were presented to members of the appropriate AES groups. According to Locanthi, there was not a sufficient number of members present to approve the recommendations. As a result, the final vote is not yet tallied, but a count is expected in the near future.

Three sampling frequencies have been suggested for different applications of digital audio equipment. The *primary rate* is proposed to be 48kHz, a frequency relatively easily synchronized with worldwide TV scanning systems. The *primary rate* is suggested for origination, processing and interchange of digital audio programming. The 48kHz value is easily related to 32kHz, which is recommended for broadcast and transmission-related applications with channel capacity restrictions. By the Nyquist theory, 32kHz should easily allow a bandwidth of 15kHz, as is currently in use with FM broadcast and TV audio and is in accordance with current EBU practices. Finally, for materials to be used in consumer-type equipment, the recommendations suggest a figure of 44.1kHz.

These sampling frequencies are only *recommendations*, the AES said. Because the frequencies are based on preferences stated by various international organizations, such as the CCIR, CMTT, EBU and SMPTE, there is hope that points of disagreement may have been solved and that we shall soon hear a new era of sound technology.

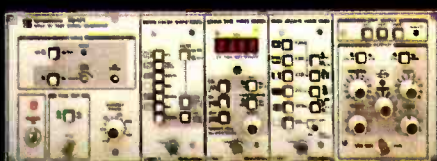
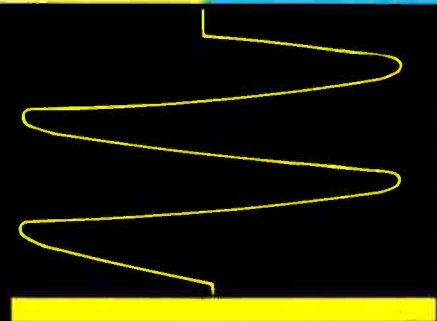
Carl Bentz
Technical Editor

are audible and, some say, contribute to a digital sound that is definitely not a compliment to digital audio. We can play trucks with phase distortion, adding more filters to compensate. But why not at least use the sampling rate that recording people have chosen, 44.1kHz, and ease the filter requirements somewhat?

Shouldn't we be demanding more of our entry into digital audio mass communications? Or are we content to be dictated to? Existing digital audio technology, as used in recording, is capable of much more. We should take a look at the continuing saga of the digital recording industry. The sampling rate has been a hotly

debated question for some years. Now, unfortunately, some products developed have standards that make part of the products obsolete. But they have standards. Shouldn't the broadcast industry use similar standards, or at least look at the issue more thoroughly?

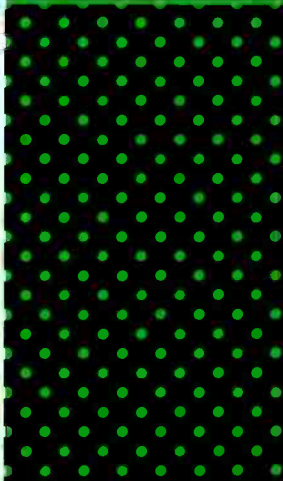
In the digital audio discussion, it should be obvious that we are dealing with a complex science, one in which our choices of sampling rates and other parameters will dictate future potentials for broadcast digital audio. Will the compromises we make today be acceptable tomorrow, or does the glamour of digital audio now overshadow everything else?



TG-7 TEST SIGNAL GENERATOR

The TG-7 TEST SIGNAL GENERATOR is a unique system which contains a total of 48 different signals and functions and may also be completely automated with the optional IEEE-488 interface bus. Because of its modular design, you may select the perfect configuration for your facility and then expand at any time. Its special features are

- A main frame with sync generator, color lock, gen lock with the VBS or sync with color burst.
- Chroma phase may be varied 360°
- Signals may be remote controlled by using the optional IEEE-488 interface bus.
- Seven modules are available: LINEARITY, SIN², COLOR BAR (10 signals), SINE WAVE, SQUARE WAVE, NOISE TEST, and a VITS Generator.
- Complete drives system (VBS), Sync, Black Burst, Sub Carrier, Burst Flag, and Blanking - Stability of ± 5 Hz.
- Output amplifier with R-Y, B-Y modulator is built into the main frame and allows variations of the Burst, Luminance, Chroma, Sync, and pedestal level, available in NTSC and PAL.



226 COLOR BAR GENERATOR

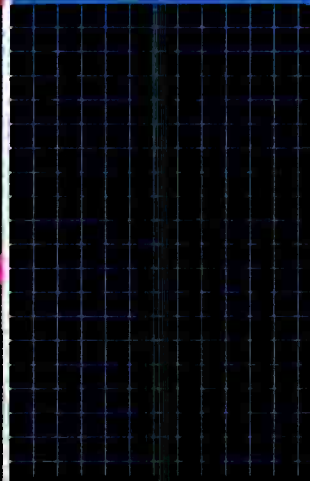
The 226 is a COLOR BAR GENERATOR designed for use as a testing and adjustment device for ENG applications. The unit contains split field color bars and a programmable prom to generate station identification as well as a 1 KHz oscillator and a 0dBm output signal at 600 ohms. The 226 may be operated on both AC or DC power and it is available in NTSC only.



CB53A1 COLOR BAR GENERATOR CHARACTER GENERATOR

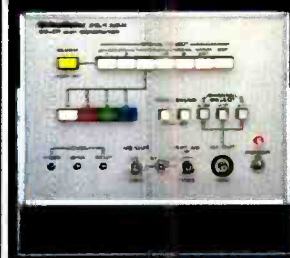
The CB5 3A1 combines a COLOR BAR GENERATOR and CHARACTER GENERATOR in one versatile instrument you can take right into the field for remotes and on-location shooting. It generates SMPTE and Y/REF color bars, plus red bar, black burst, multiburst, cross-hatch and dot signals. Standard NTSC sync signals and the gen-lock function are built in. You can insert character information into each signal using a special keyboard with Random Access Memory that retains the signals even if your power is lost. The CB53A1 gives you a total of 31 character spaces on 2 lines.

- Black burst output.
- Selectable black or white background, four characters.
- External or internal switching for video and audio signals.
- Output range of +8 dBm $\sim$ -50 dBm for 400 Hz and 1 kHz audio signals.
- RF signal on USA channels 3,4 and 6.
- AC-DC operation.
- Available in NTSC



216 COLOR BAR GENERATOR

The 216 COLOR BAR GENERATOR is adaptable to all video service applications. It contains 2 color bar signals, Red, Green, Blue, & White Rasters, and 4 cross hatch & dot patterns. With this versatile instrument, you may obtain a video output as well as use the unit as a TV channel modulator with an internal or external video signal (2 VHF, 1 UHF). For audio, a one KHz signal is generated internally and modulated to form an RF signal. The 216 is available in NTSC, PAL B, M, N, and SECAM.



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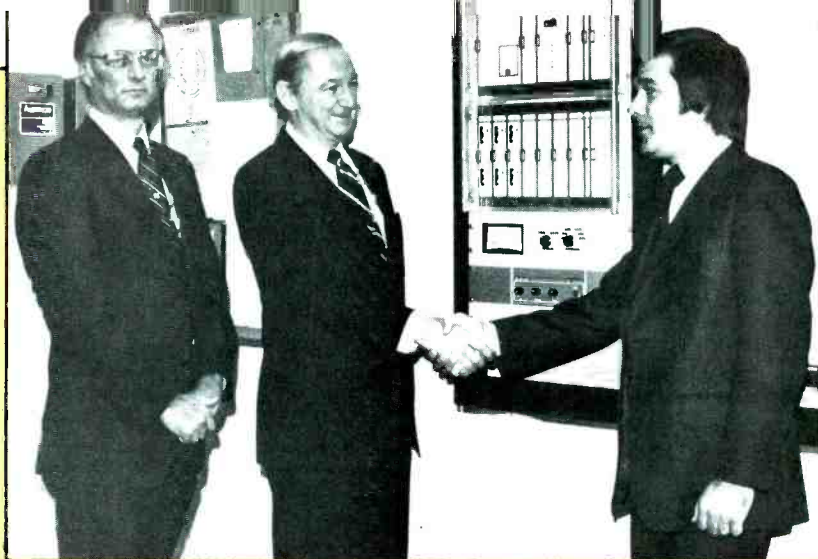
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Congratulating each other on the initiation of digital audio transmission via satellite are Edward F. McLaughlin (center), president, ABC Radio Networks, and Michael Harvey, president and general manager, WTKN/WWSW, Pittsburgh. Watching (at left) is Jack Kelly, executive vice president, Scientific-Atlanta.

ABC launches digital satellite system

In January, ABC Radio Networks affiliate radio stations WTKN-AM and WWSW-FM in Pittsburgh, PA, became the first stations in the United States to receive network programming via the new digital satellite transmission system.

The two stations, affiliated with ABC's TALKRADIO and Contemporary Network, respectively, now receive network programming originating from Los Angeles and New York.

Programming is sent to the stations via the RCA Satcom I satellite in digitally encoded form, allowing for an audio quality and flexibility previously unavailable by other methods. ABC successfully converted to the RCA Satcom I-R satellite during the first week of June this year. ABC began program tests on the satellite in late December 1982, delivering regular network programs and ABC TALKRADIO to WTKN and WWSW. The uplink is provided by RCA from Vernon Valley, NJ.

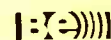
WTKN/WWSW are the first of the more than 3000 radio network affiliates in the United States that will switch to this digital system. In addition to ABC, other major radio networks—NBC, CBS and

RKO—are joining ABC in converting to this method of program distribution. As of early June, more than 200 ABC stations have been linked up.

The receiving equipment installed at the WTKN transmitter site was specially designed and manufactured by Scientific-Atlanta to specifications supplied by the ABC Radio Network. This equipment consists of a 2.8m dish, which receives the signal from the satellite, and special electronics that convert the digital signals back into high quality audio.

ABC will provide 19 program audio channels of 15kHz each and one data channel. Programming on the system will include four time-zone feeds of ABC's six networks (Contemporary, Direction, Entertainment, FM, Information and Rock) and several stereo pairs for special music program distribution, along with an expanded news and special events channel to provide stations with more news and features.

As a further update, ABC expects to start withdrawing land-line transmission links in five zones starting on Aug. 28 of this year.



Ampex 197: designed especially for broadcast.

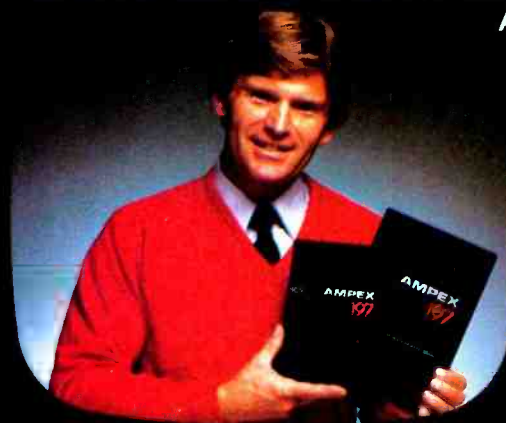


**Broadcast-quality
color and sharpness.**

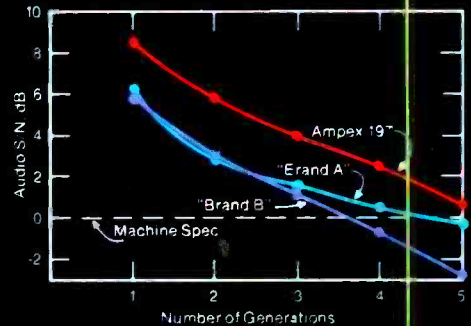
The Ampex 197 3/4" videocassette was developed with nothing less than perfection as the goal.

With superb chrominance and luminance performance it is ideal for ENG, EFP and on-line editing.

Ampex 197 has been especially formulated to optimize the performance of Sony BVU recorders.



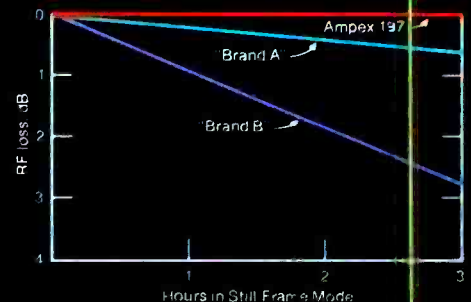
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Even after five generations, Ampex 197's audio signal-to-noise ratio exceeds the BVU series machine specifications.



Broadcast-quality sound.

Ampex 197 offers superior signal-to-noise and low distortion characteristics. This means crisper, cleaner audio performance under heavy editing conditions and multiple generation dubbing. Plus excellent stereo fidelity when used for music recording.

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Laboratory tests proved that Ampex 197 held up for three full hours with no RF loss.



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In blind field testing, Ampex 197 got the highest marks from broadcast professionals for picture quality, stability, and durability.

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Quality worth broadcasting.

Circle (23) on Reply Card

Audio console roundup

By Carl Bentz, technical editor

A few minutes spent thumbing through an equipment directory reveals many audio mixing system manufacturers. Some companies consistently feature a particular type or application of equipment. Others have branched out to produce systems applicable to several audio requirements. Consoles vary from portable to studio, on-air to recording, and production to sound reinforcement.

Because the needs and desires of the broadcast community vary widely, this roundup provides a few comments about all types of mixing systems from more than 70 manufacturers in the United States, Canada, Japan and Europe. Unfortunately, comprehensive coverage of every available model from every manufacturer in the marketplace would require a book.

When manufacturers were contacted for this article, they were requested to limit comments to approximately 50 words on each of their top three systems. Their responses were used to develop this article, along with materials pulled from the 1983 NAB records and product files in the **Broadcast Engineering** data bank.

For more information on systems listed in this roundup, use the Reader Service Numbers provided.

ADM

2442 Series II. Between models 1600 and 3200, the 2442 Series II is a full-featured, floor-standing, on-air console, designed to double as a production system. Fully wired from the start, the user may select up to 24 input channels, four sub-masters and two master outputs. Flexibility is increased by a modular pre-selector increasing input counts to 108 line sources and 60 microphones. Factory wiring for field-retrofitable stereo panning is available.

Circle (430) on Reply Card

9000 Series. A new generation of TV broadcast production consoles, the 9000 is configured for true stereo operation of line-level inputs from the source to the master outputs. An integral computer-operated router eliminates external switching and patching. The system handles up to 128 mic, 64 mono and 32 stereo sources. The computer stores and recalls 99 discrete setups.

Circle (431) on Reply Card

VP series. VP series consoles complement video editing with synchronized audio and video mixing from a single editor. User flexibility and performance combine into a full-featured console.

Equipped for stereo panning, the consoles are capable of mono or stereo operation. Computer interfacing to VCA faders comes in 8-, 12- and 16-input configurations.

Circle (432) on Reply Card

ALICE (STANCOIL) LTD.

Series 2000 mixers. The 2008 and 2012 8- and 12-channel mixers allow mic/line inputs to be routed to two output groups for stereo with a linked limiter, talkback and monitoring. Both $\pm 15V$ and 48V are available for phantom power. Panpots and EQ on each channel tailor the audio. Aux 1 and 2 outputs may be selected for each mixing channel and from pre- or post-fader points.

Circle (433) on Reply Card

ALLEN & HEATH BRENNELL LTD.

System 8. The control layout of the System 8 avoids repatching, yet allows expansion from a basic 16-input channel system with the EX8 expander. Long-travel faders, peak LEDs on all inputs, 3-band EQ and sweep-shelving are some features.

Circle (434) on Reply Card

AMEK SYSTEMS & CONTROLS

AMEK M3000. A standard console includes 36 each multi-track assignment, input/output and VCA fader modules for use with automation computers. Four aux

send/return/subgroup, aux return bus assign and subgroup fader modules, as well as monitoring and metering (38 VU meters), serve any type of mix.

Circle (435) on Reply Card

TAC 1882. The Total Audio Concepts system is expandable from a 16 mic/line input, eight group, separate stereo output console up to 40 inputs with 24-track monitoring. Each mix channel offers 4-band EQ, four aux sends, with PFL/Solo and 13-LED meters, as well as peak LEDs.

Circle (436) on Reply Card

AMEK BC01. Either ac or dc operation of the BC01 portable mixer allows studio, van or edit suite applications. Three input module types interface to 4-bus outputs for stereo audition and program. An internal limiter includes a limiting activity LED. PFL speaker and amp system are built-in.

Circle (437) on Reply Card

API/DATATRONIX

Gold Seal 4024. Sound quality and flexible custom designs are two selling points of this console. Discrete circuitry is used with interchangeable modular components. Ease of operation is enhanced by a logical layout. A typical model includes 48 inputs, 32 mix buses and 40-track monitoring for use as an automated music mixing console.

Circle (438) on Reply Card

ARRAKIS SYSTEMS

150SC console. Five channels control up to 11 balanced inputs through VCAs for stereo tracking within 1dB. Reed relays do audio switching, while NE5532 ICs handle the bulk of amplification. Jensen transformers are available, however, active-balanced circuitry is standard. LED VU metering complements the LED peak flashers on a threshold control.

Circle (439) on Reply Card

2000SC console. Twenty-four balanced inputs are routed, two per channel, to balanced program and audition outputs.



An ADM custom stereo system for Glen Glenn, Hollywood, includes 96 inputs and 18 outputs with microprocessor control and interfacing into the total post-production system.

Microdyne Satellite Receiving Equipment is backed by the Most Responsive Service Policy in the Industry

Microdyne equipment is designed to the highest achievable standards of reliability and we are very successful in meeting these standards.

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If your Microdyne equipment fails, ship it to our service depot. Within 48 hours of our

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If the equipment is out of warranty, you pay only our published flat repair charge which is quoted prior to your

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P&G slide faders handle VCA level control for stereo tracking. Active circuitry or transformer balancing is available per the customer's request. All audio is dc-controlled, with no audio signals appearing on the operating panel.

Circle (440) on Reply Card

AUDIOARTS ENGINEERING

8X series. Designed for multi-track recording, the 8X series includes exclusive AudioArts Engineering M-104 precision conductive plastic linear faders, mix-down subgrouping, 24-track monitoring and 3-band sweepable frequency and semiparametric EQ.

Circle (441) on Reply Card

AUDIO DEVELOPMENTS

ADO45 Pico Plus. Each of six channels includes panning, 3-band EQ, a high-pass filter and mic/line-level input control, using a choice of carbon or P&G plastic sliders. The A and B outputs or battery condition register on a VU, PPM or N10 meter. Ten C cells or a regulated supply/charger power the unit. For portable uses, the ADO45 weighs about 13.2 pounds.

Circle (442) on Reply Card

AUDITRONICS

200 series on-air broadcast. Designed for AM or FM control, this console features full stereo facilities, a comprehen-

sive on-board, user-programmable logic system and accessories to enable configurations for newsroom to multistudio installations.

Circle (443) on Reply Card

300 series production. With full audio-follow-video capability, the consoles are designed to complement changing production methods of today. Available in 4- or 8-output models, features include mono or stereo inputs, each with or without EQ, VCA control, submastering and accessories for signal processing or local control of external functions.

Circle (444) on Reply Card

700 series multichannel console.

Available in 16- and 24-output models, the 700 series serves in audio-for-video use. Standard features include VCA grouping, effects, foldback EQ, monitoring and logical, easy-to-use layout. Level and mute automation, as well as special units for mobile use, are available.

Circle (445) on Reply Card

AUDIX

Assignable audio technology. Full control of 32 input channels and all ancillary facilities are handled from a control desk remotely located from the electronics. Control communication is handled through coaxial cables in digital commands. Memories allow instant recall of individual channels or complete desk settings at the touch of a button.

Circle (446) on Reply Card

AUTOGRAM

Microgram. Two input module types make up four of five panels on the Microgram console. One type accepts four single inputs. The second type includes two multiline systems that allow a fade to the next selected source. Any channel may output to any or all three stereo output buses. A computer interface automates two of the three buses with an internal memory for repeated sequence operations.

Circle (447) on Reply Card

BSM BROADCAST SYSTEMS

Rackmaster-5. The five input sections of the rack-mount system include a selection of mic or line level, with tone generator on Channel 1. High- and low-cut filters allow shaping of audio signals. Each input may be selected to line or cue.

Circle (448) on Reply Card

RBV-2 portable. Four microphones and one line-level signal have individual on/off switches and level controls. Headphones may be used for monitoring the program, cueing tape or monitoring studio talkback. Output terminals are provided for a single telco pair for transmission to the studio. A built-in dialer works with touch tone and rotary dialer circuits. The metal case contains enough room to carry mics and cables.

Circle (449) on Reply Card

BROADCAST AUDIO

System R. The first BAC dual-channel broadcast mixer to use the new P&G conductive plastic-damped rotary faders includes VCA audio control as standard, with full metering for program and audition outputs. The rack-mounted power

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Circle (24) on Reply Card

The brightness you need to show it big

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With General Electric's exclusive sealed light valve and sealed Xenon lamp system, in both color and monochrome General Electric Professional Large Screen Video Projectors, you can depend on sharp pictures from 2 to 25 feet wide. New high brightness models allow the room lighting viewers need to take notes and refer to written material.

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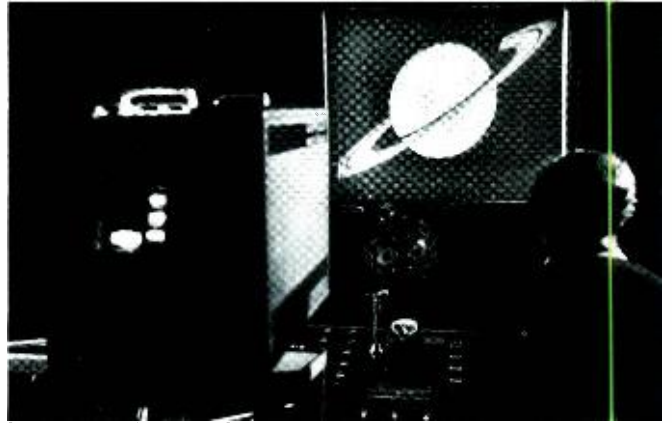
Entertainment: Theatre television, closed-circuit TV events, overflow crowds, special effects.

Television Production: Backgrounds for news programs, special effects, data display, program previewing.

Call or write: General Electric Company, Projection Display Products Operation, Electronics Park 6-206, Syracuse, NY 13221. Phone: (315) 456-2152. TWX 710-541-0498.



NEWS BACKGROUND at KBTW-TV, Denver, is displayed by General Electric PJ5055 Talaria projector.



SELL-OUT CROWDS at Fiske Planetarium, Boulder, watched live NASA transmission presented by General Electric projector.

GE Professional Large Screen Television Projector Specifications

COLOR PROJECTORS

Model	Light Output in Lumens			Resolution* in TV Lines per Picture Height		Input Power Req.		Scan Standards***	Video Input**
	Open Gate Min.	Modulated TV, Min.	Modulated TV, Typ.	Min. Horiz.	Min. Vert.	Max. Watts	Max. Volt-Amps		
PJ 5000	500	250	325	750	300	900	1350	525 li./60 fps; 625 li./50 fps	(1)
PJ 5050	1000	500	650	750	300	1100	1550	525 li./60 fps; 625 li./50 fps	(1)
PJ 5055Δ	2000	1000	1300	750	300	1750	2600	525 li./60 fps; 625 li./50 fps	(1)
PJ 5800	500	250	300	750	600	900	1350	875 lines/60 fps	(2)
PJ 5850	1000	500	600	750	600	1100	1550	875 lines/60 fps	(2)
PJ 5855Δ	2000	1000	1200	750	600	1750	2600	875 lines/60 fps	(2)
PJ 5100	500	250	300	750	650	900	1350	1023 lines/60 fps	(2)
PJ 5150	1000	500	600	750	650	1100	1550	1023 lines/60 fps	(2)
PJ 5155Δ	2000	1000	1200	750	650	1750	2600	1023 lines/60 fps	(2)

MONOCHROME PROJECTORS

PJ 7000	900	600	750	800	400	900	1350	525 li./60 fps; 625 li./50 fps	(3)
PJ 7050	1500	1000	1250	800	400	900	1350	525 li./60 fps; 625 li./50 fps	(3)
PJ 7055	3000	2000	2400	800	475	1100	1550	525 li./60 fps; 625 li./50 fps	(3)
PJ 7800	900	600	750	800	650	900	1350	875 lines, 60 fps	(3)
PJ 7850	1500	1000	1250	800	650	900	1350	875 lines, 60 fps	(3)
PJ 7855	3000	2000	2400	800	650	1100	1550	875 lines, 60 fps	(3)
PJ 7100	900	600	750	800	750	900	1350	1023 lines, 60 fps	(3)
PJ 7150	1500	1000	1250	800	750	900	1350	1023 lines, 60 fps	(3)
PJ 7155	3000	2000	2400	800	750	1100	1550	1023 lines, 60 fps	(3)

*Resolution measurements made with wide-band monochrome video input. **Video Input Key (1) NTSC or RGB Standard, NTSC/PAL/SECAM Switchable as Option; (2) RGB, (3) Wide-Band monochrome. ***For use at other scanning rates, contact General Electric Projection Display Equipment Operation for special application/model information. Projector line voltage 105 to 132v or 190 to 260 volts 50/60 Hz except those marked (Δ) above, which are 190 to 260 volts 50/60 Hz only.

GENERAL  ELECTRIC

Circle (26) on Reply Card

supply and a 10W/channel monitor amplifier is included in the package. Any combination of mic and line preamps are available at no extra cost.

Circle (450) on Reply Card

Series II mixers. Interchangeable modules, from 8-16 mixing positions, provide a variety of options. Each mixer module has a mic/line sensitivity switch and gain trim. Blackout-type meters are only illuminated when the line they represent is in service. External MOSFET monitor amplifiers are available for use with the series.

Circle (451) on Reply Card

System 14. System 14 is a digitally controlled stereo mixer using digital slide faders and CMOS high resolution logarithmic audio attenuators. Panpots and optional 5-frequency EQ are available for each plug-in mixer module. Extruded aluminum panels and durable mylar overlays create a pleasing appearance. Solid walnut armrests and end panels are a standard feature.

Circle (452) on Reply Card

BROADCAST ELECTRONICS

5M150/8M150 consoles. Dual mono channels in M150 series mixers provide program and audition feeds for production or on-air applications. Five- and 8-channel systems allow two mic or line inputs per mixer for distortion of less than 0.05% IM and THD at a +18dBm output. Signal-to-

noise is spec'd at 70dB below +18dBm from a -50dBm low level input.

Circle (453) on Reply Card

Deluxe M250 series. Designed for dual-channel mono applications, the 5-mixer 5M250 and 8-channel 8M250 mixer operate with modular electronics. Ladder-type attenuators and FET bus switching control two inputs to each mixing channel and routing to program and audition outputs. The 8-channel system includes additional 4-input switching for future expansion. The rotary faders have a cue position.

Circle (454) on Reply Card

CETEC BROADCAST

2000 series 5-channel mixer. The 5-channel 2000 series console comes in mono or stereo formats with carbon potentiometers or step attenuators. Each channel has two inputs with program and audition outputs. Auxiliary switching allows four additional inputs. Monitor, cue, headphone amps and muting relays are built in. The systems are well-suited for newsroom, small studio and remote broadcast applications.

Circle (455) on Reply Card

2000 series 8-channel mixer. Stereo and mono versions of 8-channel mixers use step attenuators as standard equipment. Each channel may select from two inputs for program or audition outputs. Integral to the console system are headphone, cue and monitor amplifiers. A talkback system

is valuable in production and on-air studio operations.

Circle (456) on Reply Card

8000 series consoles. The top of the line 8000 series console operates in full stereo and comes standard with eight channels serving 24 inputs. Expansion to 16 channels and 48 inputs with EQ is possible. P&G faders feed four output buses, three stereo and one mono. Expansion is simplified by modularity. All work surfaces are scratch-resistant and non-reflective black overlay.

Circle (457) on Reply Card

CLYDE ELECTRONICS

Alpha series. The modular Alpha series provides portable formats or fixed studio installations. Module locations are interchangeable for configurations needs. Mic/line, dual mic and dual stereo line input modules mix into four groups or program and audition pairs. PPM, VU and bargraph metering choices may be in a module or a meter hood.

Circle (458) on Reply Card

COMREX

SLX remote package. Facilities for four mics, three headsets and two tape inputs combine with a Comrex frequency extender system for improved frequency response via telephone lines. The unit may feed two Telco or RF program loops and two dial telephone lines simultaneously, while a third dial interface is for com-

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Get it out of your system.

Television is an electronic medium. Yet TV graphics still involve messy paints, glue, air brushes, razors, and other paraphernalia.

MCI/Quantel's Paint Box can put your TV graphics into the electronic medium.

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The Paint Box lets you do a lot more than you can do with traditional art materials. A lot faster. And with typical Quantel picture quality.

It gives you over 16 million colors. If that's not enough, you can mix your own, just like you'd do with paints.

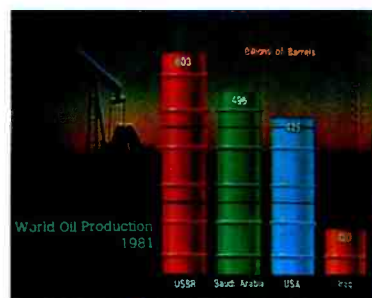
It's incredibly versatile. You can produce the look of oils, watercolors, chalk, pencil. You can make stencils. Air brush. Cut and paste. Even animate.

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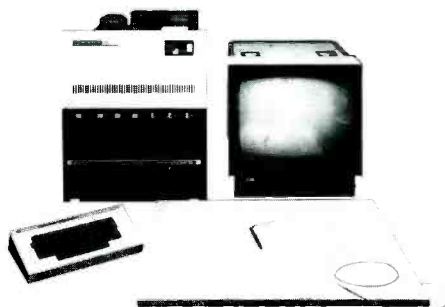
You can set type from a large variety of the highest quality fonts.

And you can interface the Paint Box to Quantel's DLS 6000 Library System for a totally digital still-picture system. It's awesome.

Call your local MCI/Quantel office. They'll be glad to show you a demonstration tape. Or get in touch with us directly at 415/856-6226. Micro Consultants, Inc., P.O. Box 50810, Palo Alto, California 94303.



Graphics like this are easy on the Paint Box



MCI/QUANTEL
The digital video people.

Circle (28) on Reply Card

munications. The 15-pound system serves remote applications, as in sports and outside broadcasting.

Circle (459) on Reply Card

CONTINENTAL ELECTRONICS MFG.

Rock 10 console. Ten rotary step-attenuator faders offer reliable, easily maintained levels to two program outputs, a mono mix or monitoring outputs. Each pot contains a cue detent. Two pairs of VU meters offer full-time Program 1 levels and selected signals to those labeled Program 2. Machine control interfacing is available on request.

Circle (460) on Reply Card

Mark 8 console. This broadcast console

handles 26 input pairs on eight mixers in stereo and mono. Integral monitor amplifiers are designed with three outputs each. Program, monitor and headphone outputs are included. Machine controls are optional, but right and left VU meters are standard.

Circle (461) on Reply Card

DEZTEK

BC-164 broadcast console. Fully modular, the BC-164 comes in mono and stereo models with dual redundancy power supplies, transformerless balanced inputs. EQ on each input module and FET switching. Circuitry is designed for 28dB of headroom before clipping.

Circle (462) on Reply Card

EELA AUDIO

System 200. Various S 200 formats range from a 4-into-2 film dubbing mixer and a 16-into-8 multi-track recording console. A 100mm carbon PREH linear fader is standard, but Duncan, Audiofader or P&G units are available. Different arrangements of grouping and aux sends may be specified. A meterbar mounts over the console with VU or PPM displays.

Circle (463) on Reply Card

Concord S 2000 in-line mixer. Applications for the S 2000 include multi-track record, broadcast, A-V, educational or PA/reinforcement plans. Two frame sizes, 20 inputs or 28 inputs, use only three types of modules to form the complete mixer system. Subgrouping is available in record and remix modes. In-place solo is standard on 8-, 16- and 24-track models.

Circle (464) on Reply Card

EMT-FRANZ

Multioutput mix system. Models from 10- to 30-input channels in portable and stationary configurations use output distributors for routing input signals to as many as 16 outputs. Peak voltage indicators aid visual monitoring of output levels. Expandable, these systems also allow supplementary pre- or post-fader outputs for reverb.

Circle (465) on Reply Card

ELECTRO-VOICE/TAPCO

EVT 5212. Panpots on the 12 input channels direct mic, line or external device return signals into a left or right group. Each channel includes a slide fader, 3-band EQ, monitor effects sends and a peak LED. The monitor includes two LED meters, switchable from left/right to main/monitor modes.

Circle (466) on Reply Card

C-12/Series Two. A compact 12-input channel mixer, the C-12 is a 4-subgroup, stereo and mono output system for musical, speech and theatrical sound reinforcement and recording use. Four analog VU meters register subgroup levels and switch for solo, mono, and L and R mains. A C-8E expander allows building 20-, 28-, 36- and 44-input systems.

Circle (467) on Reply Card

Series 72. Eight-, 12- and 16-channel models of the series 72 include transformerless balanced inputs to 6mm slide faders. Stereo and a mono mix output are monitored on two VU meters. The solo system uses an internal headphone amp and may be monitored on one meter as well.

Circle (468) on Reply Card

ENERTEC/SCHLUMBERGER

UPS 5104. The most compact of UPS 5000 series consoles is housed in a carrying case, table-top package or console support frame. Ten channels may be selected to two principal and two auxiliary outputs. Each mixer may select mic 1, mic 2, line or tone. Phantom power for 12V mics and a coupling connection to increase the number of inputs are featured.

Circle (469) on Reply Card

UPS 5124. The design is for radio or TV

Spill Coffee In Our Faders! You Still Get Great Sound!



Custom Audio Series Consoles

- P&G's newest splashproof faders. (Most boards still use older, unprotected P&Gs.)
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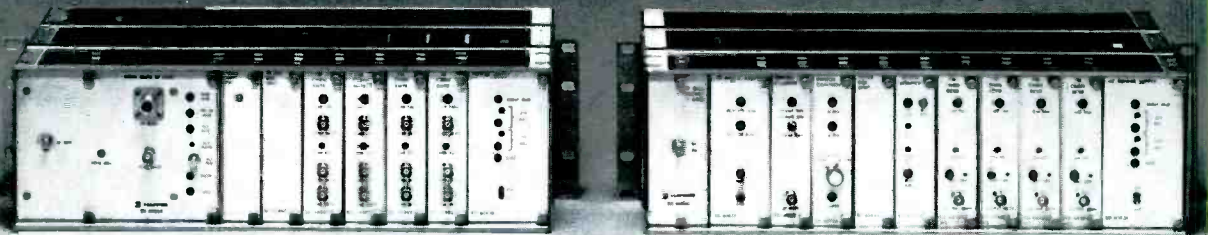
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Circle (29) on Reply Card

Advanced technology in a new, compact television relay system...



Harris 7FB Solid-State Microwave for Television Relay

Designed for STL, TSL and Multi-Hop Systems

Introducing a new, compact baseband radio from Harris Broadcast Microwave. Designed for easy installation in existing equipment racks, each receiver or transmitter uses only six rack mounting spaces. Yet this compact television relay system offers superior transmission performance for single-hop STL/TSL systems and for many multi-hop intercity systems.

FET Technology... Low- Noise Figure

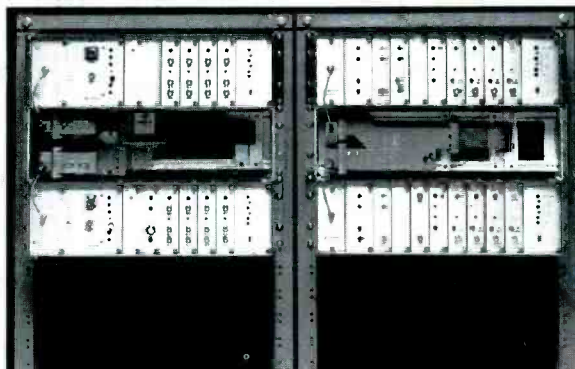
The transmitter uses a phase locked source to assure precise transmit frequency and a power-efficient, state-of-the-art broadband FET output amplifier. Use of a thin film LNA and an Image Rejection Mixer result in a receiver noise figure of only 7 dB.

Video Clamper is a Standard Feature

Some manufacturers call this a luxury option. We call it built-in quality. Our 7FB receiver includes a clamper which stops picture bounce, reduces low frequency noise and eliminates hum from the video signal.

Expandable System

You can easily expand your 7FB system, in the field if you wish, to a fully protected version. The monitored hot standby protection arrangement is offered as a factory option or as a field installed add-on. And you can equip the system with up to four audio subcarrier channels—in the same shelf as the radio.



In this fully protected system, the audio and video signals automatically switch to a second system in the event of service interruption to the main receiver and transmitter.

Simplified Maintenance

To save maintenance time and cost, the 7FB is designed with modular plug-in units. This design allows each unit to be quickly and easily removed for servicing.

Quality, Service & Technology Leadership

Farinon Video—now Harris Broadcast Microwave—built its reputation by supplying top quality television transmission equipment for STL, ICR and portable systems.

You can continue to expect exceptional quality and the finest service-after-the-sale from the industry's technology leader...Harris Broadcast Microwave.

For all your microwave equipment and accessories, contact HARRIS CORPORATION, Broadcast Microwave, 1680 Bayport Avenue, San Carlos, CA 94070. Phone (415) 595-3500.



HARRIS

studios, but the size is small enough to fit an outside broadcast vehicle. Twelve input channels feed six group channels and two main or auxiliary outputs. Stereo operation is possible, while filtering and 3-band EQ may be used on either of two mics or a line-level signal on each channel. The aux outputs may include compression.

Circle (471) on Reply Card

FARRTRONICS LTD.

M70 series. Rack-mounted mono and stereo systems use dc voltage for all level and switching control. Stereo input channels interface to editing systems for up to 16 mono mixers, four subgroups and two output channels. Expansion in groups of eight mixers also allows submaster expansion, if required.

Circle (472) on Reply Card

GIRARDIN

C series consoles. Studio and portable models offer input channel capabilities from 12 to 18 channels, directed to four or eight groups and/or outputs. All include talkback and VU metering. Options include EQ/filtering, limiting or compression and remote control.

Circle (473) on Reply Card

GREGG LABS

Model 2040. The 14 mixing channels accommodate up to 24 input sources for combination to three stereo and three mono outputs. Input channel modules include audition and program switching, mic panning, remote machine starts, send level controls and P&G slide faders. Comprehensive monitoring includes a cue system fed from slider detent positions.

Circle (474) on Reply Card

HALLIKAINEN & FRIENDS

TVA 132/142. One of six inputs to the TVA 142 may be selected with control signals from a video switcher. Signals are amplified by the TVA 132 output amp to program and audition channels. Audio DAs provide three line-level outputs on each channel of the rack-mount system.

Circle (475) on Reply Card

HARRIS/BROADCAST DIV.

M90 on-air console. The M90 modular console is versatile, flexible, dual stereo and modular. Features include a selectable sum channel output, simple stereo bus assign push-button switches, monitor selector switches for typical broadcast functions and multiple studio speaker muting. The system is available with 18 or 26 input channels.

Circle (476) on Reply Card

Medalist. New from Harris, this 10-channel dual-stereo audio console is ideal for stereo on-air and production applications. The performance is virtually transparent. Features of the system include linear or rotary attenuators, plug-in/interchangeable attenuator modules, selection of 30 sources into the 10 channels and mic capability on all input channels.

Circle (477) on Reply Card

Micro Mac. In a modular format, the Micro Mac features 1-16 input channels, 1-4 output channels and three assignable submaster channels. A digital

microprocessor memory eliminates many control room errors in routine board operation. A "walkaway" feature gives semiautomatic live assist or a fully unattended operation of 99 events.

Circle (478) on Reply Card

HARRISON SYSTEMS

TV-4 console. New packaging and construction techniques significantly reduce cost, while maintaining high technical performance. Frame sizes from 12 to 52 inputs accommodate up to eight stereo groups, multi-track interfacing through stereo groups and fader packages for automation and true AFV operation with CMX, GVG, Sony and other editing control systems.

Circle (479) on Reply Card

AIR-7. The AIR-7 is designed for AM and FM broadcasters. Proprietary-balanced, differential electronic signal function blocks yield high signal performance and RF immunity. Features include conductive plastic VCA faders, silent Hall-effect switching, center detent pan and balance controls, and two inputs per mono or stereo module.

Circle (480) on Reply Card

ES-7 edit mixer. Designed for the video editing suite audio system, the ES-7 offers true AFV operation with CMX, GVG, Sony and other edit controllers. Main features include two pairs of stereo line inputs per module, pre-fader insert, patch point, eight logical mute groups, stereo in-place APL solo, headphone output and more.

Circle (481) on Reply Card

HOWE AUDIO PRODUCTIONS

7512A console. Twelve channels, serving 22 inputs, use slide faders and TTL digital logic for signal routing to the audition or program stereo buses and a mono output. VCA operation is used with active-balanced inputs and outputs. LEDs are used as status indicators. A spare parts kit, spare preamps and VCAs and a 3-year warranty are included.

Circle (482) on Reply Card

7012A console. On-air or production facilities may use the 7012A, which includes rotary faders and VCA channel control. Without TTL logic of the 7512A, the 7012A handles 12 inputs to its 12-channel format efficiently for program and audition outputs. The rotary faders include cue positions. Four meters complement an LED ladder indicator that tracks the on-air modulation level.

Circle (483) on Reply Card

7012 console. Retaining many of the features of the 7512A system, the 7012 does not include TTL logic or sliders. Instead, it uses rotary faders and a switched 3-meter system. A centrally located LED meter keeps track of the on-air modulation level. Audition and program channels allow on-air and production operation.

Circle (484) on Reply Card

INTERFACE ELECTRONICS

Series 550. Frames for 12-48 positions provide stereo on-air, audition and two auxiliary outputs. Modular construction includes machine starts, internal or exter-

nal EQ, solo, phase reverse, echo send and auto-muting monitoring. Metering options include standard VU or 30-point LED bargraphs with peak or average readings.

Circle (485) on Reply Card

Model 200B portable. Eight or nine inputs are directed to model 200B stereo outputs and controlled by Duncan faders. Each control channel offers EQ, phantom power, solo and echo. Two standard VU meters read stereo program, cue or 12V battery condition. Enclosed in a 13"x17.5"x7" package, the system weighs 22 pounds.

Circle (486) on Reply Card

LPB

Monogram II series. The stereo and monaural M-5 5-mixer consoles serve small on-air installations. Rotary faders include a cue position to feed the integral cue amp and speaker system. Four mixers have two inputs, while the fifth uses auxiliary switching for four inputs, a total of 12. Stereo models include mono sum and unmuted program auxiliary outputs.

Circle (487) on Reply Card

Signature II series. Six models of Signature II consoles have 5-, 8- and 10-mixer formats for stereo, mono, dual mono and dual stereo configurations. A selector chooses one of three inputs to each rotary fader. An internal cue system is fed from a cue detent on each fader. Four output buses include program, audition, headphone and cue auxiliary. Meters include peak level LED indicators.

Circle (488) on Reply Card

Citation series. Eight- and 10-mixer stereo systems include rotary or slide fader controls. Push-buttons route signals to program, audition or PFL cue buses. Remote starts and two VU meters are standard, with additional metering capability and a digital timer optional. Each mixer channel selects from three different inputs.

Circle (489) on Reply Card

LOGITEK ELECTRONIC SYSTEMS

CAS-11S custom audio. A modular system, designed for on-air and production, the CAS-11S features P&G splashproof slide faders. One-button operation and clear, sensible panel layout make the system easy to run. The CAS-11S, handling 28 inputs on 11 mixers, is covered by a 5-year warranty.

Circle (490) on Reply Card

CAS-5S custom audio. The CAS-5S offers 10 inputs onto five mixers. P&G splashproof faders, integral headphone amps, full metering and exceptional audio performance are standard. Complete machine start and audio-follow capability is included, with an optional built-in DA.

Circle (491) on Reply Card

Audiorack. Ideal for newsrooms, ENG, local-origination and corporate video, Audiorack is a complete 6-in, 2-out audio mixer capable of all FM broadcast requirements. Features include dual-channel metering with peak LEDs, operator and talent headphone controls, talkback and unique Preview-Program 1-button break

Continued on page 42



the trendsetters

Unquestionably the industry's standard of excellence in broadcast equipment

Most manufacturers meet industry standards; we exceed them. Our TOMCAT cartridge recorders/reproducers and BMX series of broadcast consoles deliver trendsetting on-line performance in broadcasting systems worldwide, from Boston to L.A., Australia to Great Britain.

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Circle (31) on Reply Card


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TAKE A CLOSE LOOK AT THE NEW PRIMUSTM CART MACHINES.

Introducing the PRIMUS (pree-mūs) cartridge recording/reproduction system from Ramko Research.

These new cart machines are engineered to be demonstrably and dramatically better than any other cart machines in the industry. They deliver signal-to-noise, distortion and frequency response specifications that are unrivaled. They set a new standard for the lowest wow and flutter. They're built rugged throughout to guarantee adherence to specifications.

COMPARE THESE SPECIFICATIONS: YOU BE THE JUDGE.

roller is engaged by an adjustable air-dampened solenoid with a Teflon-coated plunger for friction-free, quiet operation. Optical sensors start the motor when a cart is inserted. This not only eliminated start-up wow, but it means there are no mechanical switches to break or jam. Bearings have a longer life too because the motor doesn't need to run continuously. A crystal-controlled, brushless D.C. servo motor insures timing accuracy to within 0.05%. The minimal motor heat is kept away from your tapes by a high traction, ceramic capstan. Tape speeds (7.5 & 15 ips) are field selectable.

With PRIMUS, you have three cue tones with sharp, error-free digital sensing. Solidstate bar graph meters and dynamic noise reduction are standard. An

sistently repeatable, accurate electronic phase alignment. A front panel phase meter and internal diagnostics are added for operating ease.

PhaseMaster works flawlessly with any cartridge and eliminates the compromise of unreliable and inconsistent electromechanical schemes. The trade-off imposed by noise-inducing and non-compatible matrixing approaches are now history. Complex, inexact cross-correlation techniques have been discarded. With PhaseMaster you're positively guaranteed compatibility with all your previously recorded carts. Here's a cart machine truly ready for superior FM & AM Stereo applications — a machine that rivals the performance of an open reel recorder.

	PRIMUS TM	ITC R/P SERIES	AUDICORD #128	RE SERIES 3200		PhaseMaster	TOMCAT	ITC SERIES 9918	ATR 800* (Reel-to-Reel)
Signal-to-Noise Ratio:	-60 dB	-50 dB	-47 dB	-52 dB	Signal-to-Noise Ratio:	-65 dB	-50 dB	-56 dB	-60 dB
Distortion (System):	0.9%	2.0%	1.0%	2.0%	Distortion (System):	0.9%	0.9%	0.8%	0.3%
Frequency Response: 50 Hz - 15 kHz	±1.5 dB	±2.0 dB	±2.0 dB	±2.0 dB	Frequency Response: 40 Hz - 16 kHz ±1.5 dB	40 Hz - 16 kHz ±1.5 dB	40 Hz - 16 kHz ±1.5 dB	40 Hz - 16 kHz ±1.5 dB	40 Hz - 16 kHz ±1.5 dB
Wow & Flutter:	0.095%	0.2%	0.15%	0.15%	Wow & Flutter:	0.08%	0.09%	0.15%	0.06%
Price:	\$2,550	\$2,610	\$1,979	\$2,450	Real-time Phase Correction:	locks to 5° at 16 kHz	none	none	none
					Price:	\$3,850	\$5,280	\$5,330	\$6,200

All measurements referenced to 250 WPM, distortion is THD at 1 kHz.
All models are R/P Stereo, priced with three cue tones.
All prices are based on latest available manufacturers' information 3/83.

A CLOSER LOOK AT BETTER ENGINEERING

Mono or Stereo, R/P or playback, here are more reasons why the PRIMUS cart machines are the industry's most advanced.

The PRIMUS transport deck is $\frac{5}{8}$ " thick cast alloy for superior stability. It's covered with stainless steel for wear resistance and EMI shielding. The machined headmount allows easy and precise adjustments. In addition, the heads are internally illuminated for cleaning and inspection. For smoother insertion and withdrawal and to prevent distortion, carts are securely held at the edges by spring-loaded rollers, rather than friction springs. To prevent tape skew, pinchroller parallelism is adjustable with the motor running. The pinch

automatic 4½ digit timer is optional. All electronics are on plug-in modules and rear panel connectors are quick disconnect type.

In summary, the PRIMUS cart machines have been engineered to be the most sophisticated broadcast reproduction system you can buy for under \$3,000.

COMPARE THE PHASEMASTER: YOU'RE THE JUDGE AGAIN.

If you're in the market for the ultimate Stereo phase-correcting cart machine, look to our PhaseMaster, the broadcaster's premier phase-correcting, stereo cart machine.

The PhaseMaster has all the features as PRIMUS plus, the advantages of con-

THE CERTIFIED PERFORMANCE GUARANTEE

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Take a close look at how the Certified Performance of PRIMUS or PhaseMaster can make your job a whole lot easier.

PRIMUS

PRIMUS is a division of Ramko Research, Inc.

Ramko Research, 11355-A Folsom Blvd., Rancho Cordova, CA 95670 (916) 635-3600 Telex: 176493 RAMKOSAC Heads are warranted for one year.

Circle (32) on Reply Card

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switching. The system is covered by a 5-year warranty.

Circle (492) on Reply Card

MBI BROADCAST SYSTEMS LTD.

Series 24A mixers. Modularity of series 24A mixers allows complete interchangeability of modules for any configuration. Expandable, the systems give mono and stereo operation with EQ options. P&G conductive plastic faders are used throughout. Remote and local machine starts, a telephone line input module and PPM (VU optional) metering are standard features.

Circle (493) on Reply Card

MCI/SONY

MCI JH-800 compact console. System features include 12 inputs for mic/line-level signals, four VCA groups, four sends, three echo returns and comprehensive EQ/filtering. Channel VCA access enables easy interface to edit controllers. Separate line and mic inputs are balanced transformerless. Communications include talk-to-cue and independent 2-way to three locations.

Circle (494) on Reply Card

MCI JH-618 console. A small frame size (52 inches) provides full studio features and performance in tight control rooms. I/O modules (to 18) include mic preamp, 24-channel assignment, 3-band EQ, high-/low-pass filtering, six sends and in-line

monitoring. Stereo line input modules are available. Five returns, DIN connectors and a complete patch bay are standard.

Circle (495) on Reply Card

MCI JH-636 console. Up to 36 I/O modules in the JH-600 series frame each include mic preamps, 24-channel assignment, 3-band EQ, filtering, six sends and in-line monitoring. Stereo inputs allow VTR, RIAA phono, cart machines and reel-to-reel ATRs to be controlled/mixed independently. Five returns, a comprehensive patch bay and DIN connectors are standard.

Circle (496) on Reply Card

MCCURDY RADIO INDUSTRIES

SS8900. A free-standing, modular console comes in 16-, 24- or 32-input channel forms, with four or eight submasters and two or four masters. Each mixer includes four auxiliary outputs with full assignment capability. Comprehensive metering and patching facilities are provided with valuable options available.

Circle (497) on Reply Card

SS8808. The 8-mixer stereo desk includes two inputs per channel and a choice of modules for mic or line levels. Each input assigns to either or both of two outputs. One auxiliary and selectable mono-sum outputs with cue, monitor and talkback facilities are included.

Circle (498) on Reply Card

SS8500. The free-standing stereo con-

sole includes a 10-mixer format with two inputs per mixer channel. A choice of input modules accommodates any input type. All channels are assignable to two outputs. Along with a complete cue, talkback and monitoring system, foldback and echo sends are available.

Circle (499) on Reply Card

McMARTIN INDUSTRIES

1000 Series. Five-channel stereo and 8-channel mono or stereo systems have 10- and 18-source capabilities with input convertible for mic or line. Program and audition outputs serve on-air and production purposes with complete control over muting switching. Integral monitor and cue amplifiers have sufficient power for almost any requirements.

Circle (500) on Reply Card

MICRO-TRAK

6500 consoles. The 5-channel, low profile 6509-DB and 10-channel 6510-DB console are basic, reliable, full VU-metered systems. Rugged construction with top performance at reasonable cost affords a +24dBm headroom level along with nine or 14 inputs. Both systems use plug-in components to provide dual bus outputs.

Circle (501) on Reply Card

6618 console. Six audio channels support mono and stereo outputs. Included in the package is a 10W/channel monitor amp and VCA level control. Latch Logic audio switching in the 6618 gives noiseless switching of the selectable input preamps.

Why Your Radio Station Should Own An Eventide H949 Harmonizer®

• IT'S A COMPLETE AUDIO TIME COMPRESSION SYSTEM AT A FRACTION OF THE PRICE

The \$3500* H949 gives you the same audio time compression and expansion capabilities of competitive single-purpose units costing well over twice as much. You get the power to control time itself...with no editing, no program material deleted and no abnormal pitch effects.

• IT'S A COMPLETE SPECIAL EFFECTS DEPARTMENT

The Eventide H949 Harmonizer® special effects unit gives you an almost endless variety of effects. There's variable delay, echo and reverb. Feedback level and equalization controls let you "custom-tune" the audio. Pitch change capability can create new voices. Mix input with pitch-changed output for chorus and harmony effects. Want the distinctive sound of flanging? The H949 offers the best flanging ever. There's time reversal and repeat too. For even more versatility, many more effects can be created from combinations of the basic effects.

WHAT CAN THIS MEAN FOR YOUR STATION?

• IT CAN HELP YOU MAKE MORE MONEY

Go after those co-op dollars! The H949 can easily compress an existing national spot to accommodate a local retailer tag. Local advertisers who deliver their own ad copy will love what the H949 can do. Endless retakes to correct

the non-professional's timing errors are eliminated. Use pitch-change to make that local retailer sound more like an announcer (He'll love that!) Time compression with the H949 can bring order out of chaos when running back-to-back religious or political programs which are often mistimed. And, you'll find yourself doing more and better station-produced local spots—with those special audio effects that make for a more professional custom production. Your advertisers will notice and appreciate the difference.

• IT CAN GIVE YOUR STATION A MORE DISTINCTIVE, TIGHTER SOUND

The H949 Harmonizer can really make a difference. Use its special effects capabilities to produce really distinctive promos, intros and custom jingles. For a brighter, fast-paced sound, some stations choose to speed up their music by a few percent, utilizing the Harmonizer to maintain normal pitch. Using pitch-change, you can even create new voices to populate your air.

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Circle (33) on Reply Card



Sound on Vision

Some rather discerning people are using Soundcraft Series 2400 master recording consoles. They've established that Soundcraft performance and reliability meet the rigorous standards broadcast and video post production impose – within some fairly tight budgets too.

In conjunction with Television Projects in London, Alan Bunting, the Audio Manager for BBC Scotland, specified the Series 2400 for their new dubbing suite – making this the second 2400 the BBC have purchased for their Glasgow studios so far.

If you'd like to find out why more and more Soundcraft consoles are being specified for broadcast and post production audio mixing, contact Soundcraft or your Soundcraft distributor today.

Soundcraft

Soundcraft Electronics Limited, 5-8 Great Sutton Street,
London, EC1V 0BX, England. Tel: 01-251 3631. Telex: 21198.

Soundcraft Electronics USA, 1517 20th Street,
Santa Monica, California 90404. Tel: (213) 453 4591. Telex: 654923.



A custom 51 series Neve system for CBS Records packs into mobile crates for easy transportability to the recording site.

Plug-in parts simplify service, when necessary.

Circle (502) on Reply Card

Telefile II. A 4-channel portable console, the Telefile II includes features for newsgathering and telephone filing. The Telefile is book-sized, battery-powered and includes switch-selectable mic/line-level XLR inputs and outputs. Dedicated connections are provided for telephone and piggyback cassette recorder interfacing. A snap-slide mounting plate eases van or VTR mounting.

Circle (503) on Reply Card

NEOTEK

Series I consoles. Almost any number of

channels could be incorporated in a Series I production console and mixed to feed four or eight subgroups. Logic signals for starts come from special P&G slide faders. Solo and overpress cueing, peak and VU metering are featured.

Circle (504) on Reply Card

NEVE ELECTRONICS INT'L.

51 series. The 5116 console is designed for broadcasters as well as those needing 24-track recording capability. Standard models have 24, 36 or 48 input channels, eight subgroups and four main outputs. Inputs and subgroups are provided with 4-band format spectrum EQ, filters, limiter/compressor, and may be expanded on special order.

Circle (505) on Reply Card

System 542. Several models of 542 consoles offer 6- to 16-input capability with two groups. An interconnection system combines more than one system for expanded functions. In suitcase or smaller table-top formats, the series includes modular channel amplifiers with P&G faders, comprehensive EQ, L/R stereo outputs and aux 1 and 2 outputs.

Circle (506) on Reply Card

53 series consoles. Two models of 53 series TV sound production consoles cover from 12-36 channels with channel assignment to various grouping and masters. Outputs may be used for multi-track recording, multifunction operation and outboard processing. Extensive EQ, metering and patching facilities are provided.

Circle (507) on Reply Card

OPAMP LABS

Wired or kit. Various configurations of audio mixing are available from Opamp Labs as kit construction projects or pre-wired systems. From an 8x2 system for TV to a 20-in/8-out/16-mixdown monitor can easily fit small studio or mobile vehicle plans.

Circle (508) on Reply Card

PACIFIC RECORDERS AND ENGINEERING

BMX broadcast consoles. Three frame sizes include 14-, 22- or 26-input module formats. Although all wiring is in place, not every module has to be at the start. Mic inputs include cough and talkback functions. Line inputs include machine starts. Sidechain processing patches into the system easily. A remote line selector offers a 10x2 stereo inputs matrix. Full VU metering covers program or audition outputs as well as a mono mix of either.

Circle (509) on Reply Card

PROTECH AUDIO

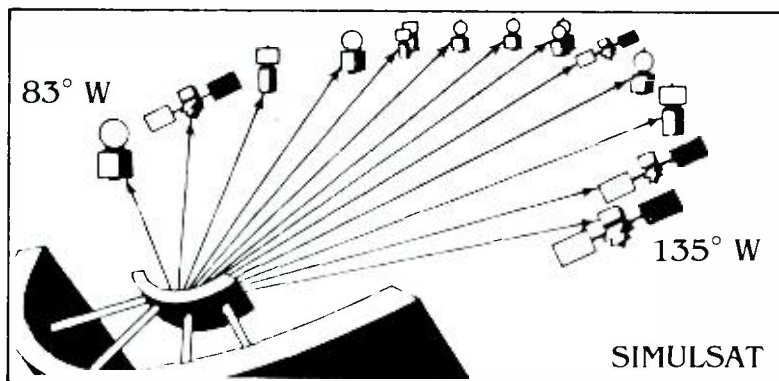
Series 1600. Engineered for TV audio, 1600 consoles are custom-built from a basic plan of 16 input channels, four sub-master channels and two or four program output channels. Total assignments of all inputs, complete monitoring and integral cue/talkback facilities are features.

Circle (510) on Reply Card

QUAD EIGHT ELECTRONICS

Ventura II post-production system. Ventura II includes disc-automated mixing

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Circle (35) on Reply Card

and editing designed for TV post-production. The microprocessor-controlled equipment, with COMPUDISK software, includes SMPTE time code from internal readers, generators and panel and CRT displays. Systems to 28 input channels and 16 or 24 outputs offer simultaneous stereo/mono mixes, in-line monitoring, eight program mix buses and six aux mix buses.

Circle (511) on Reply Card

248 component series. The 248 mixing consoles form a group of modules/main-frame configurations for any application. From 8-24 inputs (and expandable) and 2-8 outputs may be arranged as a 24x4 + 4 production console, a 12x2 + 2 broadcast system or a 16x4 reinforcement console. Four auxiliary send buses include pre/post and on/off switching. EQ is a 3-band stepped parametric type with adjustable "Q" and filtering. VCA subgrouping and additional VU metering are options.

Circle (512) on Reply Card

QUANTUM AUDIO LABS

Series 22. Broadcast, production and on-air mainframe sizes accommodate 8-, 14-, 20- and 28-input modules. Completely modular in design, the systems may include mono and stereo inputs with or without EQ. The external power supply is rack-mountable. P&G sliders are standard items, while 48V phantom powering and a digital clock/timer are only two of many options.

Circle (513) on Reply Card

RTS SYSTEMS

HPM-41 mic mixer. Compact and lightweight, the HPM-41 mixer serves audio, film sound, location radio and studio needs. Four balanced, transformer-isolated inputs include phase reversal switches, selected 12V A-B and 48V phantom power, pre-transformer pads, high-pass filters and limiting. Outputs include two independent line-level signals, a balanced low-Z XLR output switched between mic/line levels and a balanced 600Ω output on binding posts.

Circle (521) on Reply Card

RADIO SYSTEMS

Audio Metrics ESA-10. Ten channels, each accepting three inputs, feature linear faders with total dc control. Two outputs allow mono mixdown. A 2-way cue system, machine starts, digital clock and digital timer are standard. Audition, Program and Auxiliary metering is by 76-segment LED units, using 3-color formats with peak or average response and peak hold segments.

Circle (514) on Reply Card

RAINDIRK LTD.

Series 100. For small broadcast or mobile requirements, the series 100 includes eight channels feeding two inputs. Mic or line inputs are routed to Left/Right, PFL and auxiliary buses with P&G slide level controls and limited EQ.

Circle (564) on Reply Card

Series 200 broadcast mixer. For stereo in the small format, a series 200 mixer allows mic and line inputs for stereo and mono outputs. Limited EQ and machine

control switches are provided, as well as auxiliary outputs and PFL/AFL monitoring.

Circle (515) on Reply Card

Series 400. Up to 12 mono or stereo channels are directed to four main output groups, clean feeds or direct channel outputs. Also, each channel includes 3-section EQ, high-pass filtering and phase reversal. PFL and solo switching allows source cue monitoring. Three twin RTW peak program bargraph meters show levels of the four main groups, specific channels and mixes.

Circle (516) on Reply Card

RAMKO RESEARCH

P-4M mixer. Part of the new Primus system, the P-4M includes four mix/line input channels with an EQ scheme that may be used on Channel 1, 2 or all four. Conductive plastic faders incorporate a cue position. For the news and production room or remote use, two additional inputs serve phono or ATR needs. With table-top or rack-mount packages, expansion of inputs is possible with a P-5MX unit.

Circle (517) on Reply Card

DC-38 series. Four inputs to each of five, eight or 10 mixing channels of the DC-38 units may be directed to Cue, Audition and Program outputs. A dual cue arrangement allows signal checks without changing a mix level. LED VU meters indicate Left, Right and Mono/Phase signals. Inputs and outputs are differentially balanced. Options include a clock/timer module and remotability.

Circle (518) on Reply Card

DC-12 series. Modules allow building up of consoles to 12 channels, using slider level control. Solid-state balancing on inputs and outputs interface to any system. A 2-way cue, audition and program system allow flexibility of dc-controlled audio. LED VU meters of Left, Right and Mono outputs are selected between program and audition channels.

Circle (519) on Reply Card

RAMSA/PANASONIC PRO AUDIO

WR-8118. One button switches the WR-8118 from a reinforcement/PA system into a multi-track recording mixer. Up to 18 mic and line inputs connect to the 3-band EQ system. Direct outputs are available from each mixing channel. LED bargraph meters show output levels, while a Solo meter function looks at any one input or group signal. For smaller installations, the WR-8112 offers 12 mic and line inputs.

Circle (520) on Reply Card

RUSSCO ELECTRONICS MFG.

Studio/master 505. Four channels quickly modify for mic, line or phono inputs, while a fifth channel accepts any one of five stereo, high level, balanced inputs from push-button switching. Four channels include FET on-air switching. All channels have a Cue detent.

Circle (522) on Reply Card

421 mini-mixer. A mono mic, one line-level and two stereo phono inputs feed a stereo output bus. Three-band EQ is

available and two LEDs indicate overload conditions on right and left channels. When a fader is at Cue, that channel output is switched to the headphone monitoring circuit.

Circle (523) on Reply Card

T411 Tel-a-Mote. Similar to the 421 mini-mixer, the T411 includes a telephone rotary dial instead of an equalizer. Switched EQ is available. A 9Vdc alkaline battery pack backs up ac power for 10 hours of remote operation. For sports-casting, a 2.6kHz filter prevents line dropout by whistle during the broadcast.

Circle (524) on Reply Card

SATT ELECTRONICS

SAM 42 portable. Four mic/line inputs, selected to A or B outputs, have PFL monitoring and slide faders. A talk-back mic is built-in, along with the test oscillator and a power supply for phantom powering. Metering uses PPMs with logarithmic scales. Battery operation is normal, but an ac supply may be used.

Circle (525) on Reply Card

SAM 82. Weighing about 17 pounds, the SAM 82/design is the result of broadcasters in Sweden, Norway and Denmark. Eight mic/line inputs feed two main outputs from 16 sources. Two auxiliary outputs provide cue and echo/studio playback facilities. Other features include echo return, monitoring, tape monitor input, talkback capability, test oscillator and phantom powering. PPM metering uses logarithmic scales.

Circle (526) on Reply Card

SELA

SELA 6F mixer. The 6-channel SELA 6F portable mixer is designed to be used directly with a Nagra recorder or other analog or digital systems. Four of the input channels switch to accept line levels. All include PFL listen and solo, 3-band EQ and high-pass filtering. Limiting is switchable and multiple outputs feed various systems.

Circle (527) on Reply Card

SQN LTD.

SQN-3 mini-mixer. A Type M model for recorders accepting balanced mixer outputs and a Type C model for the Nagra SNN recorder feature one line-level and three mic-level inputs. Six AA cells give 12 hours of continuous use, including phantom powering at 12V and 48V. Within the 3.5-pound weight are 20:1 compression/limiting, a headphone output with independent gain adjust and high-pass filtering.

Circle (528) on Reply Card

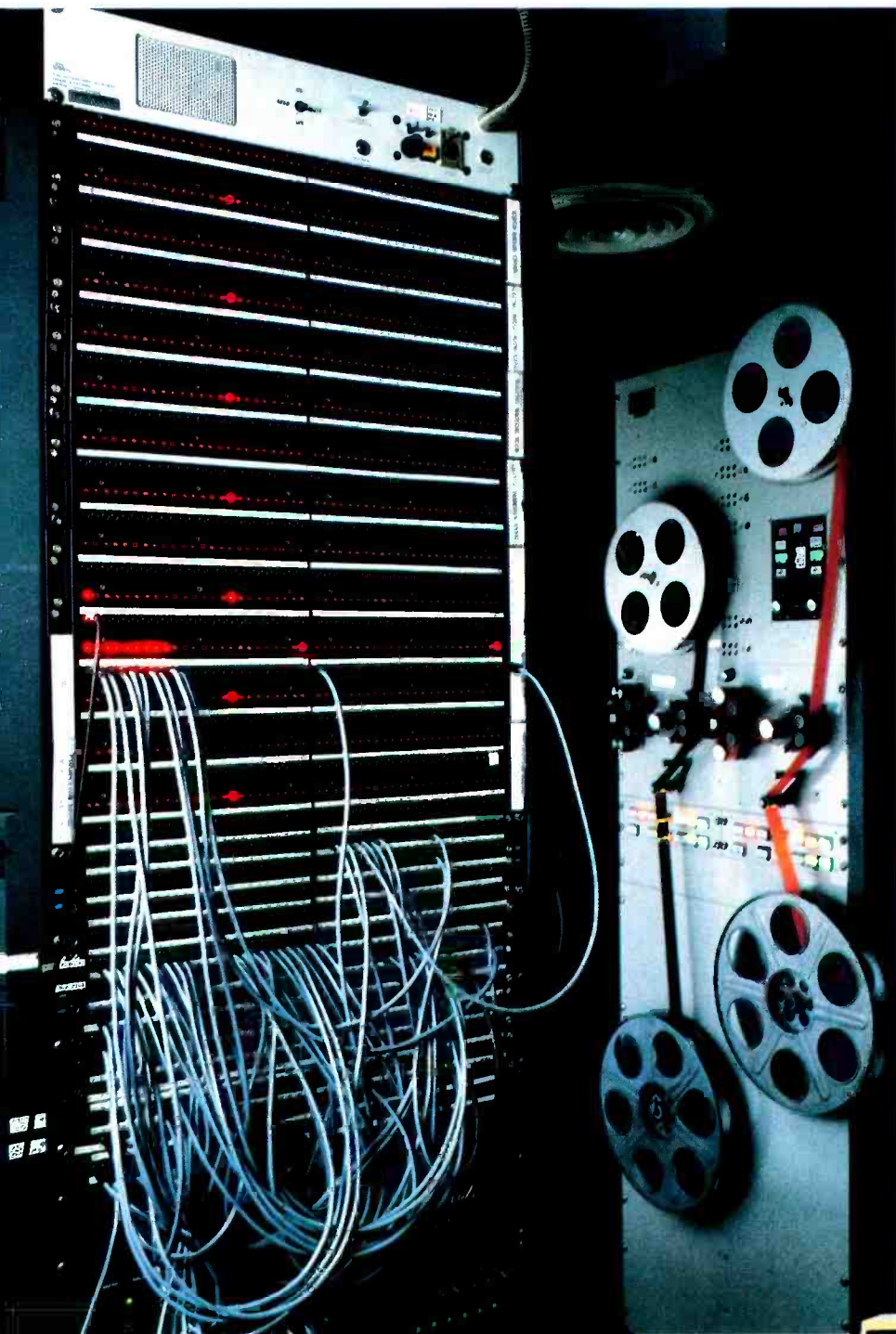
SHURE BROTHERS

M267 mic mixer. Four mic or line inputs include switched low-cut circuitry. The master output channel includes limiting with an LED peak indicator. Phantom power at 30Vdc may be switched for each mic channel. If expansion is desired, a companion mixer, the M268, allows four mics, and an auxiliary/input for additional capability. Battery operation of both units is possible.

Circle (529) on Reply Card

Continued on page 50

With state-of-the-art technology in their recording studios, Lucasfilm Ltd. didn't settle for do it yourself jackfields.



Lucasfilm's special effects in sight and sound have become the hallmarks of the STAR WARS saga. To achieve those other-world sound effects takes a lot of patching, switching, and mixing.

When Lucasfilm's audio patching requirements called for a unique and complex design to provide high-quality audio throughout its complex, Chief Audio Engineer Tom Holman selected ADC to manufacture jackfields to fit those requirements. All Tom had to do was plug them in, and the jackfields were ready to go—guaranteed and pre-tested—eliminating the hours of wiring, testing, and correcting that do-it-yourself jackfields often require. ADC custom and standard jackfields can save as much as 50% of the cost of do-it-yourself jackfields.

In addition, we offer more than 240 configurations in 1/4" or Bantam jacks, wire wrap or solder terminations, variable cable lengths, plus a variety of normalling configurations and types of terminations (including our revolutionary new "punch-down" connectors, introduced at this year's NAB). We inspect and computer-test every circuit to make sure it lives up to spec. That's why we can offer a five-year warranty on every unit.

Best of all, we can have any of our standard jackfields on their way to you in only two to four weeks. And that's a promise we can deliver. For information about ADC's standard or custom jackfields, write ADC, 4900 West 78th Street, Minneapolis, MN 55435. Or call our toll-free hotline—1-800-328-6188. In Minnesota, call (612) 835-6800.



(Above) ADC custom jackfields form an integral part of Lucasfilm's state-of-the-art audio technology.

(Right) Tom Holman, Chief Audio Engineer for Lucasfilm Ltd., selected ADC for responsiveness, quality, and reliability.



Circle (36) on Reply Card



HAWKEYE

ONE-MAN GANG SHOOTS 25 SET-UPS IN 12 HOURS



Mississippi ETV has a one-man equipment gang on the road shooting and recording their new documentary series "Mississippi Roads". They're able to do it because of the versatility of HAWKEYE!

In a recent production covering the restoration of the Natchez Eola Hotel, the HAWKEYE recording camera and that one-man equipment gang were able to cover 25 different set-ups in 12 hours under a producer's direction.

"HAWKEYE gets into tough-to-shoot places," reports Larry Holden, director of production for Mississippi ETV. "It speeds our coverage and its small size puts on-camera individuals at ease. It gives us high quality productions in a cost-effective way."

"Outstanding . . . Impressive"

"The camera video quality is outstanding and recorder performance is impressive. We've been putting HAWKEYE through a tough grind for nearly a year now and we haven't had any major problems."

Segments for "Mississippi Roads" are shot with the recording camera . . . a HAWKEYE studio recorder is used with existing 1" VTRs for multiple generation editing.

HAWKEYE is versatile. It can be easily integrated into your present equipment complement. Ask your RCA Representative for the HAWKEYE facts—camera, recorder, recording camera, or complete systems. Have HAWKEYE Your Way. RCA, Bldg. 2-2, Camden, NJ 08102.

Illustrations show HAWKEYE in a variety of locations and configurations at the Natchez Eola Hotel.

RCA

Circle (37) on Reply Card

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Circle (38) on Reply Card

Continued from page 46

SR109 mic mixer. Up to eight individual mics with high and low frequency EQ combine into a single output. Inputs 7 and 8 handle line levels, if desired. An internal peak limiter includes bypass switching and threshold adjustment, while link jacks allow external processing systems to be added.

Circle (530) on Reply Card

SOLID STATE LOGIC

SL 6000E stereo video system. With all signal processing, switching and machine control handled by a single engineer, the SL 6000E audio console provides film-style audio flexibility with electronic efficiency and economy. In 16- to 56-channel formats, up to 112 line/mic inputs and four stereo effects returns, mono, stereo and multi-track configurations may use the Total Recall computerized floppy disc system to deal with control settings. Computer-assisted, live or post-production uses CRT displays to keep the operator posted on system status.

Circle (531) on Reply Card

SONIFEX

RB102 radio desk. The RB102, a 10-channel, 2-output group mixer, is designed for radio studio work. Two phono channels have RIAA EQ and, like the cart machine channel, have machine starts. A telephone return channel uses built-in telebalancing. An FM tuner selects five preset stations with routing switches. The LCD clock includes set controls.

Circle (532) on Reply Card

SONOSAX

Portable SX-S. Two forms of SX-S portable systems offer eight or six inputs. The output module level uses two slider or rotary potentiometers. Powering is from internal batteries or an external 10-15V source. Packaged for convenient portability,

there are no protruding parts. The handle is retractable and a transparent cover encloses all controls.

Circle (533) on Reply Card

SX-A console. Compact, versatile and lightweight, the SX-A console depends on VCAs for applications in fixed or mobile studios, video post-production, broadcast or PA work. Innovative features include PFL auto reset, voice over, compressor per input and flat cable wiring. Modules insert into custom-made chassis.

Circle (534) on Reply Card

SOUNDCRAFT ELECTRONICS USA

Series 200. Three frame sizes of series 200 include 8-, 16- and 24-channel formats. With four groups and two stereo outputs, balanced mic and line inputs, 4-band EQ, four aux sends (two post- and two pre-fader) complement 48V phantom power, input clipping indicators and 2-track replay. The 8-input model is 19-inch rack-mountable. Others are table-top designs.

Circle (535) on Reply Card

Series 800B. Primarily for concert sound and auditorium installations, the 16- to 40-input configurations of series 800B include 4-band EQ, eight aux buses for effects/foldback sends and a choice of modules for monitor mixing and speaker control. Eight VUs monitor individual outputs with an additional pair for stereo left and right. All include peak LEDs.

Circle (536) on Reply Card

On-air console. The standard 36-inch mainframe accommodates 18 stereo inputs in a modular format that reconfigures in minutes. Each input module is capable of mono or stereo mic or line. EQ modules are inserted only where needed. Universal bidirectional logic interfaces on each channel may control carts, turntables, ATRs, tallies and mutes. With program

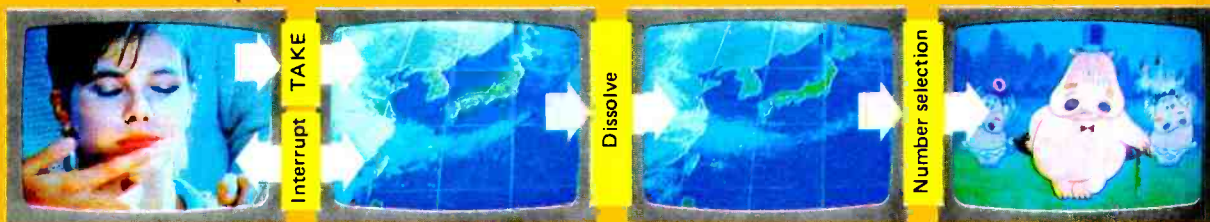
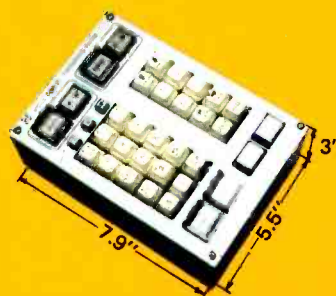
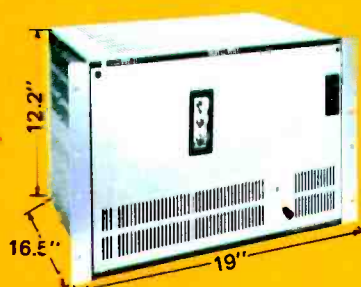


The Editel New York sound mix room, designed by Vin Gizzi, includes the Solid State Logic SSL 6000 with 32 inputs and six mix buses. Expandable to 48 inputs, the Events Controller handles automated dynamic mixing from stored and organized titles, cues and SMPTE locations.

MODEL DSS-11 DIGITAL STILL-STORE

MEETS THE FIVE ESSENTIAL CONDITIONS FOR STILLS.

1. Simple operation. (Touching the digital still-store causes it to be operated instantaneously and freely.)
2. Fast read time. (0.35 seconds for 1 field, 2 fields, and 4 fields storage)
3. Large storage capacity. (500 field pictures on internal disk. 1,000 field pictures by adding an equivalent external disk.)
4. Natural picture quality. (CC-SPF system acclaimed for its excellent picture quality)
5. Small size. (only 12.2" high, including internal disk. Mounts in a standard rack or a relay vehicle.)



- Only the body and operation board need be purchased.
- Simple installation. Simply connect the body and operation panel with a 1 cm diameter cable.
- Program transmission possible.
- Convenient AS mode for emergency picture transmission. AS is the abbreviation for "picture after setting" and is used for picture material that arrives after transmission preparations are complete and for emergency messages. For example, if the AS switch is pressed, then 0 ~ 9 is pressed, the AS image is inserted directly during LIST transmission or in the next picture and operation is resumed according to that LIST.
- The output picture is switched over to the next picture under two modes; One with common switch and the other under dissolve (switched over to the next picture as if the last picture is dissolved).
- Control can be made by three types of monitor connection. Control can be made thoroughly with any method. Moreover, the comment can be watched on a 9" monitor.
 1. Use one unit of on-air color monitor. Operate by watching the on-air image output with comment.

2. Use one unit of on-air color monitor, and one unit of next preview color monitor. Operate with the on-air image output and next preview output with comment connected to the on-air monitor and next monitor respectively.
 3. Operate with the on-air image output, next preview output and comment output connected respectively to the on-air monitor, next monitor and monochrome monitor.
- The operation panel is small enough (1/2 letter size) to be installed anywhere. Alphabetic comments are also included.
 - The switch section of the operation panel can be removed and used up to 3 m away through an extension cable. Therefore, the operation board can be freely designed by installing the switches at the desired desk and connecting them to the operation panel with this extension cable.
 - All operations which can be performed from the standard operation panel can also be remotely controlled from an external EDP.
 - For the additionally installed disk, series connection which increases image capacity and parallel connection which makes the system to presently used type and stand-by type can be switched over by the switch in the main unit.

Our still equipment is being used by the NHK News Center and many public broadcasting stations, and incorporate the know-how gained from long experience. For example, all this technology is included in this one unit. Therefore, performance is high and stable, and operation is extremely easy.



NTI America, Inc.

1680 North Vine Street LOS ANGELES, California 90028
Phone 213-462-8945

and audition channels, the prototype system is expected in production soon.

Circle (537) on Reply Card

SOUND WORKSHOP

Series 30. Auto-Recall Mixdown System shortens to ARMS on the logically planned panel of the series 30 recording console. Typical systems offer 8-in/8-out to 36-in/24-out configurations with extensive metering, patching and EQ capability.

Circle (538) on Reply Card

SPECTRA SONICS

1024-24 console. Multiple audio signal routing, EQ and quad, stereo and mono outputs are characteristic of the 1024-24 console and related models with 12-32 group outputs. Complete channel assignments, multi-track recording monitoring and extensive metering touch only on visible features of the system.

Circle (539) on Reply Card

SPHERE AUDIO

Sphere Type C. Each channel of the Type C console includes 10 auxiliary send buses and nine VCA groups. Assignment to any of eight submaster groups is also possible, all as good as the main stereo output bus. The multi-track bus includes separate trims for each track (to 24). At post-production, Datalog automation recalls console setting from equalizing to bus mixes.

Circle (540) on Reply Card

STELLAVOX

AMI 48 portable. Five identical input channels include treble/base control, slide fader, cue selection, panpot and switches for mic/line and phantom power. A double modulometer tracks the right/left output channels, each controlled by an individual fader. Compression switches into Channels 4 and 5. Powering is available from external sources or 15 AA cells.

Circle (541) on Reply Card

STUDER REVOX AMERICA

Studer 900. Two standard versions offer 13 or 28 inputs to feed four outputs in 901 and 902 mixer consoles. The series offers increased EQ; optional manual or VCA automation faders; transformer or transformerless microphone inputs and VU, PPM or bargraph metering. A choice of housings includes a fixed wooden console or a transportable, folding case.

Circle (542) on Reply Card

069 outside broadcaster. In a suitcase for transporting, the 069 contains one line channel and two mic/line channels, each selectable to outputs 1 or 2. Plastic faders set levels, as indicated by a single switched meter. A second meter shows the amount of limiting occurring in either output channel. Additional flexibility includes the commentator box and an integral telephone dial and interfacing.

Circle (543) on Reply Card

Small format mixers. Models 169, 269 and 369 are small format console systems for fixed or portable applications. Each modular unit may be arranged in configurations to meet particular requirements. Metering on output channels includes a small indicator to show amount

of limiting on the channel, as well as a phase correlator meter on the 369. Individual phantom power controls and equalization are available on each mixing channel.

Circle (544) on Reply Card

STUDIOMASTER/DIV. OF IMC

16x8x2 recording console. Electronically balanced inputs direct mic or line signals to 8-track recording outputs and subgroups or into a 2-track stereo mix. Tape monitoring uses subgroup electronics, thus avoiding tying up inputs. All metering is done with LED ladder-type displays with channel overload indicators near the appropriate slide fader.

Circle (545) on Reply Card

TASCAM PRODUCTION PRODUCTS/TEAC

M-50 production console. Production with the M-50 12x8 console uses one-of-three source selection to each of 12 channels. Assignable submixing and monitoring simplify 8-track recording and overdubbing. Auxiliary mixes develop performer cues and carry effects sends, remote feeds or stage monitor/foldback mixing. Other features include in-place stereo solo; PFL cue; a 178-jack, rear-panel patch bay; 3-band, parametric sweep EQ; and a meter bridge with eight VU meters, each with a peak LED.

Circle (546) on Reply Card

M-35 modular console. Eight transformer-isolated or line inputs, four bus outputs and an independent 8-track monitor mixer complements the TASCAM 80-8 recorder, but is equally suitable to 4-8-track, studio and solo work. Parametric sweep EQ on input channels selects either of two low and two high frequency ranges. An expander option gives an additional 12 mic/line inputs.

Circle (547) on Reply Card

M-16 mixing console. Flexible bus assignment via switching, variable controls and numerous patch points allow the 16-track system, with a 16-track monitor section and 24 input positions, to handle three simultaneous, independent stereo mixes. Solo capabilities include pre- and post-fader features with panpot tracking and solo remix mode. Each channel includes 4-band, parametric swept EQ, filtering, phase reversal and separate mic/line trim pots.

Circle (548) on Reply Card

TEL-TEST

1002 console. Built by ISI, the 1002 allows 10-input channel control to program and monitor outputs (two each) and serves outputs for foldback, echo send and cue. High- and low-cut filters combine with 3-stage EQ.

Circle (549) on Reply Card

TORE SEEM A/S

SEEMIX console. Broadcast or multi-track recording applications of the SEEMIX console use up to 48 inputs with eight subgroups, eight dc groups and several mono and stereo outputs. Four-band EQ combines with high and low filters. Computer control hands the op-digital fader modules and assignment/routing needs. Options include compres-

sion/expansion and gating in each channel, auto mixdown and interfacing for various telephone hybrids.

Circle (550) on Reply Card

Pluto mini-mixer. Three input channels each have rotary faders to provide one mono output. Headphone monitoring, an input for return cues and an output for the commentators' headphones are available. One input switches from mic to line. Two inputs have phantom power, if desired. For ENG and OB use, with six 9V batteries, the mixer weighs about 5 pounds.

Circle (551) on Reply Card

TRIDENT AUDIO

VFM modular system. Two modular mainframe systems, 16x8x2 and 16x4x2, are suggested for PA or recording applications. Each mixing channel includes separate mic and line inputs along with insert send and return. Metering and overload indications are LED type units.

Circle (552) on Reply Card

TRIMIX systems. Trimix consists of a basic mainframe of 24 vacant slots that may be filled in a variety of ways, then joined with other mainframes for expanded capabilities. Any module fits any slot of the 8-bus system. Metering uses VU analog units as standard, but LED PPMs may be obtained.

Circle (553) on Reply Card

Series 80. For 16- and 24-track recording needs, the series 80 consoles follow the design criteria for Trident's TSM systems to handle the most complex recording and mixdown needs with full automation available as a standard or retrofit package.

Circle (554) on Reply Card

TWEED AUDIO (USA)

Broadcast consoles. Six console formats provide various arrangements of 16 or 24 mixing channels, all including a table-top area for scripts and logs. Several types of input modules serve different functions with all channels operable remotely. The final configuration conforms to needs of on-air and production studios in radio and TV stations.

Circle (555) on Reply Card

UREI

Model 1620 music mixer. The 1620 is a multi-input stereo mixer for broadcast, production or other applications. Standard units include one transformer-isolated mic, five stereo line-level and two phono inputs. Outputs include main program, monitor, headphones, effects and recorder channels. Balance, tone and level controls, with cue switching and an input matrix, allow maximum flexibility.

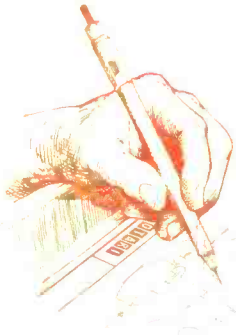
Circle (556) on Reply Card

1650 series console. A 5-channel full stereo allows the choice of rotary conductive plastic, Shallco precision or P&G linear fader attenuators. For budget-minded, small market stations, the highly RF-immune systems include monitor, headphone and cue amplifiers, with internal speaker muting system and noise-free FET switching. For 8-channel capability, the 1680 is available.

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The recent installation of an M-series console from Ward-Beck in the KPIX studios, San Francisco, enhances audio operations for production and on-air. Peter Glamona, engineer, is at the controls.

WARD-BECK SYSTEMS LTD.

R1000 radio console. R1000 consoles are stereo-ready, awaiting the station's choice of mic, line and stereo input modules. Ten input channels typically feed two stereo program and two combined mono master channels, two stereo monitor channels and a PFL cue channel with amp and speaker. Three VU meters show *Left, Right and Mono* from Program 1, Program 2, *Off-Air* and External signals.

Circle (558) on Reply Card

T1202A transportable console. Intended for small studio and remote pickup use, the T1202A provides 12-channel capability with mixing to three output channels. Each input allows phantom mix powering with a 3-section state variable EQ and a P&G balanced plastic fader. Four mixing buses are provided with stereo operation possible.

Circle (559) on Reply Card

M2484B broadcast/multi-track. Each of 24 input channels feature state variable EQ, P&G plastic faders and bus assignments. Eight subgroups of inputs are further directed to four program master buses, as well as to a patch panel for multi-track outputs. A monitor mix-down section includes capability of 16-track playback or other combinations of playback and console outputs. Comprehensive metering involves 17 analog VU meters.

Circle (560) on Reply Card

YAMAHA COMBO PRODUCTS DIV.

RM1608 recording mixer. Sixteen channels employ electronically balanced XLR mic and unbalanced RCA tape jacks. Switch-selected outputs on eight main program mixing buses allow 16-track recordings in successive overdubs without re-patching. Individual channel switches control phantom mic powering, while each channel also includes 3-band EQ and high-pass filtering. Talkback, slating and test signals are assignable to program, echo, stereo and studio buses.

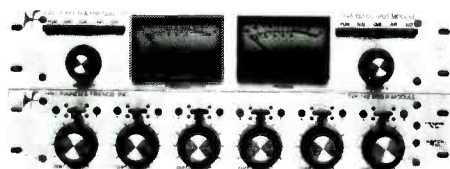
Circle (561) on Reply Card

M916 mixer. For fixed or portable requirements, the M916 includes 16 input channels, 11 mixing buses and 19 outputs, as well as 22 patching out/in points. Each channel selects a mic or line input and incorporates 9-frequency EQ with assignments to program, foldback or echo pairs. Four matrix channels create discrete mono combinations of signal sources. Metering tracks matrix levels or bus assignments and includes peak LEDs.

Circle (562) on Reply Card

PM-2000 mixing console. In 24- or 36-channel formats, the PM-2000 offers 14 mixing buses of eight program, four foldback and two echo channels with subgrouping, scene presetting and multichannel recording. A matrix mix of 14-in/8-out adds additional capabilities. Complete EQ, filtering and metering with peak LEDs tailor and monitor signals for any requirements. Individual channel phantom powering accepts any mic type of audio source.

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The TVA 132 is the metering and output module. It can handle two separate audio mixes - a real convenience when one channel is "on air" and another is to be simultaneously recorded.

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The TVA is great for remote work too. A balanced 600 ohm output is provided for a studio phone link. All the pots and switches are big and sturdy and they plug in (no soldering) for quick, easy maintenance.

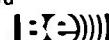
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All in good time.



Part 1

Inside CBS Operations: At home

By Bebe F. McClain, president, B. F. McClain Productions, Asheville, NC

If CBS Broadcast Group can be thought of as a body, then CBS Operations is surely its heart. For it is this entity that pumps out the blood, sweat and tears of all the professionals at CBS to the TV audience, while also being the port of entry for much of the new blood.

Upon visiting the vast CBS Broadcast Center in New York, one's first impression is that it is one of the largest collections of TV paraphernalia ever assembled under one roof. Trying to understand how it is organized and how it can possibly function 24 hours a day, seven days a week, is tantamount to arriving in Washington, DC, and inquiring how the United States operates.

Although CBS Broadcast Group is comprised of many parts, it soon becomes obvious that the core is CBS Operations, headed by Robert Hammer, whose title is vice president, Production Facilities—New York. One cannot be in Hammer's presence for long before he makes it clear that the technical gear housed inside his huge domain is not the end all, be all.

"Human beings run this place," Hammer said, "and they are my major concern."

Hammer, an electrical engineering graduate of Rensselaer Polytechnic Institute, began his TV career in 1950 as a union video technician at CBS and rapidly moved through various supervisory positions while remaining in the union ranks. After five years, he joined the management team as an operations engineer and then became part of the line staff, eventually working in almost every area until 1962 when he became director of Technical Services. In 1972, he became vice president, the position he still holds.

Approximately 1500 people are part of CBS Operations. They ultimately report to Hammer, who describes his job as one that embraces planning, program production, broadcasting, remotes, and all the people problems.

"I have the technical end—everything from the camera lens forward—such as set designers, carpenters, set

decorators, stage hands, lighting, makeup, etc. In addition, there is the Broadcast Services Group, which is responsible for monitoring the continuity of the programs, commercials and other announcements transmitted to the various networks CBS feeds and to WCBS-TV. It also encompasses manpower scheduling. There is the facilities services end—buildings, air conditioning, heat, painting, cafeteria, bathrooms, etc. There is the production control end, which includes production supervision and accompanying program and post-production finances and, finally, the long- and short-term capital planning group, not to mention special events like covering the political conventions."

The CBS organization

Although there is a complex organizational chart for this entity, it can simply be described to include everyone involved in the technical and production efforts. This includes efforts in New York and at remote sites, as needed by CBS Entertainment, News, Sports and the local New York CBS-owned station, WCBS-TV, to produce the shows and feed them to more than 200 affiliated stations. This complex involves nine elaborate studios, including nine fully equipped control rooms plus the Dan Rather newsroom.

The facilities include 68 1-inch VTRs, 76 studio and remote cameras, 150 U-matic machines and so much other equipment that five shifts are needed to operate the facility—three

regular shifts spanning a 24-hour period, plus two overlapping shifts. This equipment is not just housed at the Broadcast Center, but also in 10 remote trucks and three off-premise production studios. All of this equipment and all of these people are needed to broadcast and produce programming 24 hours a day, including more than 300 remote events each year.

It is difficult to grasp the magnitude of the task assigned to CBS Operations. Not only is it the heart of the CBS Broadcast Group but, physically, it occupies most of the body. It has to. There are 35,000 miles of recorded videotaped programming material stored in the CBS library in addition to 70,000 miles of film. (This includes 2200 feature-length movies.) At the end of 1982, CBS Operations inventoried 43,000 reel of program 1-inch and 2-inch tape. CBS must rent special fireproof and temperature/humidity-controlled storage space in New Jersey to help house its gigantic accumulation and to preserve the old priceless footage.

Approximately 10,000 commercials, promos and public service announcements, including backup, are played each week on the Ampex cart machines that, since installation, have cycled 4.5 million times. CBS Operations inventories more than 50,000 carts, which is not much accumulation seeing as 24,159 spots were delivered to CBS last year alone for airing.

CBS Operations provides more than

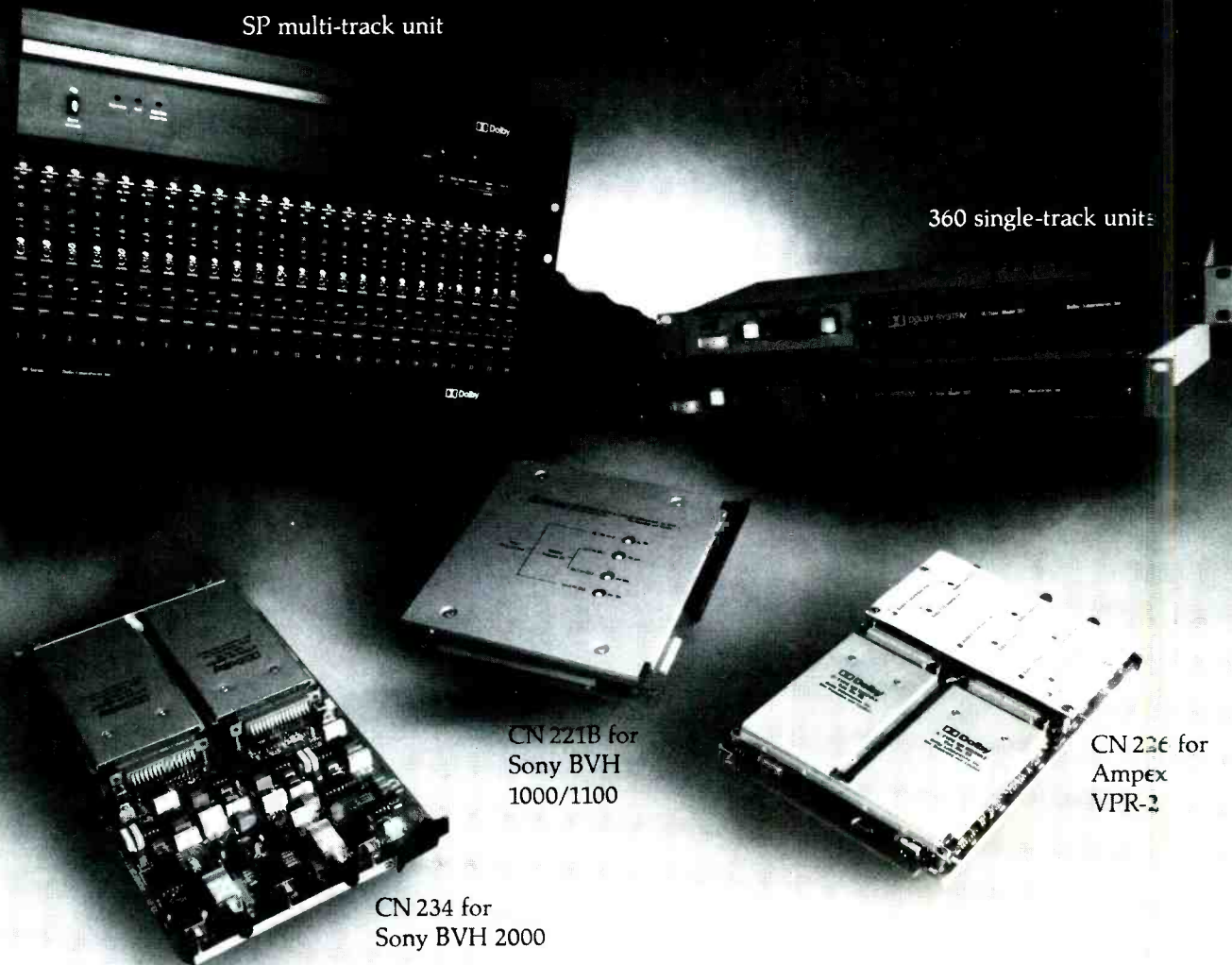


CBS Control Room 41 is one of the most technologically advanced facilities in broadcasting.



Jack O'Donnell (left), director, Technical Services, in CBS master control.

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25,000 hours per year of raw stock to its various clients for original recording and editing purposes. And, they oversaw the processing of one million feet of film per year last year.

The people of CBS Operations not only operate and maintain the various facilities and the remote equipment, but are now being called on to do so while implementing a major facility update budgeted in excess of \$100 million, which will ultimately touch almost everyone and everything at CBS Broadcast Center.

In addition to filling daily production and technical requirements, CBS Operations is coping with the birthing pains of "Extra Vision"—the CBS teletext system, which became available to all of its affiliate stations as of April this year. About 100 pages of national interest items (News, Sports, Financial, Health, etc.) will be generated in Hollywood and fed to New York for broadcast. Local stations can insert pages of local concern.

Simultaneous to all of this, Hammer must handle many special events. For instance, he has already begun to put the CBS Convention team together. People and budgets must be assigned by this summer—a full year before either convention. The planning is done now, and building will begin this fall. After the sets and the systems are

fabricated, they must be transported to the convention sites for installation and debugging. The timing between the conventions, the sites selected and the space allocated will dictate whether totally independent apparatus must be used at both conventions. Hammer must be prepared to go either way.

Technical Services

The Technical Services arm of Hammer's operational group, managed by Jack O'Donnell, is broken up into seven areas: Studio Technical Services, Electronic Graphics, Video Tape Operations, Film Services, Maintenance, Central and Broadcast Operations (the actual broadcasting of the signal), plus Field Operations, which will be the subject for the second part of this article.

Unlike Hammer, O'Donnell did not come from the union ranks, but began his career as a CBS management trainee. A degree in electrical engineering combined with an MBA, plus 15 years experience inside CBS Operations and a 3-year stint in the financial department have proved to be excellent prerequisites for the diverse challenges of overseeing the technical side of CBS.

Home for CBS Operations, which includes Technical Services, is a



Andy Barry, director, Video Tape Operations, with 1-inch recorders dedicated to adjacent CMX editing room.

1-million-square-foot facility on the west side of Manhattan, where hundreds of technicians devote themselves to the daily task of preparing and broadcasting programs.

O'Donnell said that Technical Services employs a pool concept. In addition to those assigned to provide the technical assistance needed to produce ongoing programs, a group of unassigned people are placed where and when they are needed. O'Donnell never forgets that his group's mission is to serve his customers—the producers. When a producer puts in an order, Technical Services often has to supply pieces from each department. "In essence, I have three major concerns: to satisfy the customer; to do the job efficiently by providing what is

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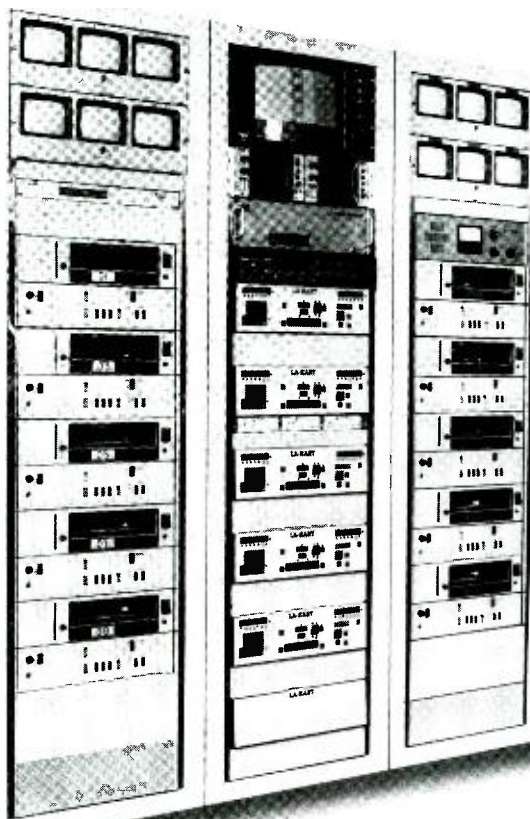
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AUTO-DUB. For safety copies of your source tapes or edited masters, all you need is IVES' one-button Auto-Dub command. A direct dub from the play VTR to the record VTR, or vice versa, is that simple, and both VTRs automatically rewind before dubbing.

PRE-STRIPE. IVES automatically stripes the record tape with continuous SMPTE time code, control track pulses and video black with this one-button command. The command also automatically rewinds the record or source tape and resets the internal time code generators to zero.

INTERNAL ROUTING SWITCHER. All video, audio and SMPTE time code signal routing is performed automatically in response to VTR selections, so no signal cable reconnections are necessary.

INTERNAL AUDIO MIXER. Audio mixing for voiceovers or background soundtrack is a cinch with IVES. Its internal audio mixer can blend audio inputs from microphone or auxiliary audio with the audio track of the play VTR, while front panel controls provide programmable fade and allow adjustment of mix ratio and input level.

SINGLE SHUTTLE KNOB. An entire edited master can be

built using only IVES' shuttle knob and the PERFORM key. All the functions necessary to search at variable or selected cruise speeds, mark edit points and initiate previews are at your "fingertips".

In addition to all this, the IVES contains its own internal NTSC sync and video black generators and dual internal SMPTE time code generator/reader for the record and play VTRs. And IVES offers variable rate video fade to/from black, split audio/video edit capability, output to a printer and a non-volatile memory.

IVES, the Intelligent Video Editing System from EECO. It has no competition. For more information write or call, Video Products Marketing Group, EECO Incorporated, 1601 E. Chestnut Avenue, P.O. Box 659, Santa Ana, CA 92702-0659, 714/835-6000.

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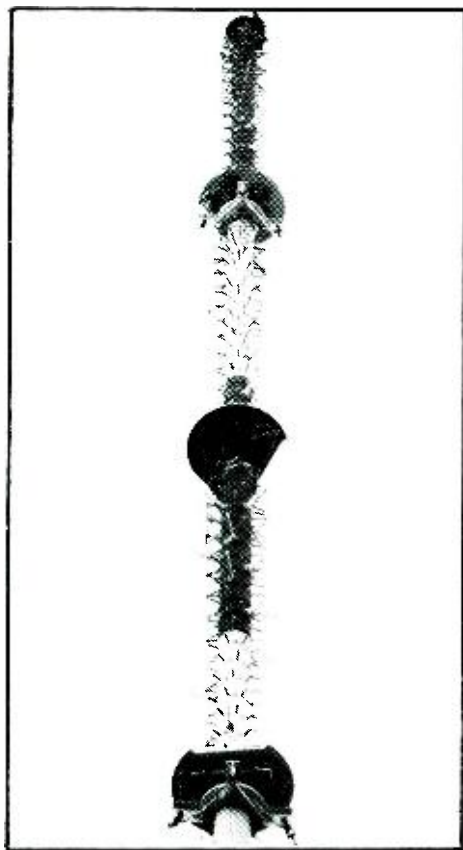
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needed to everyone who needs it with the resources available, in other words, spreading the resources around and fully utilizing what we have; and protecting the quality."

O'Donnell said that his main objective has always been to inspire a sense of teamwork among the individuals of this enormous group. "I want the producers to perceive us as a group of people who will provide the services needed—and not a lot of individuals going in different directions, each of whom must be negotiated with separately."

Measuring success is difficult, but he was encouraged recently when a foreign visitor toured the videotape production area and remarked that he could not distinguish the technicians from the producers because they were working together so informally.

There are nine studio technical managers assigned to the New York facility. Each is responsible for more than one show, as opposed to the 13 field technical managers on the road who handle one event at a time. Although the official title for these men and women is technical manager, they are often referred to by their old title—EIC (Engineer In Charge). Speaking of all the EICs, O'Donnell said, "They have the hard job; mine's easy. I devise policy and procedures, the EICs bring it all together."

The studio EICs rely on the individual technical directors assigned to each show while they split their time among them all. It is possible for the EICs to oversee multiple shows, because most of the productions are centered around the New York facility. "It's different for the EICs in the field," O'Donnell said. "Each remote is unique and there is no backup for the EIC. He can only handle one at a time."

About all his EICs, O'Donnell said, "They amaze me how they can make dozens of very quick decisions—and usually be right. The only explanation is that those decisions are based on maturity, experience, good judgment and the ability to thrive in this mad-house environment." Referring to their ability to get the job done without developing an ulcer, he said, "This job calls for someone who is self-disciplined. Maybe a degree in electrical engineering isn't what's needed—perhaps a degree in abnormal psychology plus a touch of show biz."

All of the EICs working in the studios are the responsibility of Jim Martens, director of Studio Technical Services. Also, the 219 technicians (camera operators, technical directors, audio and video operators) assigned to the various productions, along with the millions of dollars



Fred Schutz (right), director of Maintenance, in CBS maintenance area.

worth of equipment and supplies, are under the auspices of the group.

Martens never stops being impressed with the ingenious ideas the producer/directors conceive, although it places great demands on his resources. One example is the recent Cronkite Missile Debate aired in late April by CBS. At first the director wanted Martens to rent four ADOs (at a cost exceeding \$100,000) to electronically assemble any combination of five men onto one screen. Three, at different sites in Europe, were coming in simultaneously on individual satellite feeds while Walter Cronkite and Henry Kissinger were in separate studios inside the Broadcast Center.

Instead of using ADOs, the operations personnel and the director devised a set based on a chroma-key situation incorporating a group of monitors so that when Cronkite turned to any of the different monitors (off stage), it appeared he was talking face to face with the desired man. Mark Ganguzza, the young studio EIC in charge, said that he used eight cameras, 16 tape machines, five frame synchs, two still-stores and one character generator. The three incoming satellite remotes were fed a switched-return video feed and a mix-minus audio feed by satellite to facilitate the "one on one" effect needed for the debate. According to Martens, "Ganguzza did a beautiful job. It was very, very clever."

Surprisingly enough, one of the biggest production efforts of the year never goes to air. It is the *Prime Time Preview Presentation* that CBS stages every year at Broadcast Center to show off the new season's offerings. The advertising agencies attend to gather information to advise their clients about potential advertising buys for the season. Martens, who deeply involves himself in this extravaganza, acknowledges this to be his number one potential headache of the season, although staging *NFL Today* and the *Dan Rather News* is always full of challenges.

CBS Technical Services' main problems involve the frustrations of trying



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to provide the resources the producers request as fast as they are needed. CBS is not unlike every other production facility in the world in that each producer tends to believe his, or hers is "the only show." O'Donnell thinks this is a healthy attitude and is a key ingredient for good programs, even though it calls on his group to stretch their resources to the limit.

"Actually," he said, "my greatest enemy is time, or, more explicitly, the lack of it. Time to get the right people and time to get the right facilities. I feel we have to compromise too much—especially to handle all the changes. News and Sports are off planning all sorts of great things that all call for change. It's compounded because the hardware people keep inventing new things. We need time to sit together and plan beyond next week, next month. We need to make it *management by planning* instead of *management by crisis*. Sometimes I'll get upset at something that's done and say, 'Why'd you do that?' The answer is, 'I had to get the show on the air.' That's a good reason, but what about next time? And, what are you going to do so you don't have to do that next time?"

O'Donnell has the same headaches as most others in the technical end of broadcasting. The difference is in the magnitude of the operation, which compounds the problems and the frequency.

To further complicate matters, the tools are constantly changing—now, more than ever, because the facility update is in full swing. CBS technical personnel must operate a plant that is simultaneously a 1960 and 1990 plant. Operational procedures are also changing. New equipment is being used alongside old models. A technician might have to cue up one device the old way, and then turn around and cue up a new device a new way. "These people have to remember an awful lot of information—and do it the correct way each time," said O'Donnell. "We have a non-uniform system with one foot in the old and one in the new."

Videotape operations

More than 158 people are dedicated to videotape operations, under the direction of Andy Barry. His groups supply the manpower and machines to air the shows. All programming, no matter what the production medium, airs on videotape. And, total redundancy is always the order of the day at CBS. "Every show (except live broadcasts) and every commercial employs not only machines for airing, but also machines for standby," Barry said.

Barry manages use of the videotape equipment, plus handles the assignment of editors and operators needed

at Broadcast Center, and the off-premise production centers. Barry said that he has more human problems than equipment problems; not just assigning the people needed for the grueling CBS schedule, but trying to provide producers with the right people and needed equipment, including backup, consumes most of his time.

CBS Operations has completed the transition to 1-inch tape except for a couple of machines that Barry refers to as "Heckle and Jeckle."

Another difficulty in contending with the update is explaining to producers why some have new equipment and others do not. "Like with the new Hitachi studio cameras," O'Donnell said. "It's not just a matter of plugging in new cameras; the entire control system has to be changed in each studio to accommodate them. It's hard to explain to producers why there are crates of new equipment in the hall intended for their shows, yet we can't install them. It's a ripple effect. Many other things must be done first."

Installing a new Ampex switching system and the new Hitachi studio cameras are typical examples of how CBS has advanced the state-of-the-art while updating Broadcast Center. Hammer said that CBS looked at the existing Ampex switching system, but made many modifications to it. Eventually, the model number was changed from the AVC-33 to the AC-33B.



Gil Miller, technical director, operating Ampex switcher in Control Room 41.

Control Room 41

In essence, the new Ampex system is a microprocessor-based switcher with a number of discrete program store/effects. This allows it to be modified (by changing software) to provide unique production effects to fulfill the changing CBS requirements. In addition to having 32 inputs and three mix/effects rows, the unit installed in CBS Control Room 41 has 128 iso-key setups, 179 wipes and can store eight setups in panel memory. The switcher has a built-in diagnostic system, and its memory can store a series of digital effects that can be called up and integrated into a show faster than any director could ever

normally produce them. CBS is no longer locked into a format, but can change effects and store capacity by simply changing software. Eventually all control rooms at Broadcast Center will have this capability.

In the case of the studio cameras, there was a total redesign. When CBS prepared the \$100-million-plus budget for the update, one of the largest items was for 32 full-blown auto setup studio cameras. Although the quest for these cameras began in 1979, they were not completely installed until August 1982. The reason it took so long was because CBS would not buy an existing camera. Instead, CBS needed a new camera to meet the stringent demands set down by CBG (CBS Broadcast Group) Engineering to comply with the needs outlined by CBS Operations. The original mandate was for 32 auto setup cameras. In addition to auto setup functions, Hammer said that their early objectives called for a camera that would be stable and reliable, give excellent picture quality and be easily serviced. It was the task of CBG Engineering to write the specifications, find the camera that could meet these demands and thoroughly test the cameras to document that all specifications had been met.

The new hardware for the Broadcast Center is a combination of demands for an entirely new generation of equipment, modifications of existing models, and purchases of off-the-shelf items. Hammer's biggest problem in implementing the update is contending with the fast-changing technology. He said, "Items are being invented that are making the equipment originally outlined obsolete before we even reach that part of the update. Because the state-of-the-art is so rapidly changing, the entire update plan is in a constant state of revision. This is particularly true in the area of audio and video post-production. Digital video effects and computer-based equipment have arrived." Therefore, the master plan is, at times, only a frame of reference against which CBS Operations judges what it should do next and foresees the effect that change will have on everything else.

Maintenance

Most of the new equipment is smaller and more compact, but little space has been gained because there is so much more equipment being installed. "Even though the racks for the new cameras take up half the room of the ones they replaced, that space is required to house equipment not even dreamed of when these racks were laid out in the early 1960s," said

Continued on page 66

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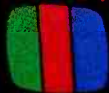
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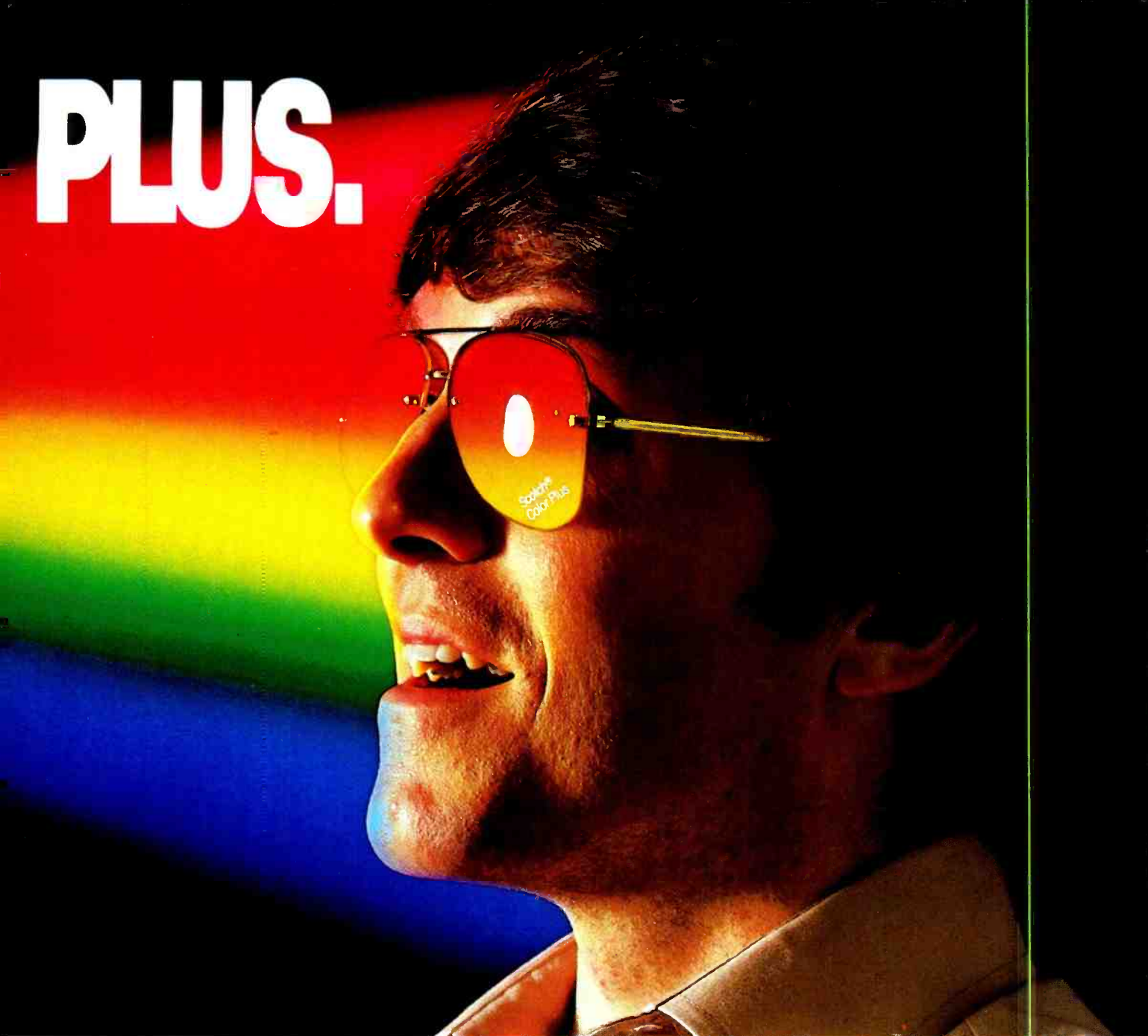
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Juergen Kirleis, manager of Studio Maintenance. Everyone at CBS Operations acknowledges that one of the most difficult tasks entrusted to Kirleis' group is maintenance of the facilities and equipment at home and on the road.

Fred Schutz, director of Maintenance, now entering his 30th year as a member of Technical Services, said that the hardest parts of his job involve "coping with the new technology and training the present staff, plus recruiting the people needed to maintain the equipment used in a technology that is moving too rapidly." He describes how years ago "CBS Maintenance used to crosstrain its technicians so that they were thoroughly knowledgeable in all major equipment areas. Today, that is no longer possible; everyone must specialize. It's impossible to learn it all."

The broadcast maintenance personnel of today must have a deep and thorough understanding of the technology in the field that he or she is servicing, because they will be called upon to install and maintain equipment that is often so new there is little or no documentation available.

Schutz said that he and his people are proud to meet this challenge. But,

he does not think that *maintenance* is the correct word to describe the overall function of his people. They do not just maintain the unbelievable amount of equipment and complex systems at CBS, but are also called upon to assist in the design, modification, installation, debugging and selection of equipment.

His technicians are called upon to continuously upgrade their skills by keeping abreast of the latest maintenance techniques and attending in-house and vendor training sessions. According to Schutz, "In the recruiting of maintenance technicians, the broadcaster finds himself at a serious disadvantage in that most of the technical schools do not concentrate or prepare graduates in specific broadcast maintenance disciplines. For instance, technical schools do not cover the specific technology relating to the repair and servicing of broadcast studio cameras, videotape recorders, character generators, etc."

Schutz often has to work with vendors to devise maintenance training needed for new equipment purchased. This was true in the purchase of the studio cameras. Schutz and O'Donnell traveled to Japan to meet with the manufacturer's factory maintenance personnel to see what maintenance was required for a



Projection room overlooking Studio 41, set up for 1983 *Prime Time Preview Presentation*.

computer-based camera—a new technology for broadcasters.

Schutz has an ongoing campaign to make the production personnel aware that the new generation of video equipment, with its sophisticated circuitry, often microcomputer-based, requires more "tender loving care and feeding" than earlier models. Recently, real life paralleled a scene from the hit film *Tootsie*, when production was disrupted because of a food spill. In the case of CBS, a major production switcher for News was knocked out for two days when a fruit drink was accidentally spilled into it and corroded parts of some major boards. "You just have to respect this equipment," said Schutz. "Thousands of dollars spent can be ruined in a

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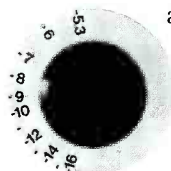
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careless minute. It is a tribute to his maintenance staff members that they were able to reroute the studio cameras to another control room and repair the switcher so quickly. Actually it could have been worse. Imagine the potential problems presented by a master assignment switcher that has 30,000 relays."

Aside from handling these emergency situations, Schutz thinks that the main function of his group is to make sure that technical productions are meeting FCC and CBS technical requirements, and to ensure that all equipment is not only working when needed, but working at the maximum parameters.

Often called upon to help select equipment, Schutz uses what he calls *vender credibility* as a major input. He said, "Some venders give us serious problems, such as lack of support, lack of field service and lack of documentation, while others are good and have excellent support." When deciding between two units with similar parameters, Schutz argues strongly for the credible vender. He also demands that this credibility be married to reliability—another factor at the top of his list. "The best product in the world is useless if we can't keep it working," he said.

Schutz, like other managers of CBS Operations, has his own specialty that is often brought into play. Originally involved in the audio aspects of broadcasting, Schutz has been called upon to handle the special audio requirements for CBS coverage of political events and space shots for the last 20 years. On an ongoing basis, he has been involved in the design and the implementation of the audio and communication facilities for various CBS News requirements. Recently, he has immersed himself in the design specifications for the new audio consoles installed as part of the Broadcast Center update. CBS Control Room 41, including its spacious video and separate audio areas, adjoins a 10,000-foot studio—the largest in the Broadcast Center—used for such productions as prime time programs, soap operas, national election coverage and other special events.

This multimillion dollar showcase control room, a paragon of high technology, houses the latest model Ampex video switcher, Neve audio console, Quantel/MCI digital effects, Chyron character generators and a variety of other equipment, including 64 video monitors.

Serving the customers

To further understand the role of CBS Operations, it is helpful to define them relative to the tasks they perform for other groups of CBS: *CBS Sports*, *CBS Entertainment*, *CBS News* and



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WCBS-TV. These more visible groups are the major customers of CBS Operations, and it is for the production of their programs that Hammer maintains the numerous services and properties.

CBS Sports supplies the producers, directors, writers, talent, etc., for all its programming, but this group relies on CBS Operations to provide the equipment and technical staff, including the fleet of 10 fully equipped remote trucks that are constantly in use. This complex role for CBS Operations will be detailed in part two of this article.

Although *CBS Entertainment* primarily buys pre-produced programming, some of the work for these outside productions for prime time and daytime shows is done at CBS Television City (the CBS production facility in Hollywood), as well as at Broadcast Center in New York. West Coast facilities, including Television City, are not part of Hammer's responsibility. But, since *CBS Entertainment* produces the bulk of its soap operas in New York, this group is indeed a major customer for which CBS Operations supplies the physical facilities and all the equipment, props, makeup and technical personnel. When the advent of high quality portable video cameras and 1-inch recorders brought mobility to the soap operas, formerly produced entirely in the studio, Hammer had to begin supplying location crews as well.

CBS News, consistently number one in the ratings and probably the most visible of the CBS groups, is home-based in Broadcast Center and leases space from CBS Operations. Unlike the others, CBS News owns a significant amount of its own production equipment. This group, comprised of hundreds of people in New York and many more based at the 19 news bureaus around the world who prepare approximately 40 hours of news programming a week, uses its gear to prepare the daily programs, but delivers those programs to CBS Operations for airing. The hard news programming, originally prepared in the ¾-inch format, is bumped up on 1-inch by CBS Operations for integration into the network programming. Even though Dan Rather's *Evening News Report* is prepared and produced by CBS News, Hammer's group provides the studio, the studio camera operators and all the equipment involved in the live broadcast.

Inside the huge New York Broadcast Center, CBS News controls dozens of edit rooms completely outfitted with the latest ¾-inch video editing equipment, plus it owns and maintains dozens of ENG cameras and portable recorders. If and when it ever finds its equipment temporarily



Jim Paterson (left) in one of the CBS News editing rooms.

insufficient to perform the job, it can call on CBS Operations for help.

Like CBS News, WCBS-TV leases space from Hammer in the large New York Broadcast Center. The station, too, handles its own ENG production while CBS Operations provides studios, control rooms and broadcasting functions, plus overflow facilities. This procedure with CBS News and WCBS-TV was devised when film was used for news. These groups were responsible for shooting and editing their own film, which was then turned over to CBS Operations for airing. This practice continued when video came on the scene.

These various CBS groups and CBS Operations work so closely together that often the line of demarcation is not discernible. As Hammer said, "We are very informal here. We have to be to get the job done." One reason for that informality is the fact that much of the staff that originally entered and worked under the umbrella of CBS Operations has migrated to other roles in CBS, providing experience and friendship ties throughout the organization.

Jim Paterson, director of operations, CBS News, is a classic example. He is responsible for the ENG facilities housed inside the Broadcast Center, the 19 news bureaus, and the accompanying equipment and technical personnel. He said that his 28 years experience in CBS Operations, beginning as a maintenance technician, proceeding through studio supervisor and field operation manager to finally becoming a manager of field maintenance, has helped him to handle his present job.

CBS Operations is indeed a breeding ground. From this fertile field, hundreds of roots have originated that have surfaced throughout the entire CBS organization. It is truly the core, the heart. And, any arrow that is shot into this heart has repercussions throughout the CBS body.

The future

Hammer is concerned about the future. Who will run this operation in the upcoming decades? Who will carry on the tradition of excellence as



A few of the 350 racks in the CBS Equipment Center, which houses the support equipment for cameras, video, sync, pulse, communications and audio distribution, special effects, character generators, still-stores, control room switching and master assignment functions.

evidenced by the hundreds of Emmy Awards presented to CBS Operations? Perhaps he has done his job too well, for there has been little turnover under his regime. The crew that rose through the ranks together will probably retire within a few years of each other. CBS Operations has had to formulate a plan for the future—for the days after the mass exodus of these men who have served CBS for the last 30 years. Hammer said, "Not long ago we realized that it takes 3-5 years to develop a college graduate to become a competent manager. He or she must learn not just how the plant works, but also how to handle people."

Hammer was no doubt referring to the 1000 union people in CBS Operations with whom he must negotiate contracts and help settle disputes. He is the kind of man who is always available, whose door is always open. He is ready to discuss the purchase of a million dollar item or take a phone call from a road crew member having a problem with hotel accommodations.

CBS Operations is actively seeking qualified people. O'Donnell describes the ideal candidates as self-disciplined people who can work as team members, yet have individual skills. Hammer gets more specific by adding, "We have need of people experienced in computers. We are rapidly acquiring a lot of computer-based equipment—not just the new Hitachi cameras. We are utilizing Ampex Video Art, Dubner Animation Devices, ADDAs and a lot of other computer-based equipment. We have to operate and maintain these. It's a problem."

Schutz said that the technology is outracing the ability to use and service the equipment. He can't find people that have experience. They don't have time to gain experience before the technology changes.

Hammer often cannot, in all honesty, recommend a career in network operations to a qualified candidate

Continued on page 74

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*Meet the Press—NBC—11/20/47
to present*



*John Cameron Swayze—NBC—
Camel News Caravan 1948 to 1956*



*Dave Garroway—Garroway at Large
1949, Today Show 1952 to 1961*



*Army vs McCarthy Hearings
April 1954*



*Huntley/Brinkley Report NBC News
10/15/56 to 7/5/70*



*Kennedy-Nixon Debates—ABC—
10/3/60*



Vietnam War



*60 Minutes News Magazine 7/24/68
to present*



*U.S. Lands Men on the Moon July
1969*

Garroway was introducing early risers to a show called *Today* and Conrac was introducing its first black and white monitor.

Swayze was anchoring network news, the McCarthy-Army hearings were being held in America's living rooms, and Conrac was introducing the first color monitor.

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Senator Estes Kefauver Crime Hearings 1951



Edward R. Murrow—CBS—See It Now 4/20/52 to 7/5/55



Coronation of Queen Elizabeth II June 1953



Walter Cronkite—CBS Evening News 1962 to 1980



John Kennedy Assassination 11/22/63



Lee Harvey Oswald Killed on Nationwide TV 11/24/63



Watergate 5/17/73 to 8/8/74 (Nixon Resigns)



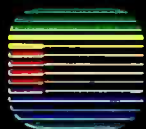
Iran 11/4/79 to 1/20/81



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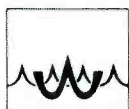
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Continued from page 70

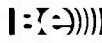


On the *Dan Rather News* set (from left) are Bob Hammer, vice president of CBS Operations; Jack O'Donnell, director of Technical Services; and Fred Schutz, director of Maintenance.

that applies to his group. The person must have the right personality and philosophical approach to life to handle the unstructured environment. The irregular hours and constant change can destroy a person not equipped to handle it. Marriages are strained when a husband is constantly on the road or must work nights and holidays. The supposed glamour of television can pale upon realizing that you were absent while your children grew up. For many in this fast-paced life, normal relationships based on regularity are impossible.

Fortunately, some people thrive on this diet. And, Hammer seems to have assembled them. The questions are: Are their replacements waiting in the wings? When 9 a.m.-5 p.m. jobs are available to skilled technicians, will some elect to "go the more demanding broadcast job route?" Schutz believes they will. He recommends it highly to anyone who wants challenges and rewards. "For, with the challenges come the rewards—both in pay and satisfaction," he said. "This job is still one of the most coveted jobs in the technical field."

It is hoped that CBS and the other networks will spread the word that there are opportunities in broadcast operations for the technically talented. The time has come to actively recruit young people into this profession. Like Hammer, O'Donnell and Schutz, they will have a chance to change the face of a network while working at its core—network operations. They will also have to keep in mind that it is at the core that the fire is the hottest.

Surely the first man hired at CBS was an *operations man*—it had to have been so, because the original mandate of the company was to transmit a signal through the airwaves. And, if the day ever comes that TV broadcasting, as we know it, becomes extinct, you can rest assured that the last person out the door at CBS will more than likely be an *operations man*. 

Editor's note:

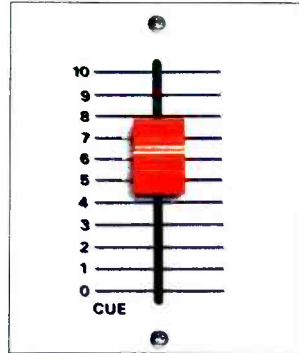
Look in future issues of *BE* for a report on CBS Operations in the field.

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Circle (52) on Reply Card



Cart machines:

An update

By Carl Bentz, technical editor

Discussions with cartridge system manufacturers bring into the spotlight major and minor innovations over several years.

Continuous-loop audiotape cartridges perform heavy duties in nearly all broadcast facilities today. Whether the station runs a 1-man combo system, separated talent and engineer duties or a fully automated format, if recorded information is to be used on a repeating basis, the cart is the primary candidate for the job. Reusability of the cart, reasonable fidelity and overall convenience of cartridge tapes are advantages of catted spot announcements, commercials and even top-40 music selections.

Cartridge systems are available in two general forms. We will look at single- or multiple-deck machines that require each cart to be loaded by an operator. Order of play is determined by the operator from his program log. For more information on carousel-type cartridge systems for automation that provide random access of any cart within the carousel, refer to the manufacturer listing.

The basic system

Cartridge tape equipment is as important to the reliable and acceptable use of carts as is the cartridge itself. Certain basic demands must be met by the cart deck. For example, a motor turns a rigid capstan to pull the tape through the mechanism at a constant speed. To do so, a rubber-type pinch roller must engage with the capstan with sufficient force to keep the tape moving, without slipping. Orientation of the pinch roller, relative to the capstan, is critical to avoid causing the tape to ride up or down. Such vertical motion of the tape could cause a loss in audio quality or perhaps even destroy the tape.

Structural design of the tape heads, head mounting bracket and guides is important. The heads must allow as wide a response as possible and be rigidly mounted at a standard position above the deck floor. Some adjust-

ment of elevation, zenith and azimuth is needed to match standards and to produce the best results. Guides are used to direct the tape path for optimum tape tracking over the head assemblies.

The electronics package forms a 2-part system. One section must be capable of sensing the low signals from the tape, amplifying the electrical representations of sound to useful audio levels. Fidelity is important and requires design attention for frequency response, noise and distortion at acceptable specs. The second section of the circuitry forms a logical control system. Once the cart is started, it must remain in the run condition until the operator stops it and/or until the detector system sees one or more cue tones. Three different cue tones (1kHz, 150Hz and 8kHz) on the cue track may be used for various functions. Internal uses include stop-on-recue, muting and fast-forwarding. Externally the cue tones may cause other events for automation or logging activities.

Finally, the cartridge equipment should be conveniently housed for the station control room, either in a rack-mount or desk-top format. Operator controls must be easily understood and quickly located. Packaging should include any required shielding to keep hum-sensitivity heads and circuitry away from the power transformer and motor circuitry. And most important, the system must allow an incredibly precise interface between the cartridge and the drive/pickup scheme, if any success is to be achieved through its use.

Use and abuse

Basic cart machines are found everywhere. Many, although relatively simple in design, have operated for years. With proper maintenance and adjustment, a good cart machine keeps working. Cleaning and occasional replacement of pinch rollers are the most demanding requirements, particularly for voice-only uses.

Cart machines, however, are among the most abused pieces of equipment in the station. Maltreatments include

failure to keep them clean and use of unnecessary force by a DJ, who slams a cartridge into place during a fast, complicated break. Both result in less than desired operation after a period of time. Deposits of the ever-present tape particles on the heads, capstan and pinch roller may lead to excessive wow and flutter, mistracking and reduced performance with excessive wear. Heavy-handed operators have been known to jar a head out of alignment, and even bend the guides and the capstan.

Cart equipment manufacturers

If you need new cartridge equipment, this listing will help you locate the materials you desire. Manufacturers are listed with series or model designations for their equipment. Reader Service Numbers are included.

- Audi-Cord(570)
 - Modu-Cart
 - A-Series
 - S-Series
- Broadcast Electronics(571)
 - 5300B
 - Series 2100
 - Series 3000
 - Spotmaster
- Consolidated Electronic Industries (Australia)(572)
 - Cuemaster 900 series
- Fitch Tape Mechanisms (UK) (573)
 - T250 series
 - T100
- ITC/3M(574)
 - 99B
 - Delta series
 - PD-II series
- Pacific Recorders & Engineering(575)
 - TOMCAT systems
- Ramko Research(576)
 - PhaseMaster
 - Primus systems
- SIS Recording Studios Ltd. (UK)(577)
 - 140 series
- Sonifex Ltd. (UK)(578)
 - Micro HS series
 - CQ series
 - CQ HS series
- John A. Steven Pro. Recording Eqpt. (Cart Technology)(579)
 - NAB cartridge transport
- Telex Communications(580)
 - MC-II series
- UMC Electronics(581)
 - Beaucart
 - Type 100/200/300



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July 1983 *Broadcast Engineering* 77

Cart concerns

No matter what the service performed by a cart system—simple voice announcements or full-length music selections—constant speed, mechanical stability, frequency response, S/N ratio and signal distortion are vital to good cart performance. The equipment must be kept in the best condition, because the cartridges themselves present problems. Even the high performance tapes available today come in molded-plastic housings and are based on a tape-wrapped-upon-itself concept that cannot avoid a resulting variable tension. Operators

have difficulty in holding onto cartridges, and accidental dropping of the cart or inadvertent slamming of the cart into place in the player bodes possible trouble. The cartridge must precisely interface to the machine.

Efforts by cartridge makers and equipment manufacturers are aimed at improving every aspect of the cart format. Today's high performance cartridges include as many new designs as there are manufacturers to address the problem of stereo phasing. As a result, cartridge machines fall generally into two categories: those designed for basic standard operation with

overall improved reliability, and those with extra features to assist in dealing with phasing.

Philosophies

Audi-Cord Corporation produces a series of cart decks designed for the "maximum machine for a minimum dollar," according to Carl Martin, president. Its newest S-series updates the company's previous premium line. Features include replay-lockout, off-cue indication, off-speed-lockout and a digital timer. Three cue tones are standard. Martin's design group opted not to move the record head for phasing correction, but the transport includes split tape guides to improve tape tracking. According to Martin, there are no miracles in mechanics to offer a miraculous answer to stereo. He thinks that matrixing of the audio may aid in stereo reproduction, but if improperly handled could harm mono performance for AM broadcasters. The S-series uses no ac hysteresis synchronous motor.

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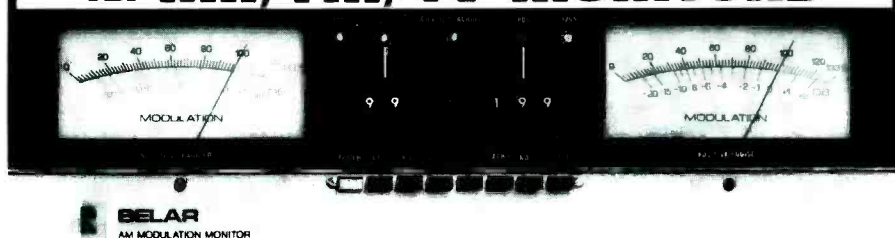
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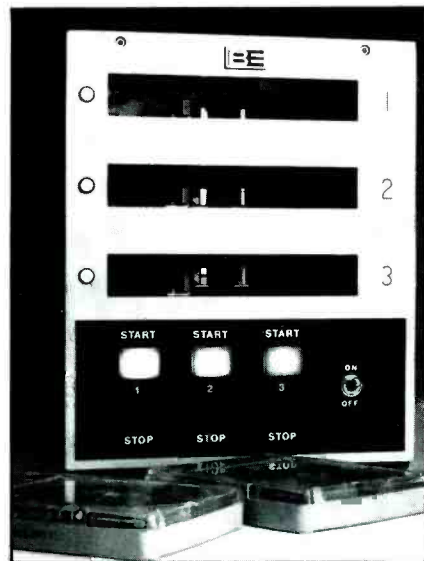
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Broadcast Electronics 5300B

Broadcast Electronics, carrying the well-known Spotmaster name, also has a reasonably priced, basic machine. The company had earlier made some modifications in the mechanics of the Spotmaster, but the major change over the years has been the Phase Lok III and IV head brackets. For improved phasing control, the Phase Lok concept allows height and zenith adjustments of the record head without affecting azimuth. The direct-drive, ac hysteresis synchronous motor is used in all models, including the newest 5300B series. Three plug-in decks of the 5300B may function with a 5310 record amp unit in mono and stereo formats with or without secondary and tertiary tones.

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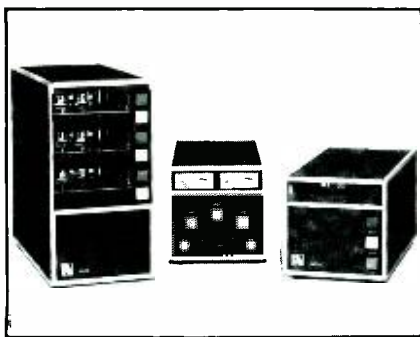
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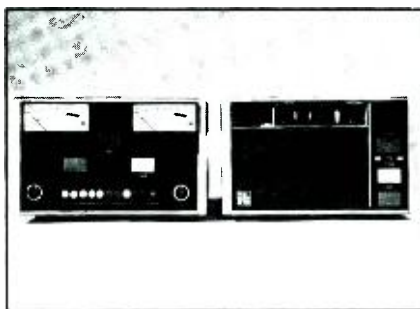


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ITC/3M Delta series

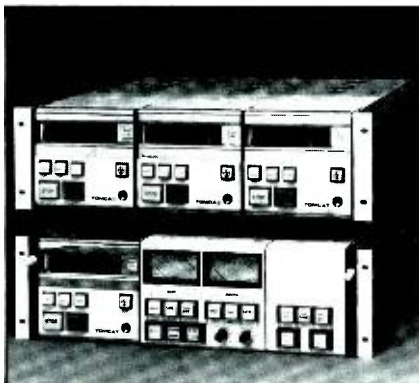
ITC/3M has included a number of changes in the last several years. The brushless dc servo motor may be set to run at 3.75ips, 7.5ips or 15ips with a high speed condition that is 3X the play speed. All three cue tones are detected digitally, according to ITC's Chuck Kelly, sales manager, by the use of microprocessor circuitry. Size has also been reduced in the company's newest system, the Delta series, through the use of a toroidal power transformer. The transformer also reduces radiated magnetic fields and operates cooler. The motor in Delta machines is smaller and runs cooler because of its special dc servo design. Included in the special design is a 2-bearing scheme, even in the 3-deck version, which places the second bearing at the upper end of the capstan. Replacing the previous premium line SP, RP and 3D machines, the Delta series currently uses a ceramic capstan in three versions: an A size; a B and C size; and the 3-deck system.



ITC/3M 99B

The latest ITC/3M systems are closely patterned after the 99B machine, but do not include the special record head phasing system. ELSA, in the 99B, stands for Erase, Locate the Splice and align the record head Azimuth before recording. A microprocessor handles control logic as well as cue tone detection. The ceramic capstan for the 99B is manufactured from materials produced by Coors of Golden, CO. Heads on the machines are of British manufacture and follow a hyperbolic pole-piece design with conical ramps.

The format reduces a response bump at 250Hz that is common on other head types, according to Kelly. Also, output circuitry is referred to as transformerless balanced, but the systems include transformers for use if required.



Pacific Recorders TOMCAT

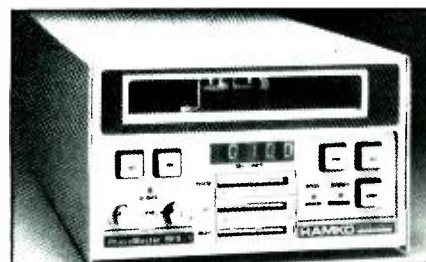
Pacific Recorders and Engineering Corporation introduced the TOMCAT cart machine some time ago in response to user requests for a performance more like reel-to-reel. A dc servo motor with 7.5ips and 15ips speeds drives a ceramic capstan, also from Coors. An 1802 microprocessor handles logic control tasks in the friendly system. TOMCAT introduced some major changes into cartridge systems. The first change to get closer to reel-type performance was the MAXTRAX head format. Jack Williams of Pacific Recorders Engineering Group explained that one of the ways to approach reel-to-reel performance was to use a head that includes two NAB 1/2-track-size tracks with a narrower track for cue and logging functions. The wider track scheme and a wide-face, pole-piece design produce greater frequency response from taped materials.

A second feature of the TOMCAT systems is a dual-format record/reproduce mode. In the Discrete condition, left and right channels may be recorded separately on tracks one and two, respectively. Alternatively, in Matrix mode, the L+R sum is laid down on track one, while the L-R difference goes on track two. If stereo is desired, the matrix scheme will tend to eliminate phase cancellation effects of residual delay errors caused by warped or skewed tapes, according to Williams.

Although some have argued that the matrixing mode reduces stereo separation, Williams said he thinks that localization effects are the matter being discussed. Far right (or left) sounds may sometimes appear closer to the center. At the same time, some near center sounds may appear farther to the sides. The real purpose,

however, of including the matrix mode was for stations that desired one machine for mono and stereo operation. A special flag signal in the cue track informs the electronics that a mono performance is desired, automatically switching only the sum track to the output terminals of the system.

The TOMCAT includes another unusual feature in that the heads are solidly affixed to the mounting block and are not adjustable. Along with the initial alignment of the heads at the factory, a single major tape guide is used to position the tape properly. Two additional wider guides are used for general "babysitting" during tape-stopped conditions. A self-aligning pinch roller, with roller bearings, completes the tape path determining system.



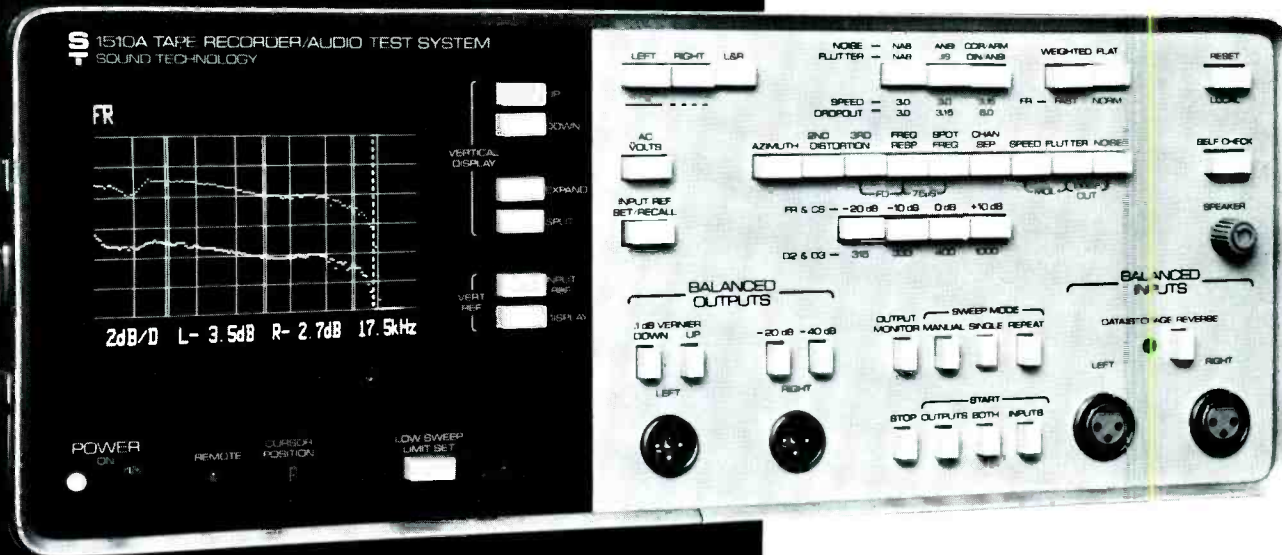
Ramko RPS-1 PhaseMaster

Ramko Research introduced the PhaseMaster series machines two years ago as an answer to stereo phasing. In the PhaseMaster, an automatic, real time phase shift error correction system samples the upper audio track, encodes the information and places the coded data on the cue track. During playback, the cue-track signature of the upper track is compared with the output from the upper track. Any phasing (or time base) errors create a correction signal for an arrangement of electronically controlled variable delays. The tape track format on the machine is compatible with previously recorded cartridges from other machines. Similarly, tapes recorded on PhaseMaster machines can be used with other reproducers.

PhaseMaster and the new Primus series from Ramko Research use a dc servo motor with a ceramic capstan. The major difference between the two systems is that Primus does not include phasing correction and may not be upgraded to include it, according to David Baldwin, an engineer with Ramko. An advantage with Primus machines allows the parallelism of the pinch roller to be adjusted while the machine is in play, simplifying that adjustment. Although the circuitry between the two series are different, the mechanical design is similar.

Continued on page 84

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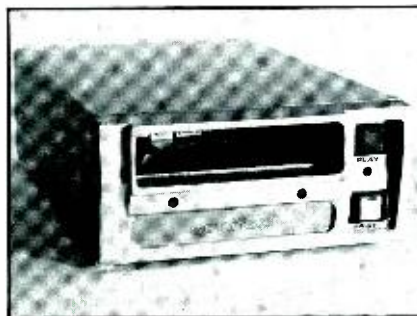
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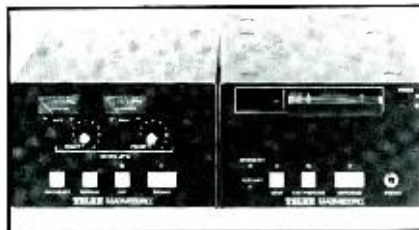


Sonifex Micro HS 200



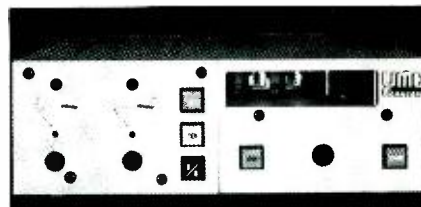
Sonifex CQ series

Sonifex Ltd., in the United Kingdom, uses a dc servo motor, but turns away from the ceramic capstan design by using a belt-driven system. A 680g flywheel helps to hold wow and flutter at less than 0.8% in 7.5ips operation. A second servo system engages and releases the neoprene pinch roller. Heat normally resulting from a pinch roller solenoid is eliminated, as no power is required during play or stop to hold the roller in place. The Micro HS systems use a British-built open-faced head. The larger head face format improves the S/N ratio and response without the low frequency pole-tip resonance effect in both its mono and stereo systems.



Telex MC-II series

Telex Communications carries the Magnecord line in the MC-II series machines. The MC-II uses a dc servo motor with a belt-driven capstan. Ribbon wiring allows simplified field conversion of mono machines to stereo. An edit function uses a single button to delete stop tones in the record mode and later to place the stop tones in the play mode.



UMC Beaucart 100

UMC Electronics produces the Beaucart systems. Beaucart II, available only in mono configurations, uses an ac hysteresis synchronous motor as standard. Only a single cue tone capability is provided. The Type 100 (for A carts), Type 200 (for A, B and C) and the Type 300 3-deck system all use TTL logic for control in single and 3-tone cue systems. Phasing in the upper grade Beaucart systems uses a motorized azimuth scheme based on the use of a white noise generator. The wide spectrum of the noise generator optimizes the head azimuth before recording of each cart.

Capstan questions

Should the cartridge machine be constructed of stainless steel or ceramics? Although the property is minimized with the metal used, the form of steel often found with drive motors allows some conduction of magnetic flux from the motor to the tape contact area. Theoretically, after a period of time, the flux could result in partial destruction of the recorded information. The conductor also brings magnetic fields closer to the hum pickup sensitive heads. The metal can efficiently transfer heat from the motor assembly to the tape contact area. Obviously, magnetic fields and heat are deleterious to taped materials.

In the move to dc servo motors, some manufacturers have introduced a ceramic capstan. Industrial ceramics are exceedingly hard, wear-resistant materials that are non-magnetic and non-conductive to magnetic flux. Because servo-type motors generally produce less heat, thermal conductivity is no problem. Ceramic proponents also think that the surface structure of the ceramic materials provides a greater coefficient of friction and, as a result, improved tape pulling.

Several types of ceramics differ greatly in properties. A question of porosity and capstan cleaning has been raised. Some reports have indicated that certain cleaning solutions/solvents used in stations for "super fast" cleaning have resulted in unexpected problems. Xylene and toluol, both destructive to the various components of recording tape, should never be used with ceramic capstan

Program automation manufacturers

Inquiries regarding cartridge systems for automation may be directed to these companies by using the Reader Service Numbers.

Broadcast Electronics(582)
Control 16, Econ-Control 16
Cetec Broadcast Group(583)
Series 7000
Data Communications(584)
Master Control Automation
Enertec Schlumberger(585)

Memocast (compact cassette)
Harris Broadcast(586)
Series 9000
IGM Communications(587)
Basic A, Instacart Type A & B
Go-Cart II
Microprobe Electronics(588)
Log 4, Control 3
RCA Broadcast Systems(589)
RT-124
Sono-Mag(590)
ESP, Carousel series 350
Caro-Stat

systems. ITC/3M's Kelly said that only isopropyl alcohol is recommended for the 99B and Delta equipment. It may not bring the capstan back to a clean white color, but it does produce sufficient cleaning action.

Ramko's PhaseMaster and Primus systems, according to Baldwin, may be cleaned with isopropyl alcohol. To his knowledge, there have been no problems in returning the capstan to its original white color with this use. However, Williams of Pacific Re-

corders said that a solution called Ultra-Pro is suggested for the TOM-CAT system. He described the liquid as much like an industrial strength "Formula 409" with some slight sudsing qualities. Although he said that isopropanol would handle most of the cleaning requirements, he expressed a concern that too much alcohol, when applied by a more-is-cleaner engineer/technician, might get into motor bearings and eventually cause trouble.

!-T-)))))

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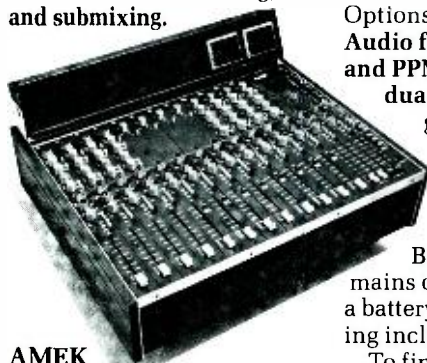
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Audio amplifier update: Monitor amps at NAB-'83

By Gary Breed, chief engineer, WCBU-FM/WTVP-TV, Peoria, IL

Audio power amplifiers are the most common type of audio equipment. They can be found in home hi-fis, all broadcast stations, public address and sound reinforcement systems. The ubiquitous nature of the audio amplifier sometimes leads to near-ignorance of the variety of available features and specifications. In broadcast applications, the audio amplifier is not always given the close scrutiny that another piece of equipment might receive at the time of purchase. A description follows of various features that engineers should consider when buying amps for their stations, as well as a look at some amplifiers exhibited at NAB-'83.

However, I will not try to cover one

type of amplifier, the small utility amp with 5-25W/channel, often used as a cue amp, headphone amp or small monitor amp. There are too many available to review properly, with huge differences in frequency response, distortion and available features from one unit to the next.

However, I will cover the larger power amplifiers that find use in broadcast stations as studio monitor drivers, "bullet-proof" headphone amplifiers, high performance, high reliability general purpose monitor amps, and as sound reinforcement in remote setups.

This year's NAB convention provided an opportunity to get a close look at a number of amplifiers; some

familiar brand names, and some finding new markets among broadcasters after initial successes in public address or sound reinforcement applications. Similarities in certain areas are immediately apparent. The following are the most universal features, found in nearly all of the professional power amplifiers:

- XLR-balanced and 1/4-inch unbalanced inputs;
- 5-way binding post output connectors;
- toroidal or semitoroidal (rectangular) power transformer for minimum ac magnetic coupling into audio;
- front-panel level controls;
- stereo or bridged monaural operation;
- very low distortion, typically 0.1% THD and 0.05% IMD (often less) into 8Ω at rated power, in stereo mode;
- speaker and output device protection by fuses or circuit breakers;
- 19-inch rack mounting; and
- complementary or quasi-complementary output circuitry using negative feedback and bipolar transistors (power FETs are not widespread as yet.)

Beyond these points, the units vary considerably in features and circuit details.



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• Aug. 16-18, 1983 • Ohio State University (Columbus, OH)

This year's broadcast conference packs 26 invited papers into three days of comprehensive sessions covering technical and regulatory aspects of broadcasting, along with a special workshop on DAs and directional antennas. Also, 26 exhibitors will display equipment for the radio and TV broadcasters in attendance.

Technical address topics include non-ionizing radiation; maintenance procedures; phono preamp technology; programmable logic controllers; RF intermodulation between FM transmitters; computer controls for radio stations; doing a live evening magazine; troubleshooting digital circuitry; the TV Channel 6 interference problem; AM proofs; FCC inspection; FCC rules; uses and problems with new FCC rules; shunt-fed antennas; phone interconnections; circular TV polarization; UHF and CP measurements; noise reduction for FM stereo; care and feeding of directional antennas; microwave path studies; LPTV; live-level microphones; the Delta series; and the NAB and the broadcast engineer.

There will be luncheon addresses by Dr. John Kraus, Wally Johnson and Richard Rudman. Sessions begin at 9 a.m., Aug. 16 and run through 4 p.m., Aug. 18.

The conference will be held at the Fawcett Center for Tomorrow, Ohio State University, 2400 Olentangy River Road, Columbus, OH 43210. Registration is \$99, but includes continental breakfast, three lunches and two dinners.

Payment may be made by check, money order, Master Card or VISA. Make checks payable to the Ohio State University. Registration is limited and will be accepted on a first-paid, first-served basis.

Further program information may be obtained from John Battison at 1-614-422-9678; registration information from the Office of Continuing Education at 1-614-422-8571.

The range of available power ratings is from a conservative 25W/channel to 1kW or more. In general, the super power amplifiers do not have quite as good THD figures, but anything less than about 250W/channel is clean, regarding audio performance specifications.

NAB-'83 products

This discussion highlights features available from NAB-'83 manufacturers.

BGW Systems. Amplifiers from 25W/channel up feature all steel chassis, modular construction (including the power transistors/heat sink assembly), magnetic speaker protection on the larger amps and a full complementary output design. As is the case on most amplifier lines, as units get larger, features increase, with progressively larger units getting first an LED clipping indicator, then a 4-stage level indicator and finally an LED VU-style meter. All units except the bottom of the line have input step attenuator level controls.

Crest Audio. Crest amplifiers are available from 35W/channel up. They feature modular construction and a full complementary output design. All models have clipping indicators or an optional LED bar graph level display. Dual energy storage capacitors are

used in the smaller amps, while independent dual power supplies are included in larger units.



The Crest 2500S power amplifier features twin peak reading VU meters with "fast" response LED, covered by a 3-year parts and labor warranty.

Crown. With units from 35W/channel and larger, Crown uses a quasi-complementary output circuit, actively balanced inputs, and the chassis of its units to augment the heatsinking of the output transistors. This line uses "signal presence" LED indicators and overload indicators for audio level monitoring.

Panasonic (Ramsa). The Ramsa 200W/channel unit was designed with portable sound reinforcement applications in mind. Physical strength is a major feature. For signal level indication, LEDs are used for signal presence and peak indication. Loop-

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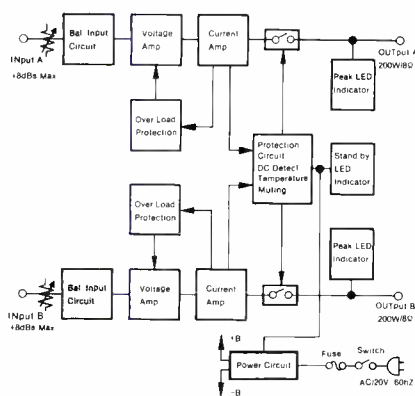
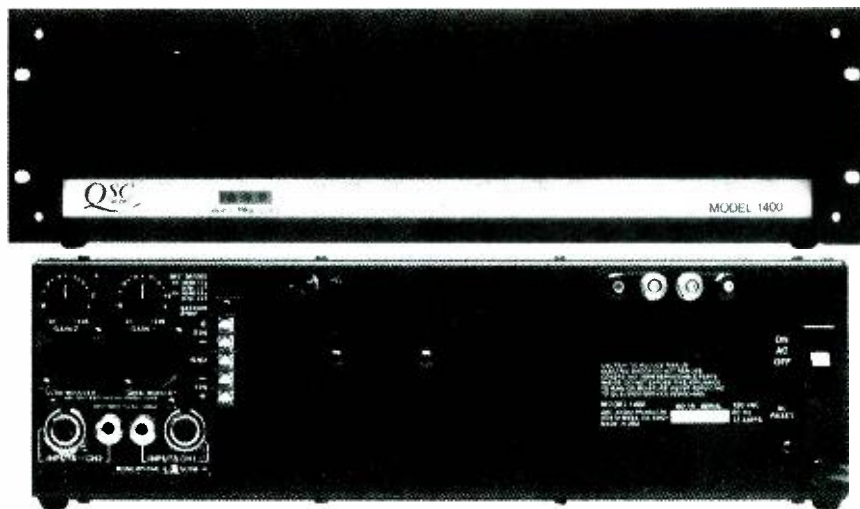


Figure 1. The block diagram for the Ramsa/Panasonic WP-9210 power amplifier shows balanced input circuitry to keep distortion within specification, even at full output power.



The QSC 1400 power amplifier, showing front and rear views. The system features high performance, full complementary circuitry and independent dc and subaudio speaker protection on each channel.

through audio inputs and high impedance balanced inputs make it easy to stack several units for parallel operation.

QSC Audio. This company has designed equipment with several features unique to its line. The amplifiers are from 110-285W/channel (8Ω), with a lower power unit in development. The amps use a dual design, with power switches separate for each channel. A modular packaging system allows service access from

the front panel. Thermal overload and speaker protection is standard, as is a 3-step LED level indicator. Although they provide the most power per vertical rack space, these amplifiers are deep (18 inches with rear support).

UREI. With amplifiers available from 80W/channel up, UREI features circuit design with a minimum of feedback, which should result in bet-

ter than average transient response. Most units in the line have split supplies, with separate energy storage capacitors for each channel. A patented feature includes the speaker leads inside the feedback loop for increased accuracy. Modular design is also featured, for maximum serviceability.

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Other niceties include direct plug-in compatibility that lets you upgrade Grass Valley racks with Shintron 200 Series modules. When you're ready for the DA you buy only once, specify the Shintron 200 Series. For complete information, circle reader service number or contact:

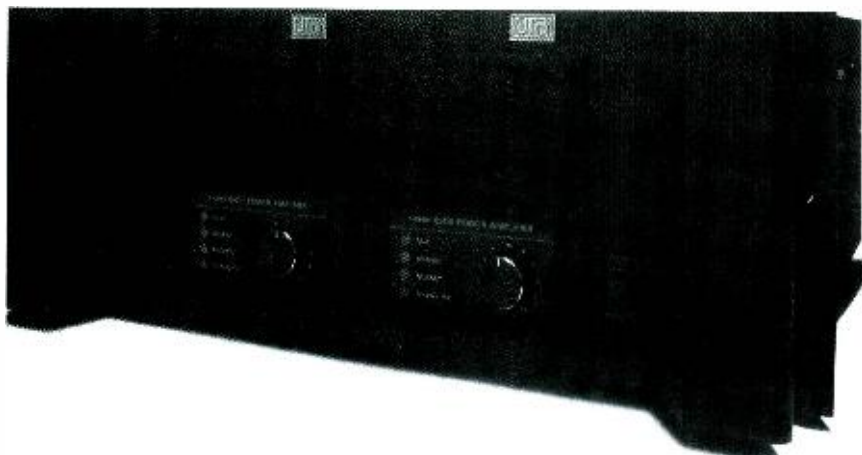


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The UREI 6500 power amplifier, providing 275W/channel, features active, balanced input circuitry and standby mode/speaker disconnect protection.

at the show, the PC2002 has a 240W/channel power rating. Standard features include step attenuator level controls, loop-through balanced inputs, dc output protection, thermal overload protection and output excessive peak protection.

There are several more amplifier manufacturers that should be investigated by the prospective amplifier buyer. A few marketed by broadcast suppliers are SAE, Grommes-Precision, Altec and NAD.

The NAB show did not provide a look into the inner workings of these amps, although units were available for broadcasters to investigate and judge their features.

All of the amplifiers in this class have good technical performance specifications and good performance track records. The differences lie in available features, physical construction methods, circuit design variations and selection of particular components. The broadcast engineer's

choice will depend on personal taste and preferred design and construction techniques. Price is a major factor, as well as reliability, parts availability, dealer and manufacturer support, and the engineer's past experience with the makers and distributors.

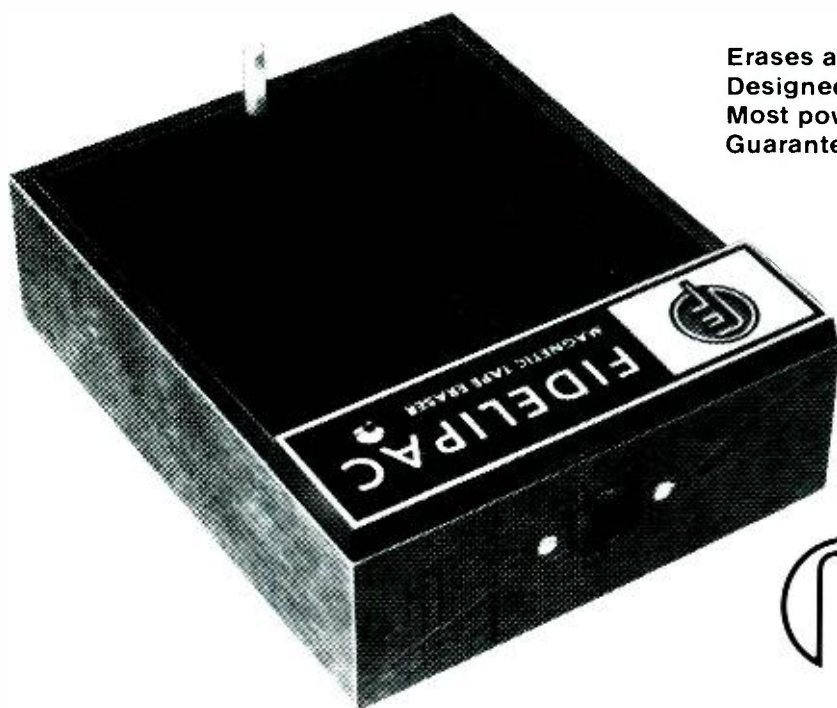
Final notes

The most significant conclusion I reached after examining the amplifiers and preparing this report does not concern the amplifiers themselves, but the fact that they are being marketed to and purchased by broadcasters in ever-increasing numbers. Broadcasters are becoming more sophisticated and demanding in their amplifier requirements. In the past, a 10W/channel or 25W/channel amplifier driving a decent hi-fi speaker system might have been satisfactory at many stations. But now, with the competition of quality audio, stations see the need for top-notch monitoring systems with high quality, usually somewhat inefficient speakers, and an amplifier to drive them with lots of headroom for sonic peaks that occur.

There are many models to choose from in the amplifier marketplace. One is likely to be exactly what your station needs. **1:7:20)**

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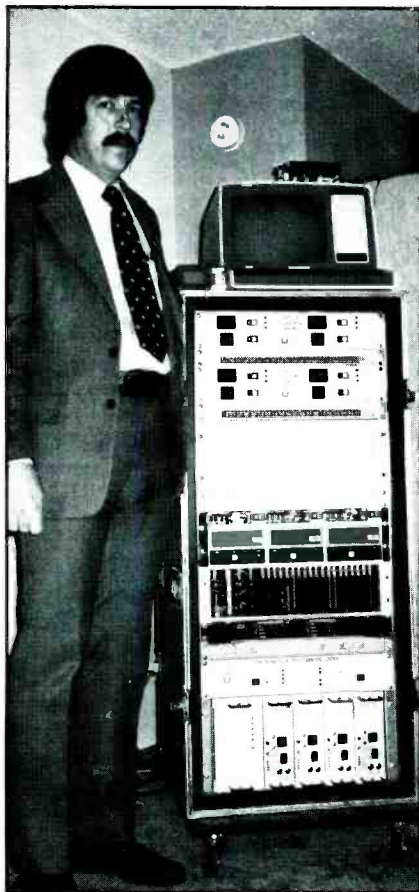
1983 PRC highlights

By Bruce Wahl, senior engineer, National Public Radio, Washington, DC

- Public Radio Conference
- Hyatt Regency Hotel
Minneapolis, MN
- April 17-20

The major item of business dealt with by NPR's member stations at the 1983 Public Radio Conference was the large deficit that has been growing since it was first announced in March. This problem has resulted in the resignation of many senior staff members at NPR, including the president, Frank Mankiewicz, and executive vice president, Tom Warnock.

On the bright side, Wayne Hetrich, NPR senior engineer, was awarded the annual Edward Elson Award for his innovative work with the NPR satellite system.

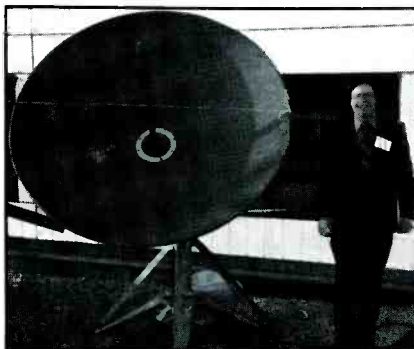


The author demonstrated the "radio station in a box" system at the annual conference.

The engineering part of the conference was reduced from the normal seminars and lectures to a single demonstration of the NPR Netcue system (See the March 1983 issue of **BE** for details of the system.) A small earth station was installed adjacent to the jogging track located atop the fifth floor of the hotel. A 6-foot dish was aimed at Westar IV, and the NPR signals were downlinked to operate a "radio station in a box." A single coaxial cable was run from the track area to the room on the sixth floor where the demonstration was held.

The equipment in the room consisted of a roll-around rack housing the satellite demodulators, a DACS/Netcue receiver/decoder, three Spotmaster 2100 PS cart machines, a McCurdy AVS-2002 switcher, two switcher control panels and a monitor amplifier. Parked on top of the rack was a Heath H-19A CRT terminal used to perform the data entry to the system. A prototype clock display was mounted to the top of the terminal. This display was synchronized via the satellite to the NPR standard time, which was in turn synchronized by an audio signal from the Naval Observatory. Three ITC 3D triple-deck cart machines, provided by McCurdy, were used as sources to the switcher.

The system provided two separate audio signals: one feeding the monitor system in the engineering suite, and the other driving phone lines to provide monitoring in another suite on the 24th floor of the hotel. The two



Greg Monti, NPR uplink engineer, poses beside the 6-foot earth station used for the engineering demonstration.

signals were independent from each other. The audio provided was a mixture of network material and local material from the cart machines. Local material filled the cutaways available in the NPR PLUS music service.

The demonstration was a success and interest was shown in the automation system and the music service.

Hetrich receives Elson Award



Wayne Hetrich, recipient, 1983 Edward E. Elson Award.

Wayne Hetrich, National Public Radio's senior engineer for research and development, was the 1983 recipient of NPR's Edward E. Elson Award. Hetrich was honored for his outstanding contributions to public radio's satellite program distribution system.

Hetrich, who joined NPR in 1971, is the architect of the network's satellite system. He was responsible for the design of small satellite earth terminals capable of multichannel, high quality, high fidelity sound.

Hetrich's career in the audio, broadcasting and recording industries spans 35 years. He has been responsible for the design, construction and installation of several commercial radio and TV stations in major market areas, including Boston and Washington.

Hetrich also holds several patents in the fields of audio level measurement and network signaling systems. He recently received a special award from the Major E. H. Armstrong Foundation for technical achievement in broadcasting and his significant contributions to audio art.

The Edward E. Elson Award, established in 1979, is presented annually to the individual who has made an outstanding contribution in the preceding year to the public radio system.

1:~:)))



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Conversations

By Bebe F. McClain, president, B. F. McClain Productions, Asheville, NC

Robert Hammer, vice president, CBS Operations, was interviewed by the author regarding various topics, including the ongoing CBS Broadcast Center update. This discussion is presented here.

Q: What are your main functions at CBS?

A: As vice president, Production Facilities, New York, I am responsible for distributing network programming to 200 affiliates and for production facilities in New York and remote locations. This involves broadcasting, program production and post-production activities. The Broadcast Center services the CBS Entertainment, News and Sports Divisions, WCBS-TV, European Broadcasting Union and independent production companies.

Q: What do you think is the most challenging part of your job?

A: The Broadcast Center is a facility where all divisions use common equipment and manpower. Scheduling and integrating the various activities for these different groups and efficiently melding them is a challenge.

Also, rapidly advancing technology, where new equipment is continually introduced, represents a challenge. This involves the how and when of installing this equipment in an on-air plant without disruption. Coupled with these decisions is managing the training of operational and maintenance personnel.

Q: What equipment-related or people-related problems do you find?

A: Equipment usually is not fully debugged before being placed in operation. Problems are always uncovered during initial operational phases, usually requiring design changes to accommodate the desires of the operational, maintenance and production groups. Also, due to the ingenuity of technicians and the production staff, new uses for equipment are found. At times, this requires additional modifications. Because the equipment being installed is complex, using computer and high technology techniques, skilled maintenance and operational personnel are needed.

Q: From a systems viewpoint, what is

the weakest link in the broadcast system?

A: I think it is the plant arterial systems that route audio, video, communication and tally systems from various pieces of equipment to the home receiver. It is usually these unheralded systems that cause the most difficulty.

Q: What type of technicians do you seek?

A: We look for individuals who have been trained in high technology maintenance and who can understand and operate complex pieces of equipment such as electronics still-stores, alphanumeric generators, computer graphics and computerized edit rooms. Usually the technicians have significant broadcast experience.

Q: What are the hardest jobs to fill at CBS?

A: Maintenance.

Q: What technical area do you think is progressing fastest?

A: The videotape area, coupled with the need for automated video and audio post-production rooms, is progressing rapidly. Computer graphics is also entering a new era.

Q: How long will the CBS Broadcast Center project update continue?

A: The update began in 1978 and should be completed in 1987-88.

Q: How did you select the equipment?

A: Because the update is such a complex, long-term project, choosing equipment ranges from purchasing equipment specifically designed for our operation to general-use equipment produced by several manufacturers. The engineering and development department evaluates the equipment. The production facilities department has significant input in purchasing equipment because of our primary responsibility to interface with customers and provide the service they need.

Q: Did Hitachi Denshi design the SK-110 camera for your operations?

A: The original SK-100 camera was not designed specifically for CBS. However, upon evaluating the camera, we made several recommendations to improve it. This method is no different than the methods used with other manufacturers. The result was the SK-110.

Q: Does the camera deliver what you originally desired—from an operations viewpoint? Would you choose Hitachi again if you had it to do over?

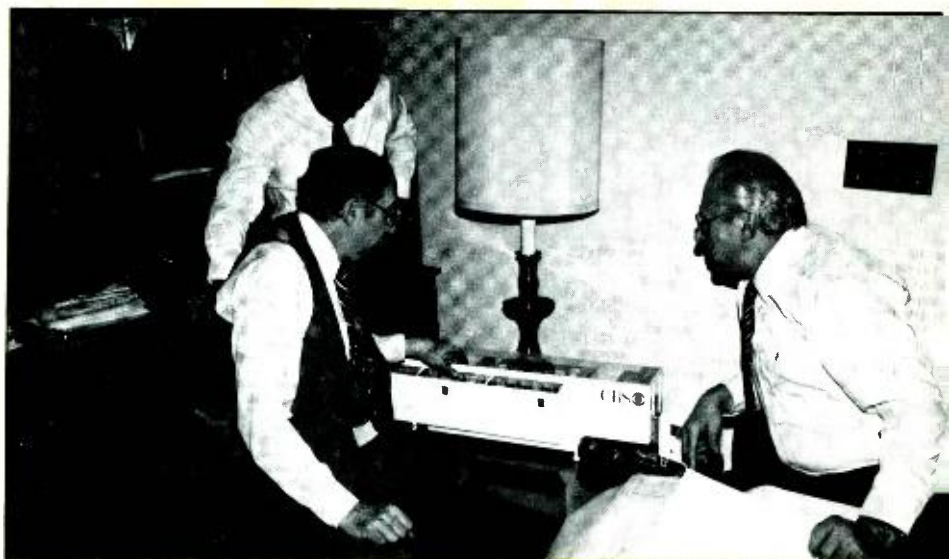
A: Yes, in both instances.

Q: Did your people need special operations and/or maintenance training for the SK-110 camera?

A: Yes. Every piece of equipment we have requires special operations and maintenance training, which continues on an ongoing basis. Continued vendor support is critical.

Q: What other major equipment reflecting technological advances are, or will be, part of the update?

A: There are many pieces of equipment, such as audio consoles, video



Hammer (seated at left) with Jack O'Donnell (standing), director of Technical Services, and Marty Solomon, director of Field Operations.

switching systems, computer graphics, character generators, electronic still-stores, automated edit rooms, audio post-production rooms, videotape machines, communication systems and digital video effects that are part of the update. The plant is being rebuilt, so most of the equipment is being replaced with new devices.

Q: How long do you think new equipment can be used and still be considered up-to-date?

A: Current studio equipment such as cameras, video switching systems and audio consoles have a life expectancy of approximately 10 years. Specialized equipment used in computer graphics, digital video effects and other high technology equipment probably has a useful life of 3-5 years. I am not referring to equipment wearing out, but rather new technology and techniques replacing it.

Q: Are there any advantages, from an operational viewpoint, of distributing the network programming via satellite?

A: I think there are operational advantages because we can control our own fate rather than leave it in the hands of a third party.

Q: What accomplishments make you the most proud?

A: Rebuilding the Broadcast Center from black-and-white to color, and establishing the Broadcast Center update are major accomplishments. All of this happened while CBS was broadcasting and producing programs 24 hours a day, seven days a week.

Q: What advice would you give young engineers for them to one day hold positions such as yours?

A: Individuals should begin at the bottom and have experience in all broadcast, production and technical areas. This way they can understand the people working for them and the operation.

Q: Would you like to cover the Olympics?

A: Yes, it would be an interesting job.

Q: Do you concern yourself with ratings?

A: Yes, in a tangential way I am concerned. The ratings affect the production load and the on-air load, which signifies changes that involve me.

Q: In what area do you think CBS excels?

A: The technical quality of the audio and video broadcast signal is excellent. This is primarily due to the dedication and training of the employees. It's a commitment—a

pride in their work.

Q: Is it difficult to keep engineers in management positions when often they can make more money as technicians without the responsibility of a manager?

A: For engineers who have opted to do maintenance work, money plays a part but is not the entire reason. For example, a person who graduates as a design engineer might find that he wants to handle the equipment.

Most management personnel came up as technicians, but now many are coming from college—from the

engineering disciplines. Some people do not want the responsibility of a management position—but most do. We haven't had too many people turn us down.

Q: What are the ideal qualifications for your critical management jobs?

A: A technical college degree, such as electrical engineering, physics or math, would be one qualification. You should have a business degree such as an MBA, to get to the top. Local experience or work in network operations are good qualifications.

1:1:1:1:1

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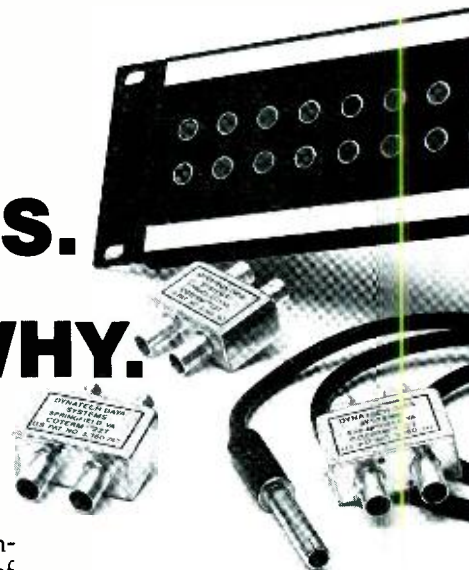
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Compact disc pioneers at WNCN

By Matthew Field, general manager,
WNCN, New York, NY



Denon DCD-2000

As a New York City classical music station, WNCN has watched development of the digital compact disc with special interest. When our studios were rebuilt seven years ago, we custom designed the broadcast facility, putting the lion's share of renovation dollars into improving our audio signal's quality. This is a distinction for which the station has been noted. As a matter of course, we watch for new advances in audio, paying close attention to those we think have an application to radio.

When it became apparent earlier this year that the compact disc would at last be introduced to the United States, we were intrigued by its possible application to radio, and saw it as a development of interest to our listeners. WNCN appeals to a 25- to 54-year-old upscale consumer—the kind of person who appreciates high fidelity. We decided to conduct an experiment with the compact disc by testing it on the air.

In late January, we contacted Denon America, which had demonstrated its DCD-2000 compact digital audio disc player and Denon CDs earlier that month at the Winter 1983 CES show. We told the company of our interest and asked if it would be willing to give us a player, on loan, so that we could demonstrate it for our audience.

STL

PRECISION



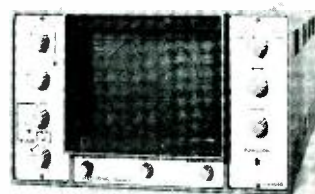
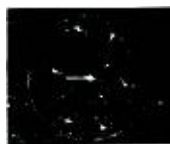
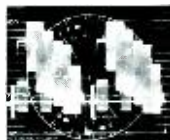
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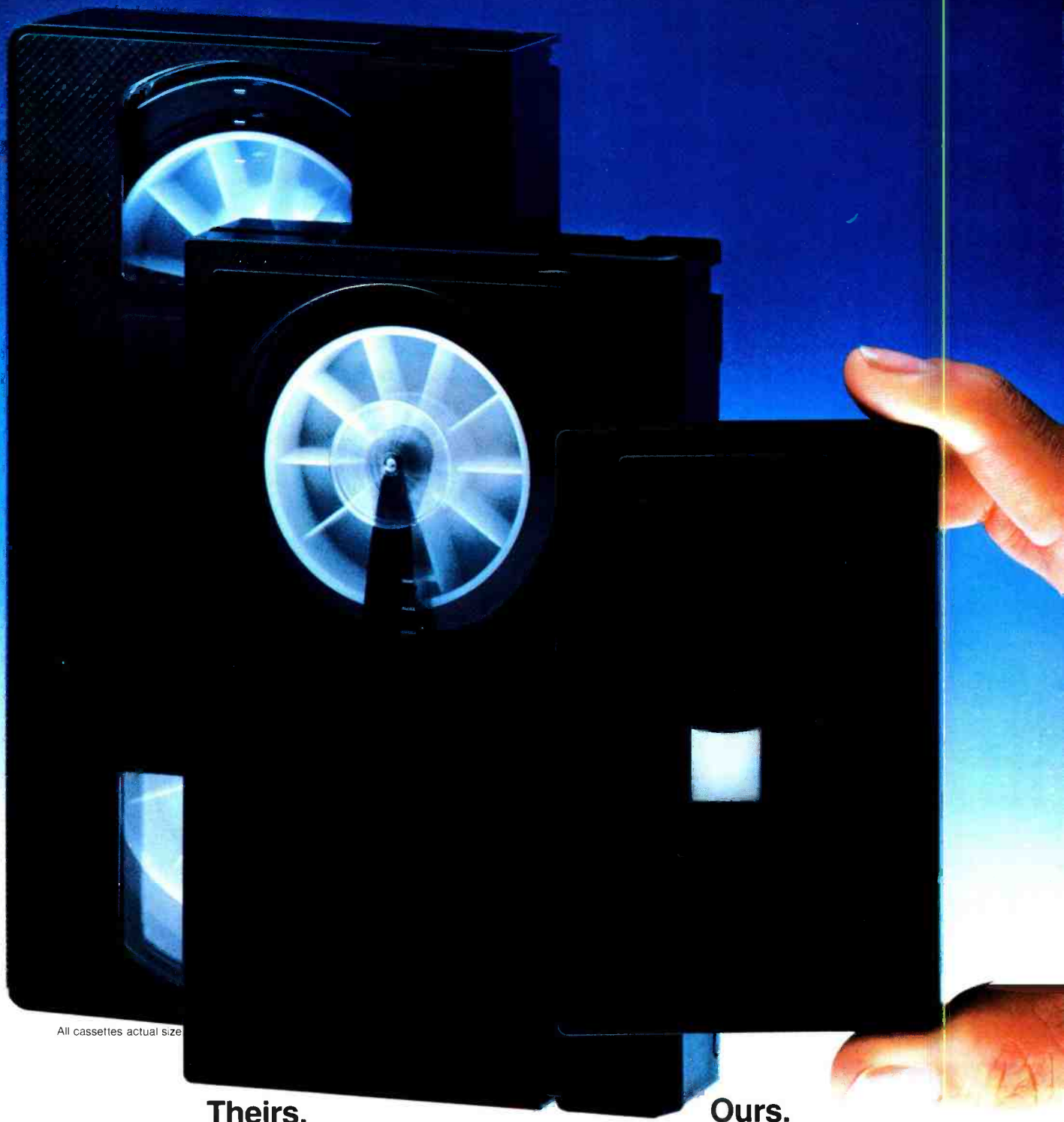
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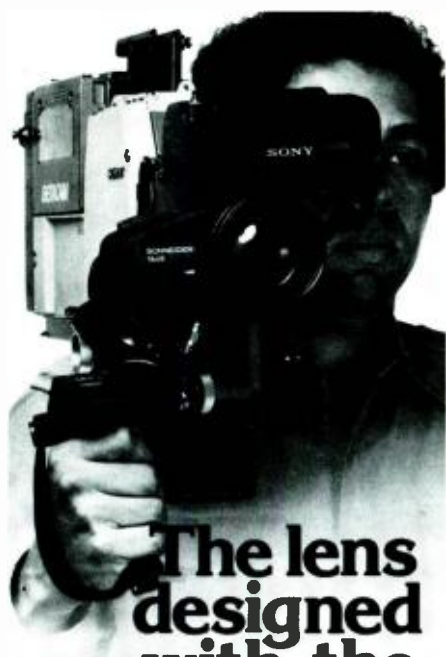
The logical ENG/EPG successor to 3/4-inch is 1/4-inch—not 1/2-inch. If you're going 1/2-inch you're only going half-way.

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Circle (51) on Reply Card



The author, shown with the Denon DCD-2000 compact digital audio disc player and Denon CD.

Denon agreed, providing us with the player and a selection of software for a week-long demonstration.

Response overwhelming

We began the on-air testings the week of Feb. 7, setting aside short periods in which we would play a disc. We invited listeners to call in afterwards to comment or have their questions answered by Larry Klein, Stereo Review's technical editor, who was on hand for each demonstration. We were not sure, before the first demonstration, whether the audience would perceive enhanced sound.

The Denon system has a 90dB dynamic range and a 90dB S/N ratio, which produces almost noise-free sound. You hear no hiss, clicks, pops or other distortion, because the disc is laser-read. Yet the player, designed for home use, would be used on FM, an analog medium. Listeners would be hearing a digital signal played through the analog broadcast chain, on home equipment of unknown quality.

It didn't take long to have our question answered. As we played the first compact disc, the phones lit up. We probably could have stayed on the air all night that first night. The response was overwhelming. As a result, Klein and WNCN staff members, including Mario Mazza, director of programming and operations, answered calls for about 1½ hours after the demonstration was finished.

The most frequent comments regarded the noise-free background produced by the compact discs. Other listeners had questions about the new technology. Still others, in possession of compact disc players they had purchased abroad, offered to lend us some of their discs for future demonstrations—an appreciated gesture, given the scarcity of available software.

Because WNCN was the first to do the demonstrations, the press and other interested industry members have been coming to us to seek our reaction to this new technology. Although it's impossible to say how revolutionary compact disc development will be in the marketplace, judging from the initial response—especially from potential consumers, our listeners—it will have a major impact.

Application to radio

Many people have asked whether I think the compact disc has application to radio, and I answer, "Absolutely." In fact, WNCN plans to purchase a unit as soon as one is developed for broadcast purposes that is compatible with our equipment and capacities.

Among the advantages of the compact disc is the long playing time—an hour or more on each 4-inch disc. Another is the capability for easily playing one cut at a time. The disc is also easily cued.

The most important advantage is its enhancement of the quality of sound and the greater dynamic range, which is particularly important in classical music, frequently transmitted with little or no compression.

The big question for compact disc's long-term success is price. The first units are expected to retail at \$800-\$1000, with discs averaging \$16.95 and up. Success also depends on availability of "software," the discs themselves. But for now, interest in the compact disc is unquestionably high, and its usefulness on radio unquestionably valuable.

Editor's note:

Since this article was written, the author reports that a second CD player, the Magnavox (Philips) CD 100, has been added to the equipment airing high quality music from WNCN. Also, the amount of programming being broadcast has been significantly increased to meet listener demands.

new products

Digital multiplexer

Signals may be inserted or deleted from T1 carrier systems with digitally encoded 15kHz audio channels using *Tau-Tron's* TDM-150 digital multiplexer. By avoiding multiple encode/decode operations, audio quality is improved.

Circle (301) on Reply Card

Automated programmer

The *International Video Corporation* videocassette programmer features a central CPU and 5-inch floppy disc that program the sequence and time-of-day that segments will be aired in up to 32 videocassettes. Back-to-back commercial insertion and unattended program operation are possible. An IVC 8002 digital frame store ensures signal stability and broadcast compliance.

Circle (302) on Reply Card

Pre-recorded effects

The *Video Imagery System* from the *Fantastic Animation Machine* requires two videotape machines and any luminance keying switcher to add wipes, transitions, mattes and backgrounds not available on your video switcher. Also, 1/2- to 2-inch tape formats may offer a "personalized" logo, created by the company.

Circle (303) on Reply Card

PCB repair system

Factory- or field-oriented PCB rework, repair and modification are simplified by the *Pace PRC-151* bench-top repair system. The system includes thermo-drive heat control, solder extractor and machining unit with deluxe tool set.

Circle (304) on Reply Card

Still-store

The *Asaca/Shibasoku ADS-1000* digital video still-store uses 8-inch Winchester disc drives to retain 218 video fields per disc, expandable to four discs. Also included is a built-in floppy disc for temporary storage. Up to 16 stills are available simultaneously for visual sorting.

Circle (306) on Reply Card

I/O replacement PCB

Designed for the *Ampex ATR-100*, the *Strategic Sound* transformerless I/O replacement circuit board simplifies setup and alignment. The ± 0.1 dB response from 10Hz to 20kHz and output noise level of -90dB (A-weighted) combine with a distortion rating of less than 0.01% at +24dBm over the response range.

Circle (307) on Reply Card

Safe area generator

For ENG or studio applications, the *Polar Video Ltd.* safe area generator attaches to the camera and supplies a safe shooting area display to the viewfinder. It is available for various JVC, Hitachi and Sony cameras.

Circle (308) on Reply Card

Lighting stands

A line of stainless steel lighting/grip stands is available from *Matthews Studio Equipment*. Guaranteed against rust for life, the line includes the 40-inch double-riser Century, the Hi-Hi Roller and the Combo-Reflector stands.

Circle (310) on Reply Card

Graphic overlay system

The *GraphOver 9500* is a high speed, high resolution color graphics display generator from *New Media Graphics*. Generated graphics may be combined with video from disc, tape or camera sources.

Circle (311) on Reply Card



Sequencer

The *Quick*Chase Slavepak* is a 4-channel, 10A accessory for the *Great American Market Quick*Chase* lighting control equipment. Features include 16 pre-programmed push-button sequences and built-in speed control.

Circle (312) on Reply Card

Lamp replacement

The problems of incandescent lamps in miniature lamp sockets may be eased by using T 3 1/4 miniature lamps from *Lamp Technology*, which use six LED chips instead of filament type lamps.

Circle (313) on Reply Card

Network clock

Torpey Controls & Engineering Ltd. is offering a series of digital time readouts with a unique time zone conversion feature. Simultaneous time displays for several cities are possible. The PBS 30-hour mode is available.

Circle (314) on Reply Card

Ohmmeter

The *Meg-O-Volt* from *AW Sperry Instruments* allows insulation testing along with ohmmeter and ac voltmeter functions. Three models, the 510, 520 and 530, allow MΩ measurements to 100MΩ, 1000MΩ and 2000MΩ full-scale, respectively.

Circle (316) on Reply Card

Information display

A new character generator from *Jasmin Electronics Ltd.* allows an output of up to eight video channels for alphanumeric data displays on color CRTs. RGB/sync and 25-frame 625-line composite video includes 12-line/24-character to 24-line/80-character screen displays.

Circle (318) on Reply Card

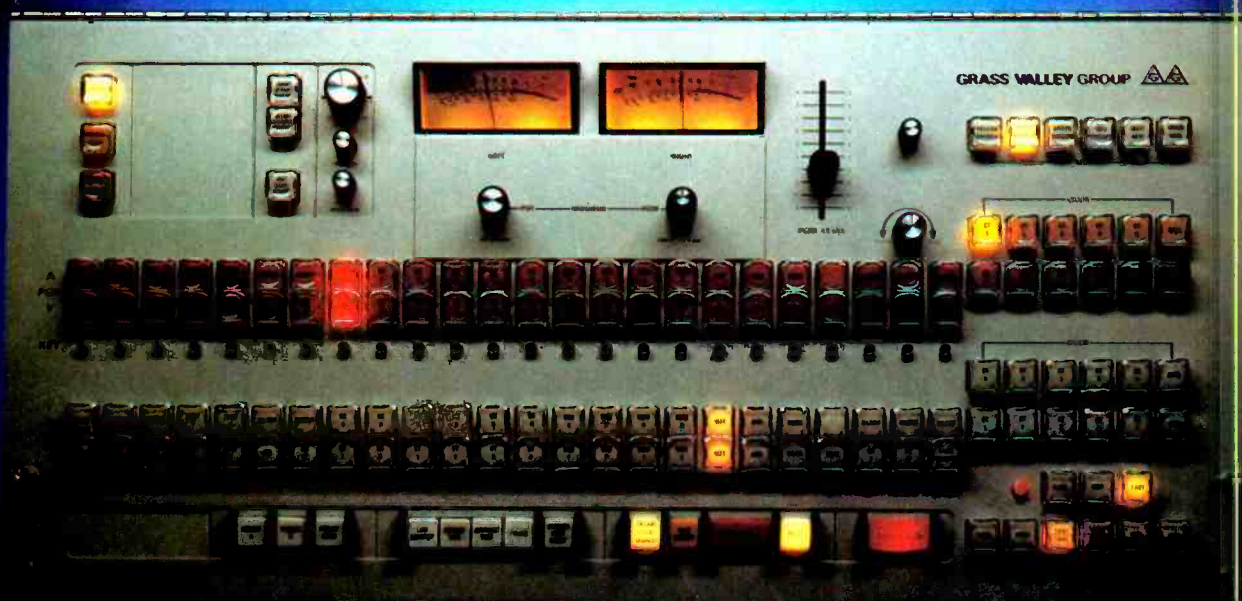
Videographics

The *UV-1R Zgrass* graphics system from *Datamax* offers 320x201x2 pixel resolution. An RS170 output or optional RGB video is provided.

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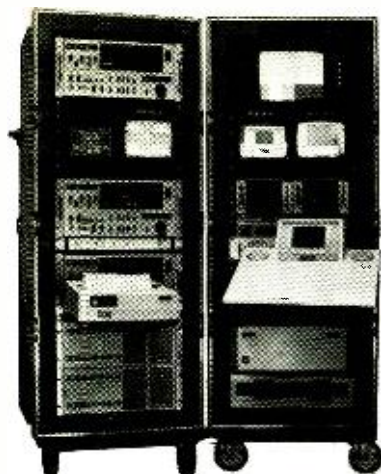
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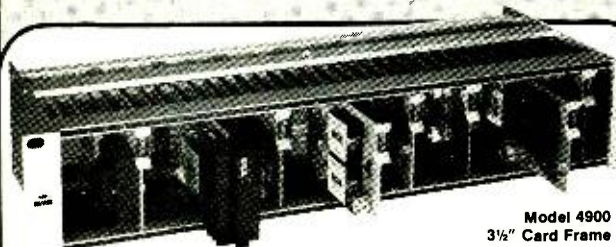
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news

FCC rule changes

The FCC made the following changes affecting multiplex subcarrier operations:

- Licensees will no longer be required to file FCC Form 318 to obtain an authorization to transmit subsidiary communications by multiplex subcarriers.

- Licensees may use multiplex subcarriers to transmit enhancements to the main channel programming including receiver control signals and quadraphonic programs; specialized broadcast programming for the public (foreign language and radio reading services); subscription program services (functional music, commodity market data); private communications services; and common carrier services such as paging.

- Stations offering common carrier-type services via multiplex common carrier directly or by leasing the subcarrier must comply with all common carrier authorization procedures.

- Logging of subcarrier "programs" is no longer required.

- Subcarriers within the band 20-99kHz may be used for FM stations transmitting monaural programming and within the band 53-99kHz when transmitting multichannel sound programming.

- Non-commercial educational FM stations may use or lease their subcarrier facilities for commercial-type services. However if they do so, they must ensure that the needs for radio reading services in their service areas is adequately met.

- Subsidiary communications services may be transmitted during periods when there is no main channel program service, however stations must have the required transmitter operator on duty and transmit the required hourly station identification on the main channel.

- Subcarriers may be angle-modulated (frequency or phase), amplitude-modulated (DSB or SSB) or frequency-shift-keyed.

- Peak total modulation may not exceed 100% referenced to 100%, however the FCC will consider raising the peak modulation limit for subcarrier operation in a Second Report and Order if additional technical information shows that existing service will not be degraded.

- Stations using subcarriers above 75kHz or using other than frequency modulation of subcarriers will not be required to have type-approved modulation monitors for such operations. However stations must have appropriate measuring equipment to determine the level of subcarrier injection and modulation. (Existing type-approved monitors may not be adequate for the extended baseband or types of subcarrier modulation.)

- The RMS sum of all subcarriers above 75kHz used for subsidiary communications may not modulate the main carrier by more than 10%. Total subsidiary communications subcarriers may not modulate the main carrier by more than 20% during multichannel sound programming or 30% during monaural or "silent" programming.

*Courtesy of
National Public Radio*

ATSC: Surging ahead on advanced TV systems

The first meeting of the US Advanced TV Systems Committee (ATSC) was held at NAB headquarters in May in Washington. The scope of the historical meeting was to acquaint potential members and the public with the purpose and proposed structure of the organization.

The committee was formed by members of the Joint Committee for Inter-Society Coordination (JCIC) to coor-

dinate the development of voluntary national standards for advanced TV systems—including generation, distribution and reception of improved NTSC, enhanced 525-line and HDTV transmission.

The JCIC comprises the National Association of Broadcasters (NAB); National Cable Television Association (NCTA); Electronic Industries Association (EIA); Institute of Electrical and Electronics Engineers (IEEE); and Society of Motion Picture and Television Engineers (SMPTE).

Former FCC Chairman E. William Henry is chairman of ATSC. He is currently a member of the Washington, DC, law firm of Ginsburg, Feldman, Weil and Bress.

Each of the JCIC organizations presented reports to the approximately 120 attendees. Presentations were made on the purpose of the committee, the need for standards and a technical description for proposed advancements.

Also announced was the appointment of Dr. Richard Green, former director of development for CBS, as ATSC executive director.

Discussing the needs for standards were Joseph A. Flaherty, vice president, engineering & development, CBS Broadcast Group, and Daniel R. Wells, assistant vice president for engineering, Satellite Television Corporation.

JCIC member reports were given by E. M. Tingley, staff vice president, Consumer Electronics Group, EIA; Wendell H. Bailey, vice president, Science and Technology, NCTA; Thomas B. Keller, senior vice president, Science and Technology, NAB; Donald R. Musson, president, Broadcast Technology Society, IEEE; and Roland J. Zavada, engineering vice president, SMPTE.

Reviewing advanced TV systems were Dr. Kerns Powers, staff vice president, Communications Research, RCA Corporation, and Ernesto R. Martin, assistant vice president, engineering, Satellite Television Corporation.

Valerie G. Schulte, NAB assistant general counsel, and Gregory M. Schmidt of Covington & Burling reviewed the ATSC charter, membership and budget.

ATSC membership is open to business entities with commercial interests in the United States that are likely to be affected by the development of advanced TV standards, as well as non-profit membership organizations whose members would be affected by such standards.

Application forms may be obtained from the secretariat of the ATSC, c/o NAB, Office of Science and Technology, 1771 N Street, NW, Washington, DC 20036; 1-202-293-3507.

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Editorial

Continued from page 10

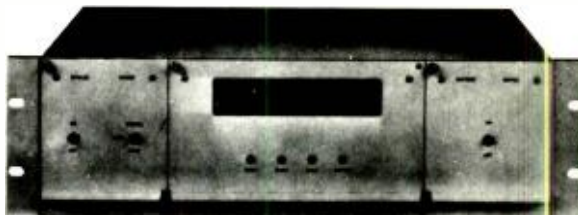
Many board members are from large companies that probably pay their expenses to attend SBE meetings. Several chapter chairmen who failed to attend meetings said that they could not afford to pay expenses out of their own pockets, and smaller stations could not afford to send them. If this is the case, should not the SBE pay traveling expenses of chapter chairmen to meetings on society business? The latest balance sheet shows a savings account many members would be glad to have, which could be used to finance travel by less-well-healed members on official business.

Perhaps the time has come for a vote to be called at the SBE—not to award offices, but to recall officers and look for a better way to run the society.

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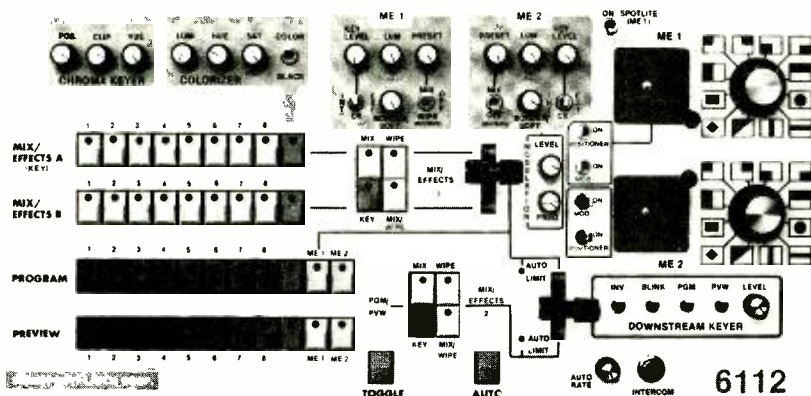
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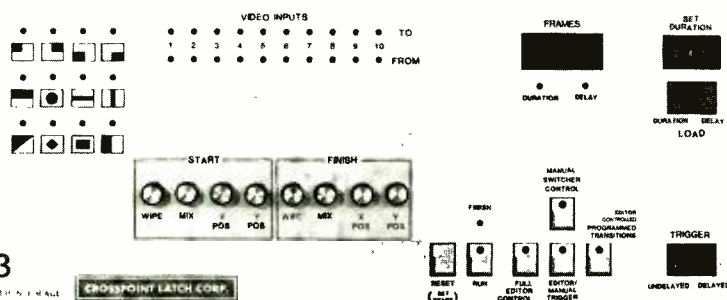
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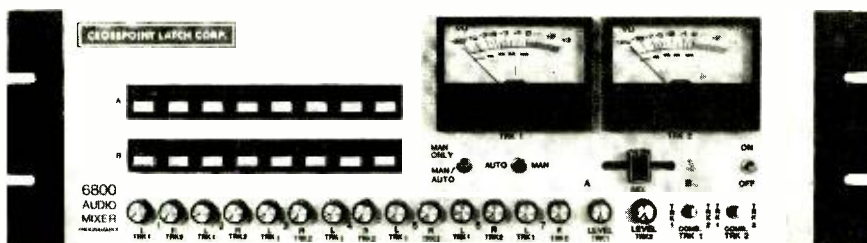
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