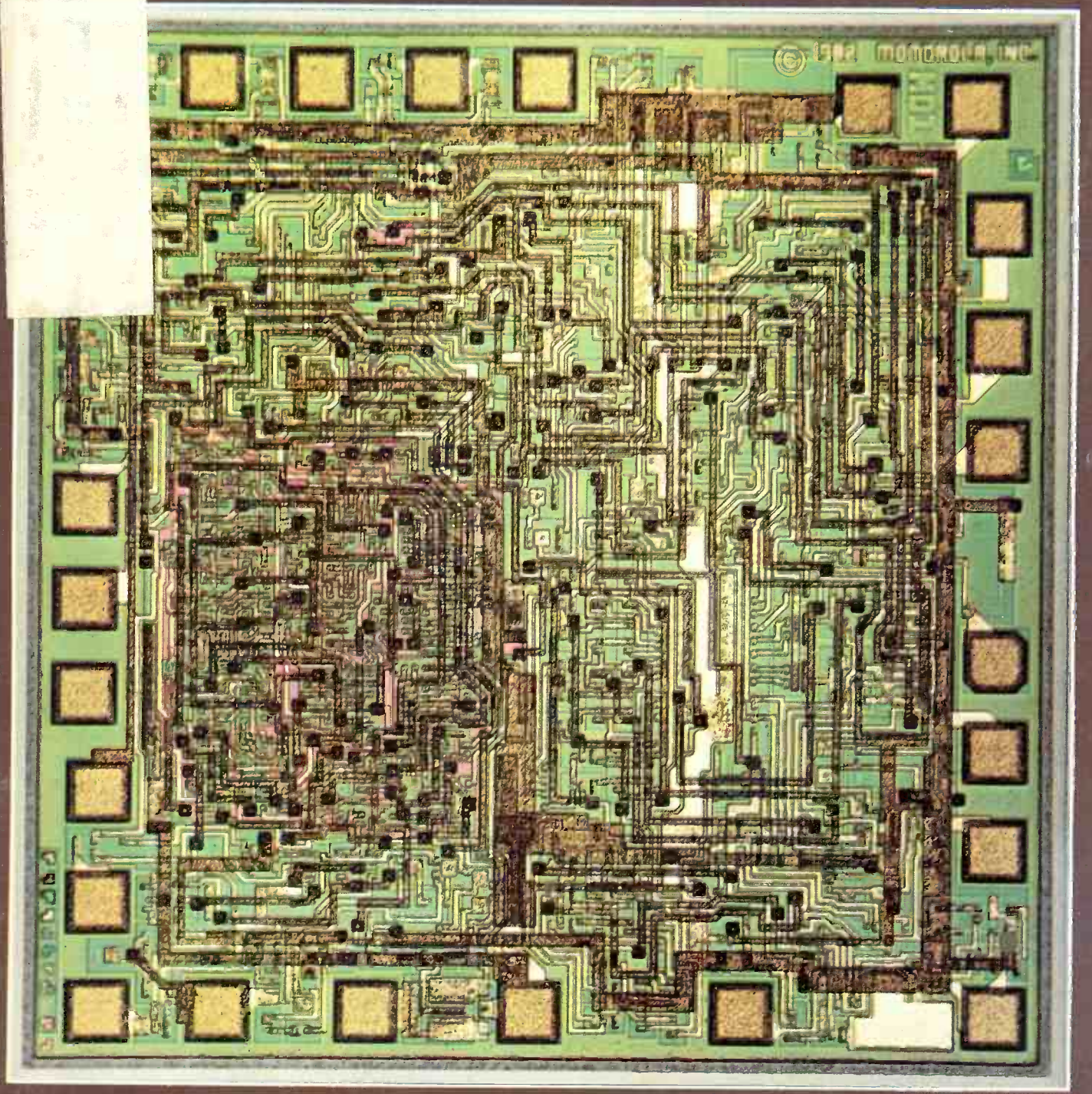
BROADCAST ENGINEERING®

August 1983/$3

M stereo ·Modulation monitors
dio processors ·Still-store update



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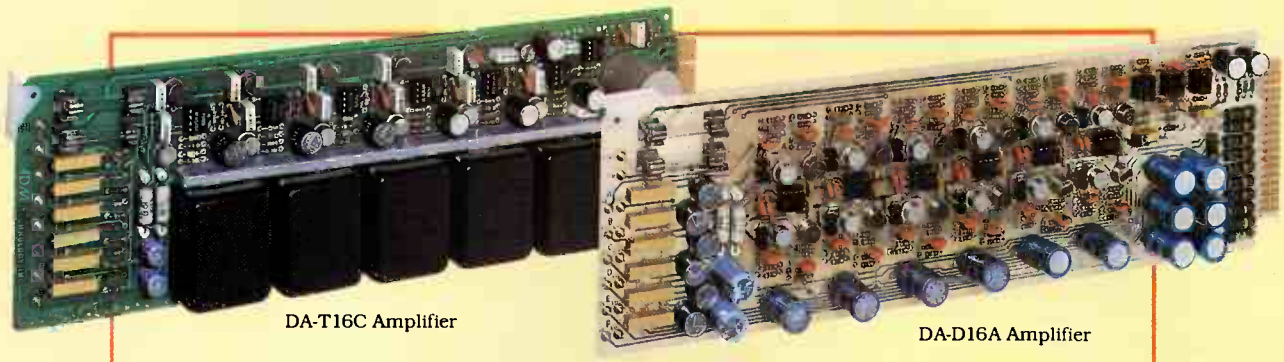
Transformer...or...Differential



DA-T16C Amplifier

DA-D16A Amplifier

...and One Great Frame Houses Both.

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Whichever you prefer — transformer or differential — you get a superb Audio Distribution system with ADM.

Both amplifiers are one-input, six-output cards. Each has an ultra low noise level with distortion less than .1% at +24dBm. Each has 6 individual front panel gain adjustments and 6 individual test points for audio outputs.

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The M-30 Mobile Production Unit featured at NAB. Equipped with field proven Hitachi HR200E VTR's.

Midwest and Hitachi... a track record for keeping your show on the road.

Whether you're covering a concert or a play-off game, Midwest can get your show on the road fast ... with a fully equipped mobile production unit that meets the tough demands of on-location shoots.

From mini-vans to 45-foot tele-production units, Midwest designs fully integrated mobile systems using only the finest equipment by the finest manufacturers ... like Hitachi. Hitachi's HR200E Type C One Inch VTR is used in Midwest's Model M-30, and features full studio capabilities plus diagnostics for easy field maintenance. Hitachi builds them for stable performance and durability, and it shows in their proven track record in Midwest mobile units.

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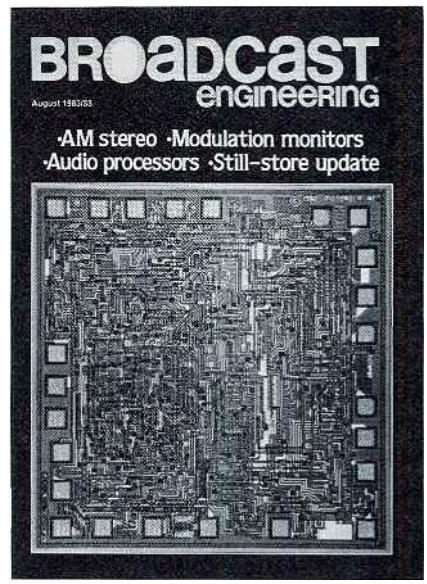
BROADCAST engineering

The journal of broadcast technology

August 1983 • Volume 25 • No. 8



THE COVER this month is an enlargement of the Motorola AM stereo decoder chip, the MC13020P. This device is designed to further enhance broadcast services, perhaps the first *complete* IC device to be so developed. The MC13020P is a complete 1-chip, full-feature AM stereo decoding and pilot detection system. It employs full-wave envelope signal detection at all times for the L+R signal, and decodes L−R signals only in the presence of valid stereo transmission. An article describing this device, "Motorola AM Stereo Decoder Chip," begins on page 19.

CABLE SECTION
Our special cable demographic section is included in this issue. It follows page 64 of our regular issue.

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NEXT MONTH we will feature our 16th annual *Buyers' Guide*, the industry's most comprehensive directory of products and sources for broadcasters. The issue will also be packed with timely articles on radio and TV broadcasting.

"I want the world. Consistent .05% corner registration and full auto-setup of up to 96 cameras on computer command."

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AUTO SETUP

Don't want much, do you?

Dynamic registration not just at dead center but at all four corners. Plus 2-minute auto-setup of all those cameras.

You're asking for some smart camera system, networks of the world and top-drawer video production companies.

Well, Hitachi heard you, and has created an outright *genius*—the Hitachi SK-110 Camera System.

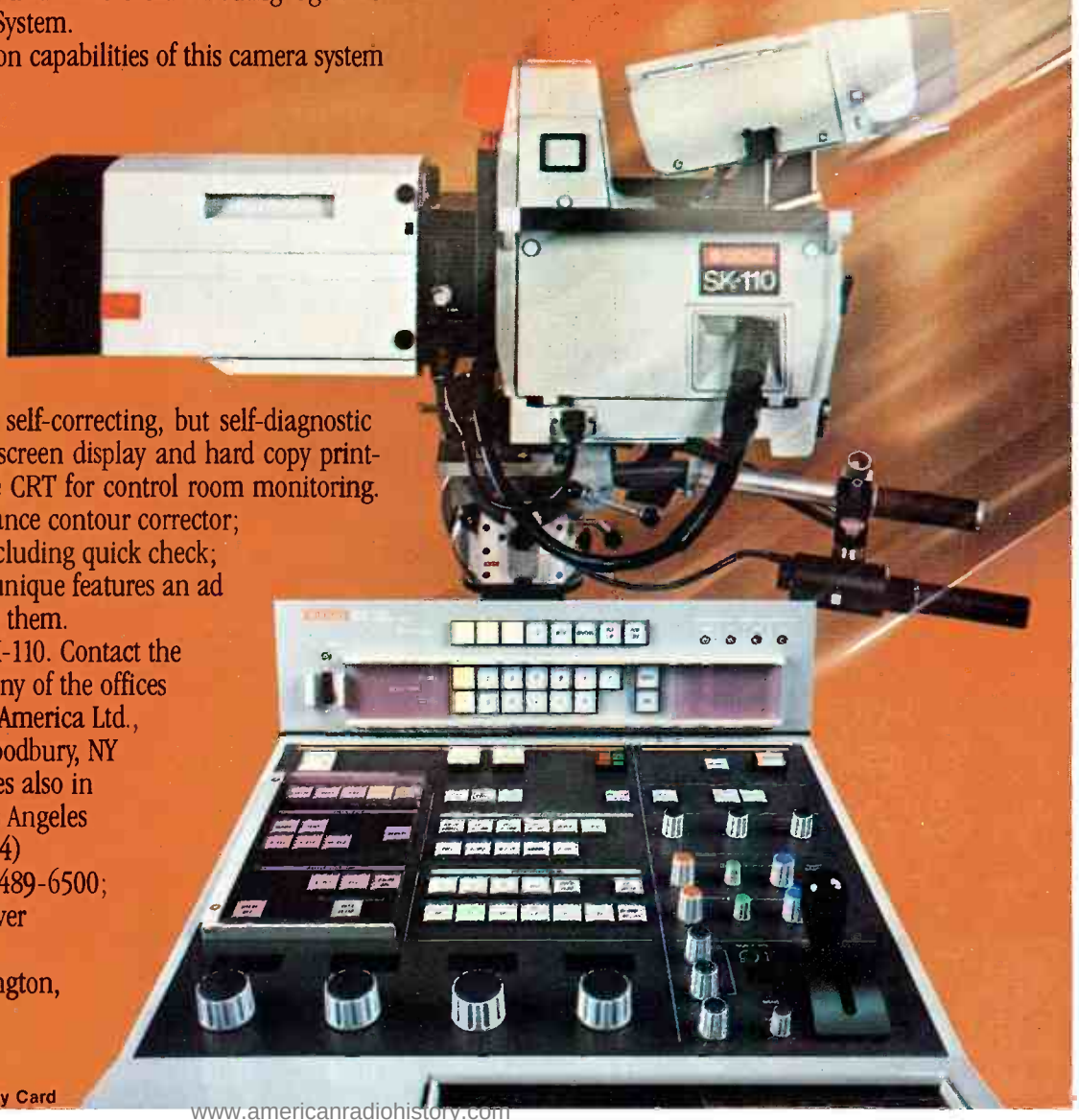
The computer registration capabilities of this camera system produce pictures of a clarity and resolution previously unheard of.

And you get auto-setup at the push of just one button, and zero reference, too, where the computer sets the green channel and compares blue and red to it with absolute precision.

The SK-110 is not only self-correcting, but self-diagnostic as well. It gives both video screen display and hard copy printout; can be hooked into the CRT for control room monitoring.

There's a high-performance contour corrector; 5 automatic setup modes including quick check; 5 data files; so many other unique features an ad can't begin to tell you about them.

The ultimate Hitachi SK-110. Contact the broadcast video division at any of the offices listed below. Hitachi Denshi America Ltd., 175 Crossways Park West, Woodbury, NY 11797 (516) 921-7200. Offices also in Chicago (312)344-4020; Los Angeles (213) 538-4880; Atlanta (404) 451-9453; Cincinnati (513) 489-6500; Dallas (214) 233-7623; Denver (303) 344-3156; Seattle, (206) 575-1690; and Washington, D.C. (301) 459-8262.



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BROADCAST® engineering

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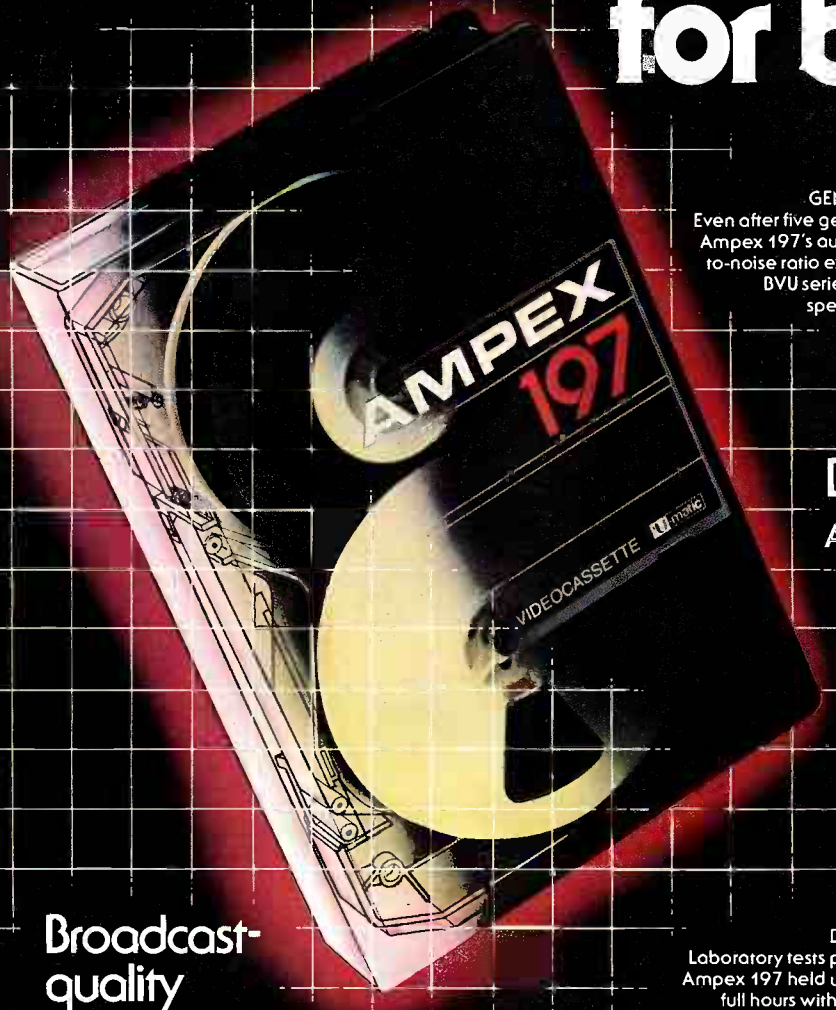
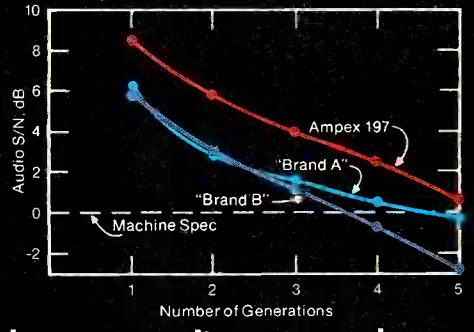
BROADCAST ENGINEERING is edited for corporate management, engineers/technicians and other station management personnel at commercial and educational radio and TV stations, teleproduction studios, recording studios, CATV and CCTV facilities and government agencies. Qualified persons also include consulting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

SUBSCRIPTIONS: **BROADCAST ENGINEERING** is mailed free to qualified persons in occupations described above. Non-qualified persons may subscribe at the following rates: United States, one year, $25; all other countries, one year, $30. Back issue rates, $5, except for the September Buyers' Guide issue, which is $15. Rates include postage. Adjustments necessitated by subscription termination at single copy rate. Allow 6-8 weeks for new subscriptions or for change of address. Controlled circulation postage paid at Shawnee Mission, KS.

Ampex 197: designed especially for broadcast.



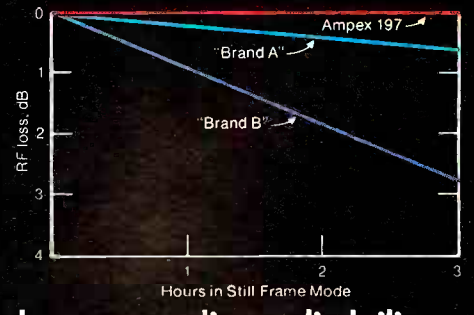
AUDIO MULTIPLE GENERATIONS
Even after five generations, Ampex 197's audio signal-to-noise ratio exceeds the BVU series machine specifications.



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.

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

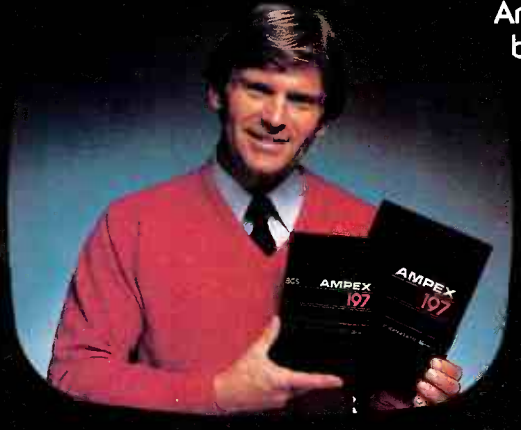


Broadcast-quality color and sharpness.

The Ampex 197 ¾" 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.



Broadcast-quality reliability.

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

Find out more about why Ampex 197 is quality worth broadcasting. Call your Ampex Regional Office or write to: Ampex Corporation, 401 Broadway, Redwood City, CA 94063 (415) 367-3809

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Quality worth broadcasting.

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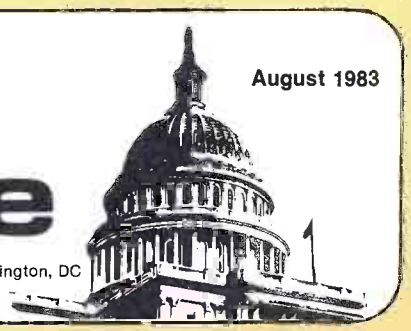
FCC update

August 1983

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



Teletext authorization

The FCC has adopted rules permitting TV stations to use the vertical blanking interval (VBI) to provide teletext services.

The rules authorize regular TV and LPTV stations to provide teletext services, to choose the kinds of services to offer, and to select the technical systems for transmitting data signals. The only limiting factor is that teletext operations must not interfere with the regular broadcast service of the originating station, signals of other broadcast stations or those of nonbroadcast radio stations. Teletext signals will be permitted on VBI Lines 14-18 and Line 20 initially, with Lines 10-13 being phased in over several years' time.

Under the adopted rules, a licensee may transmit coded data and instruction for almost any image pattern. Also audible signals may be used to attract a user's attention to specific information presented through the display function.

Teletext service may be operated by the licensee or may be leased to third parties for multiple uses. However, licensees will be responsible, in a legal sense, for all teletext services provided by their stations' facilities. Nonbroadcast teletext activities, such as paging services, will be regulated according to the applicable FCC regulatory scheme (for example, common carriers). Standard teletext services, such as electronic publishing, will be considered ancillary broadcast services governed by Part 73 of the rules.

Public TV stations are permitted to engage in the same teletext services as are commercial stations, and may offer them on a profit-making basis.

In a controversial aspect of its teletext decision, the commission said it would not apply the cable must-carry rules to teletext services. The vote on this matter was close; the issue may be revisited when the commission is reduced to five members.

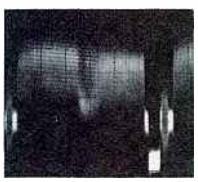
Multichannel MDS authorized

The FCC has reassigned eight channels from the Instructional Fixed Television Service (ITFS) allocation in the 2500-2690MHz band to provide additional channels for the Multipoint Distribution Service (MDS). The eight new MDS channels will be available for the creation of two 4-channel MDS systems per market.

The commission proposed using a lottery system to select permittees for the new multichannel MDS systems. Comments on that proposal will be due in August. Also, the FCC's new rules will allow existing ITFS licensees to lease excess capacity to commercial programmers.

In communities where ITFS stations already exist—or have been applied for—on the frequencies now earmarked for MDS, conditional construction permits will be issued to MDS operators. In these circumstances existing ITFS stations

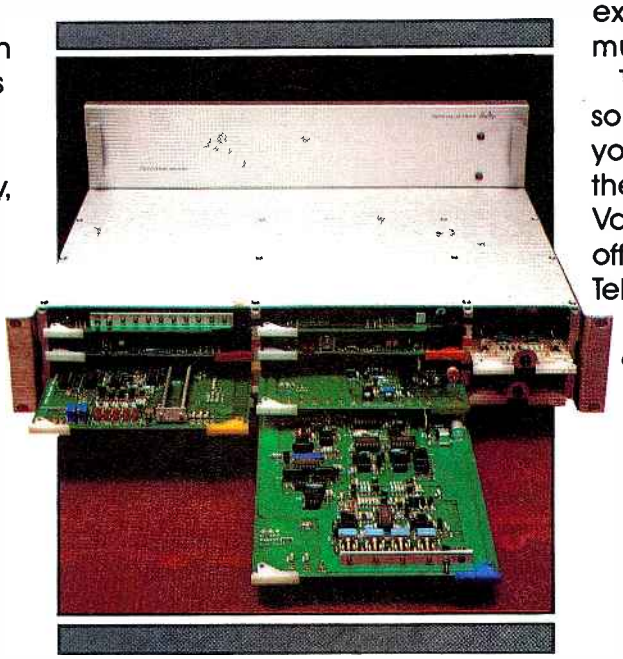
THE AGONY AND THE ECSTASY

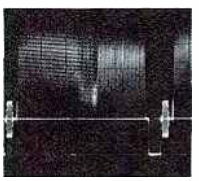


AGONY:

You work hard to keep your plant clean. A little tweak here, another adjustment there. It's an endless maze of video paths, and you're the guy in the hot seat.

To make matters worse, everytime you have things just the way you want them, somebody decides to plug in a new video source. It's tweaking time again and the longer it takes, the more it costs. Agony, pure agony.





ECSTASY:

The Grass Valley Group Proc Amp. Always SC/H phased. You get full regeneration of sync and burst, adjustable blanking width, soft and hard clippers, independent adjustability of chroma and luminance, external reference and much more. Ecstasy.

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will be encouraged to negotiate with the new MDS permittees in their markets and, when possible, reach agreements whereby the requirements of both can be met. In most markets, ITFS licensees could be accommodated by moving to one or more of the 20 channels that will continue to be allocated for exclusive ITFS use.) However, MDS operations will not be permitted to begin until agreements with affected ITFS entities are reached.

Applications for multichannel MDS under the new allocations scheme were to be accepted only on the 45th day after publication of the commission's order. The deadline had not been announced at press time.

Shared use of TV auxiliary facilities

The commission revised rules on TV broadcast auxiliary stations, permitting shared uses with other broadcast and non-broadcast entities. The FCC also revised licensing standards for TV auxiliaries.

TV stations may use auxiliary facilities for the transmission of any material, including multiplexed material such as data, telemetry or facsimile, at any time and without a time limit, on a for-profit basis. Such facilities may be shared with other broadcast or non-broadcast entities.

The commission deleted its rule permitting auxiliary licenses to obtain exclusive channel assignments in a market. In the future, TV stations in congested areas must rely on frequency coordination committees to allocate frequencies.

Although the new rules contain no limitations on the relative amount of time an auxiliary station can devote to alternative, profit-making purposes, such uses must be secondary. The commission warned licensees not to abuse the new rules by seeking additional auxiliary facilities solely to engage in profit-making, channel-sharing activities.

Clarification of LPTV rules

Responding to petitions for reconsideration of its 1982 Report and Order establishing the LPTV service, the commission clarified and changed several regulations governing LPTV licensing.

It changed the definition of "major" amendment and "major" modification, permitting technical changes that would not extend an LPTV station's contours. Under the old rule, most equipment changes would have been treated as "major" and would not have been permitted during the freeze or would have resulted in loss of cut-off rights or priority status for freeze-exempt applicants.

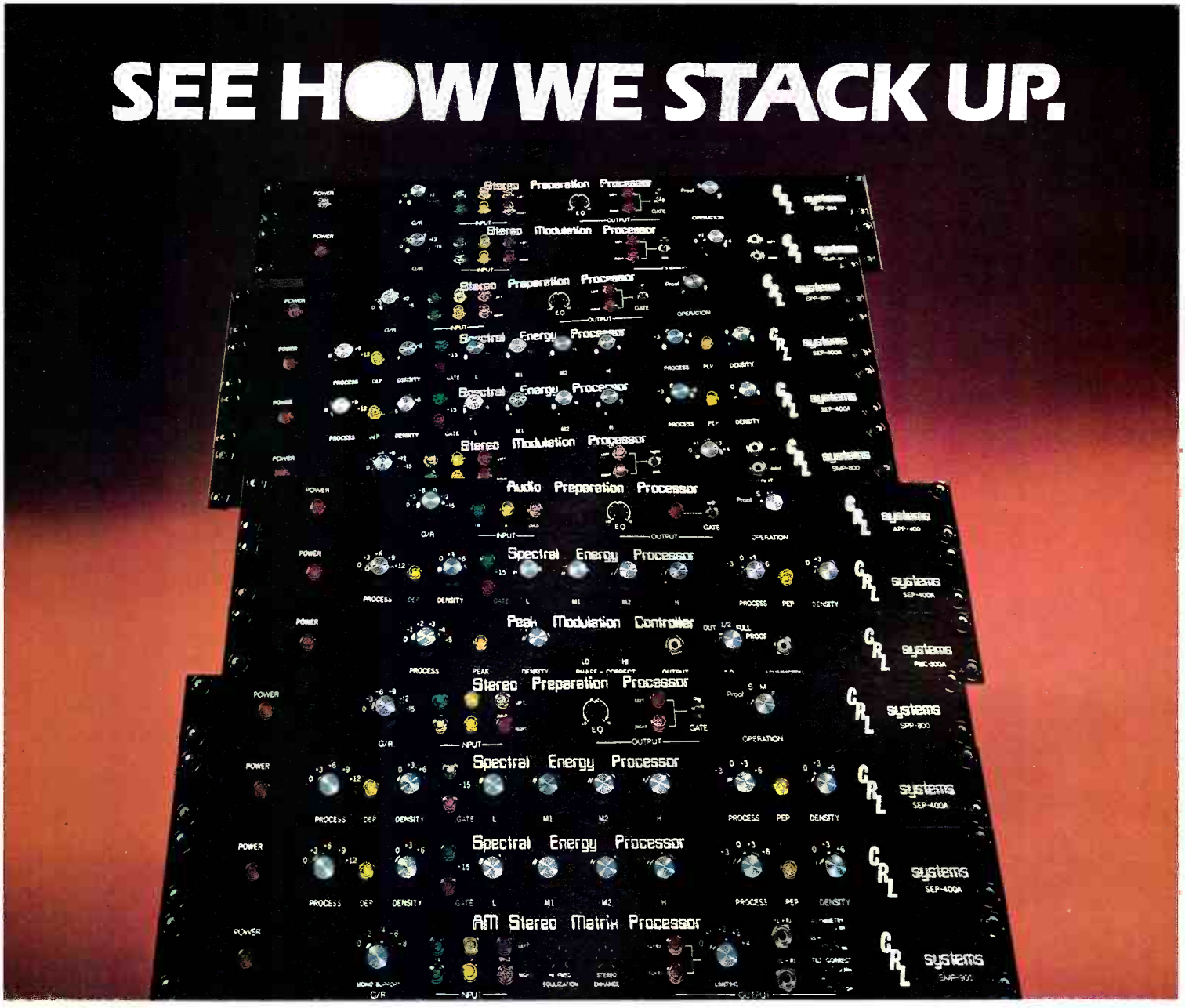
The commission also amended rules regarding ownership changes to help implement the lottery preference system. Changes in ownership of 50% or more will be considered "major." Such a classification, like a major change in service area, would cause a loss of cut-off or priority rights for freeze-exempt proposals and dismissal of applications not freeze-exempt.

The commission rejected requests that the cable must-carry rules be applied to LPTV. It also rejected requests that an interim processing procedure granting priority to rural areas and the freeze be re-examined. Pleas to change the point system that was to be used in LPTV comparative proceedings were considered moot because permittees will be selected through the lottery process rather than paper hearings.

Deletion of settlement payment limitation

In response to 1982 amendments to the Communications Act, the commission deleted rules proscribing payments to dismissing broadcast applicants that are in excess of their "reasonable and prudent" application expenses.

SEE HOW WE STACK UP.



CRL offers much more than just another limiter for your AM or FM station.

We provide you with any combination of multi-band AGC's, four channel processors, and pre-emphasizing limiter/clippers for your stereo or mono needs.

Because of this, it's no wonder we have been stacked up against the best known audio processors in the industry . . . and won!

All of our AGC's use multiband, patented circuitry, which avoid noise pull-up during pauses, and automatically correct errors in levels and tonal balance.

Using 6db/octave filters for precision shaping and altering of program material, our 4 channel processors will give you a powerful increase in loudness and still retain musical quality.

Our multiband limiter/clippers use patented low pass clipping filters to provide the final absolute peak and band width control. Our adjustable pre-emphasis circuits allow you to achieve the maximum in fidelity on typical receivers.

Hear for yourself why CRL has become a leader in audio processing. Call Bob Richards now, toll free at (800) 535-7648 for more information. Or better yet, ask about our free two week trial and see for yourself how we stack up.

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Productivity: A must

A guest editorial by Don LeBrecht, executive director, Broadcasting Industry Council to Improve American Productivity, Washington, DC

For many years, this country has experienced a declining productivity rate that has had a devastating impact on the economy and our standing in the world community. This problem has accelerated over a period of time. If we are to regain our once-proud standard of living and pass on a healthy country to our children, we must start to turn things around.

A report by the Congressional Joint Economic Committee summarized the problem in no uncertain terms. It said that the country is experiencing "a national economic crisis which threatens not only the future standard of living of our children, but also our very survival as a leading world power."

The mess we're in did not happen quickly, nor will we be able to pull out of it quickly. But we must begin—and begin now.

Broadcasters across the country have embarked on a 5-year campaign to increase productivity by making Americans aware of the problem's causes. The three fundamental reasons for the decline are ineffective management; adversarial relationships between government, management and labor; and functional illiteracy. We have to attack these areas, and each of us should be willing to do his or her share.

For each 1% of growth in the productivity rate, the work force's buying power increases by an estimated 26.5 billion dollars. The benefits to be gained are obvious.

Our goal is ambitious, but the urgency of the problem necessitates it. By increasing productivity, we can, with your help, achieve more employment, less inflation, higher incomes and lower interest rates. We can unite management and labor in a common goal and make the country's companies and products more competitive in world markets.

The broadcasters' campaign has received the enthusiastic endorsement of the White House, Congress, organized labor and management. You can add your name to the list.

Double Your Troubleshooting and Testing Productivity . . . Or Your Money Back!

Six-digit readout: Automatically tracks every CRT test. We call it digital autotracking. It's patent pending.

Bright dual-trace CRT: 60 MHz (– 3 dB); 100 MHz (– 12 dB).

Delta PPV, Time, Freq: Measure any part of a waveform for PPV, time or frequency using Delta measurements. Just dial in the waveform section you want to measure and push.

Simplify Freq ratio tests: Automatically compare input/output ratio of multiply/divide stages from 1:1 to 1:999,999 with the push of a button.

Autotracking DCV, PPV, Freq: Measure DCV to .5%; PPV to 2%; freq. to .001%. Just push a button for either Channel A or B.

One probe input: One probe input per channel for all measurements - digital and scope - with 5 mV to 2000 V measuring range. (2 lo-cap probes provided.)

Super sync: ECL provides rock-solid sync trigger circuits with only 4 controls; includes TV sync separators for video work.

U.S. Patent Pending
Financing Available

The first scope with push button digital readout. If you use general purpose oscilloscopes for troubleshooting or testing, we can double your present productivity with the SC61 Waveform Analyzer, the first instrument to turn every conventional scope measurement into an automatic digital readout.

No more graticule counting. *Connect only one probe* to view any waveform to 100 MHz. Then, just push a button to read DCV, PPV, frequency and time — automatically!

There are no graticules to count or calculations to make, which speeds every measurement.

The digital readout is from 10 to 10,000 times more accurate as well.

Plus you have everything you want to know about a test point, at the push of a button, which speeds troubleshooting tremendously.

A special Delta function even lets you intensify parts of a waveform and digitally measure the PPV, time or frequency for just that waveform section.

And it's neat. No more tangled leads, piles of probes or dangling cords. The SC61 is an entire test station in one unit.

The one and only. There are other scopes with digital readout, but none of them completely automate every conventional scope measurement so you can automatically analyze any waveform without counting one single graticule. Totally automatic waveform analyzing at the push of a button. It will make all the difference in your productivity.

Double your productivity. When we say the SC61 will double your productivity, we're being conservative. We've seen cases of three, four, even ten time increases in productivity with this first-of-its-kind, automated oscilloscope. Every situation is different, however, so try the SC61 and judge for yourself. Here's our offer.

Money back guarantee. If the SC61 does not at least double your productivity during the first thirty days, you may return it for a full refund, including freight both ways.

Call today. Get the entire SC61 Waveform Analyzer story. Call toll-free today, and ask for our eight page color brochure. It could be the most productive call you make this year!

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TEK 110-S FRAME SYNCHRONIZER

A frame synchronizer from Tektronix that sets a new standard of comparison.

Now. Authentic reproduction from any signal source. The Tek 110-S is the frame synchronizer with 10-bit resolution and accuracy. Performance that's every bit Tektronix! You get highest signal quality with correct SCH phase from any source. Resulting in the least signal degradation of any frame synchronizer on the market today.

Ten-bit digital circuitry offers digital signal processing with negligible quantizing errors. This 10-bit capability lets you cascade multiple units and depend on the 110-S for unexcelled performance. With four passes through the 110-S your signal is still better than with one pass through an 8-bit synchronizer. *Including quantizing effects,* the 110-S has the following specifications:

1% Diff Gain
1° Diff Phase
60dB Signal-to-Noise
1% Freq Response
0.5% 2T K-Factor

Compare these values to other frame synchronizers which omit quantizing effects from their specifications.

Noise performance unmatched. Signals can be tracked to low signal/noise ratios, such as those encountered during ENG Microwave fades. Or the operator can select field freeze or black. Adaptive clamping prevents streaking while quickly responding to hot switches.

Accurate color framing. With the adaptive decoder or optional four-field memory, field 1 to field 3 conversions can be accomplished without introducing 140 nanosecond picture shifts. With four-field memory (one complete color frame), accurate color framing can be obtained without decoder artifacts.

Accurate RS-170A timing. With the 110-S's 10-bit digitizer and full memory, your original sync and burst can be passed with the signal. Or you may choose to insert a new digitally generated sync and burst with RS-170A timing.

Front loaded interchangeable boards. Internal diagnostics allow you to quickly identify any impending problems. Circuit boards are calibrated individually so you can change boards quickly, minimizing downtime.

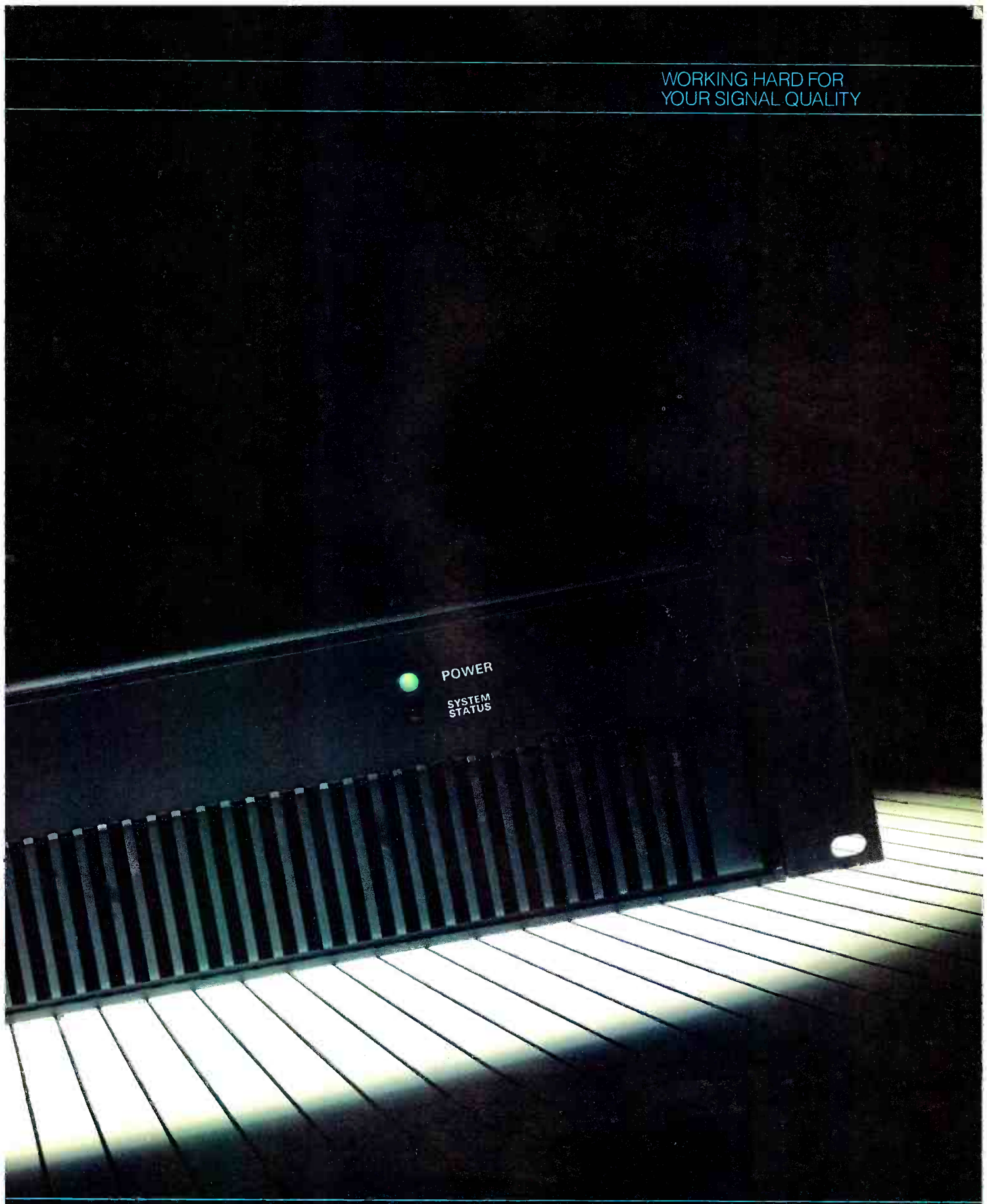
Processing amplifier with remote control provides adjustments for signal level, set-up, chroma gain and hue. Other controls such as field/frame freeze are also provided on the remote control.

The 110-S is built in our tradition of reliability, excellence and long-term value. And backed by a worldwide service network and proven technical support.

Call your nearest Tektronix Field Office (listed in major-city directories) for more information. Or call 1-800-547-1512 for descriptive literature. (In Oregon, 1-800-452-1877).

Tektronix, Inc., P.O. Box 1700, Beaverton, OR 97075. In Europe: Tektronix Europe B.V., Postbox 827, 1180 AV Amstelveen, The Netherlands.

WORKING HARD FOR
YOUR SIGNAL QUALITY



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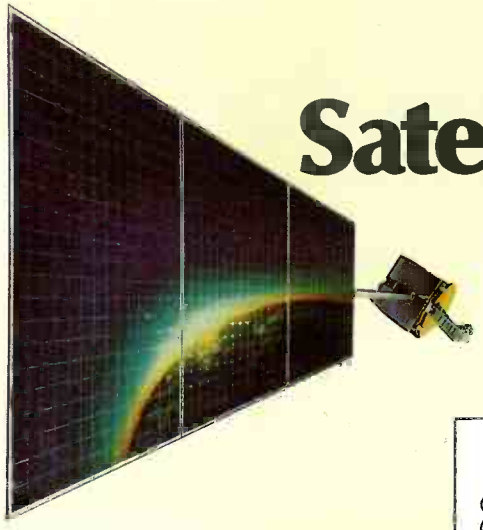

Satellite update

By John Kinik, satellite correspondent

2° SPACING

In October 1981, the FCC proposed reducing the spacing of satellites in the Fixed Satellite Service (non-broadcasting satellites) to 2°. The move would ease an anticipated scarcity of orbital slots by the late 1980s. Industry reaction was almost uniformly negative. Existing satellite carriers objected, as did earth terminal equipment manufacturers. The consensus was that 3° should be the minimum spacing for C-Band satellites, with 2.5° a possibility. The proposed 2° spacing, manufacturers argued, would impose additional costs on satellite systems because of the higher interference levels encountered by C-Band receiving earth terminals. At 2° spacing, many 3m antennas installed for cable, broadcast and private TV reception from C-Band satellites may experience unacceptable interference levels from adjacent satellites.

In spite of strong objections from the industry, the FCC in May called for immediately implementing 2° spacing for Ku-Band satellites and gradually phasing in 2° spacing for C-Band satellites over the next few years. The decision requires current 3m antenna installations to be re-evaluated in terms of possible interference levels in the future.

In anticipation of 2° spacing, for the past year satellite system operators and users have been specifying all new earth terminals with antenna RF patterns according to tighter tolerances consistent with the closer satellite spacing. Existing antennas also must be modified to meet the new requirements to be licensed by the FCC, although this applies primarily to transmitting antennas. C-Band 3m receiving antennas, with more than 5000 in service, may require performance upgrading (through feed system retrofitting) or replacement with a 4.5m antenna in time for the first adjacent satellite interferer. In many cases, what the receiving earth terminal

Table I.
Satellite orbital positions

Orbital positions (West Longitude)	User	Band(s)
143°	SATCOM V	C
141°	Unassigned	C
139°	SATCOM I-R	C
137°	Unassigned	C
134°	GALAXY I	C
132°	Rainbow	Ku
131°	SATCOM III-R	C
130°	ABCI	Ku
128°	American Satellite	C, Ku
126°	RCA	Ku
125°	TELSTAR/COMSTAR	C
124°	SBS	Ku
122°	SPACENET I	C, Ku
120°	USSSI	Ku
119.5°	WESTAR V	C
117.5°	Canada	Ku
116.5°	Mexico	C, Ku
113.5°	Mexico	C, Ku
112.5°	Canada	Ku
111.5°	Canada	C
110°	Canada	Ku
108°	Canada	C
107.5°	Canada	Ku
105°	GSTAR	Ku
104.5°	Canada	C
103°	GSTAR	Ku
101°	Unassigned	C, Ku
99°	SBS	Ku
98.5°	WESTAR IV	C
97°	SBS	Ku
96°	TELSTAR	C
95°	SBS	Ku
93.5°	GALAXY III	C
93°	Unassigned	Ku
91°	SPACENET III	C, Ku
89°	SBS	Ku
88.5°	TELSTAR	C
87°	RCA	Ku
86°	WESTAR	C
85°	USSSI	Ku
83.5°	SATCOM IV	C
83°	ABCI	Ku
81°	American Satellite	C, Ku
79°	Rainbow	Ku
78.5°	WESTAR	C
77°	RCA	Ku
76°	TELSTAR	C
75°	Unassigned	Ku
74°	GALAXY II	C
73°	Unassigned	Ku
72°	SATCOM	C
71°	Unassigned	Ku
69°	SPACENET II	C, Ku
67°	SATCOM	C

Editor's note:
In the Band(s) column, C refers to C-Band spectra, with 4GHz as downlink and 6GHz as uplink frequencies. Ku refers to Ku Band, or 12GHz downlink and 14GHz uplink frequencies.

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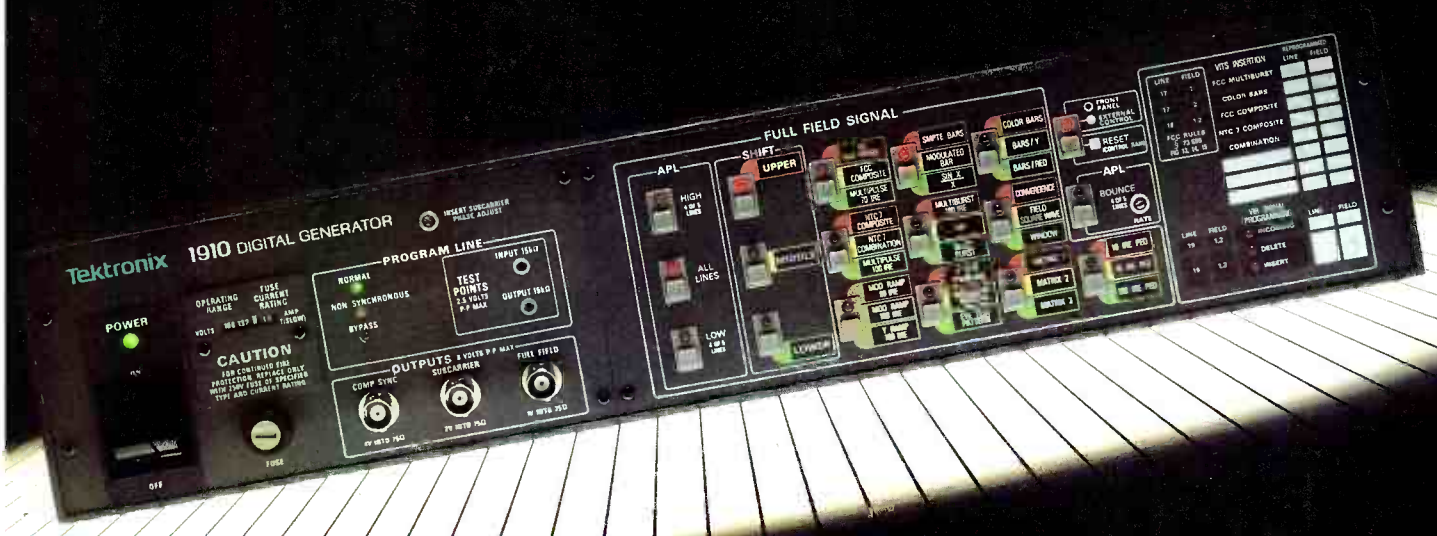

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operator decides to do will be determined by the performance margin required in operating the system. The FCC has considered all types of services and worst case interference conditions in making its decision. It has also assumed improved earth terminal antenna discrimination and increased frequency coordination among satellite carriers, so that the spacing plan is not without risk to operators of 3m C-Band receiving antennas.

Orbital position assignments

The orbital positions assigned by the FCC for existing satellites and proposed new satellites to be launched through 1987 are found in Table I.

Interference control techniques

Several methods may be employed to minimize the interference levels from adjacent satellites. First, the satellite transponder frequency and polarization plans can be standardized so that channels (transponders) having common frequency bands on adjacent satellites will be on opposite polarizations. The cross-polarization discrimination of the receiving antenna at the earth terminal will add from 6dB to 10dB to the normal off-axis discrimination provided by the main beam of the antenna receive RF pattern.

Also, modulation techniques, such as overdeviation of TV signal RF carriers, may be used to minimize the effects of interference.

Assigning certain types of communications carriers to certain transponders will minimize the probability of high level carriers or wide spectrum carriers causing interference into low level carriers, such as audio carriers.

As a supplementary technique, the earth terminal operator may upgrade the antenna by implementing the FCC's recommended tighter RF patterns. The tighter patterns will provide a higher off-axis cross polarization discrimination of 10dB instead of the normal 6dB.

Replacing a 3m antenna with a 4.5m size will increase the off-axis discrimination through the narrower beamwidth of the larger antenna. A larger antenna does not, however, automatically protect the earth terminal operator if the antenna is multibeam. This type of antenna, with a single large reflector and multiple feeds to receive signals from a number of satellites, may not have the signal-to-signal discrimination to handle 2° spacing. Any installation now using such an antenna, or planning to use one in the future, should be re-evaluated. The dual-feed antenna, which has considered an attractive retrofit solution for upgrading an existing antenna to receive two adjacent satellites, is also doubtful in the 2° spacing environment.

feedback

Another viewpoint on technical literature

Art Schneider makes some valid points in his guest editorial (May 1983 **BE**, page 10). However, he is unduly hard on the conscientious technical writer and the hard-working people in publications sections of equipment manufacturers.

Economic factors involved in preparing instruction-maintenance literature impose considerable limitations on publications departments and technical writers. My experience with Sylvania Television Publications Section, in Buffalo, NY, illuminated these handicaps.

Because every manufacturer wants to get his product into the hands of the customer/user as rapidly as possible, the demand is to have the instruction-maintenance literature ready to be packed into the carton with the equipment when the first piece comes off the production

Continued on page 86

Harris All-Solid-State SX Transmitters

Bring Back Your AM Listeners!

Contrary to what you may have heard, your "average" listener has a better-than-average knack for finding stations with a quality, transparent sound—even on a crowded dial. The lower your sound quality, the higher your audience tune-out.

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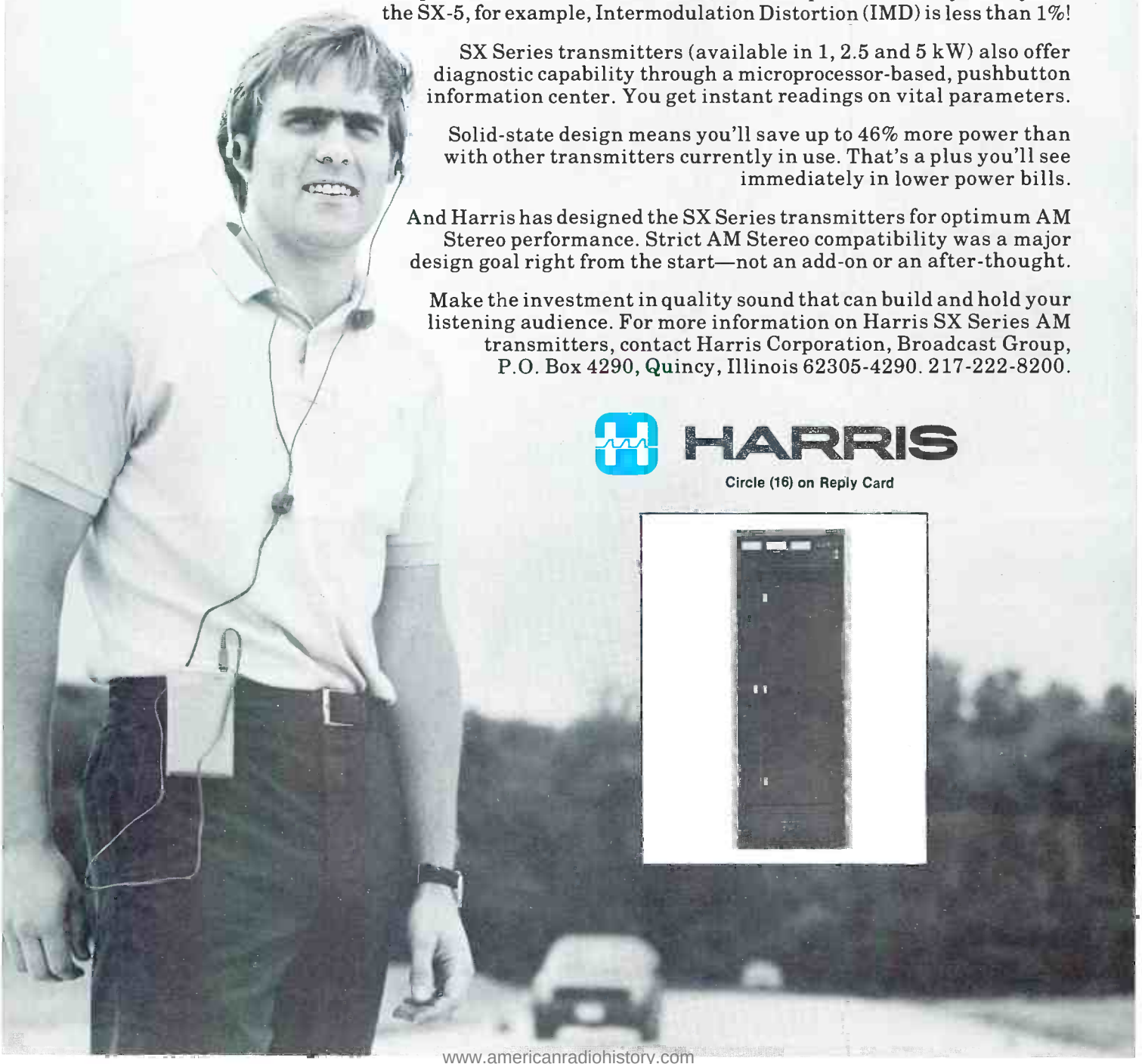

"WITH SIMULSAT, WE CAN PICK UP 5 SATELLITES AT ONCE."

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Chief Engineer
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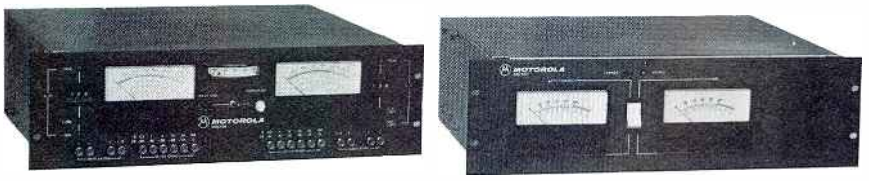
Motorola AM stereo decoder chip

By Ben Scott, manager, linear IC applications, Motorola, Phoenix, AZ



At the station end, the Motorola C-QUAM equipment comprises the modulation monitor (left) and the exciter.

As the AM stereo scene develops, several events have occurred in the past six months to give the Motorola C-QUAM* system a boost. The first was the original endorsement based on bench and field performance by Delco Electronics, followed by Concord and others. The second was the introduction of the MC13020P decoder chip. This device, shown on the cover of this issue, permits a sophisticated AM stereo receiver to be built at a low cost. This article describes the system, decoder chip and broadcasting situation. In each area, overall objectives are presented and, where applicable, implications to the broadcaster and consumer are included.

Why develop AM stereo? After years of losing market share to FM, AM radio needs a shot in the arm. The general quality of AM receivers, even in relatively expensive AM/FM equipment, has been neglected for so long that critical music listeners seldom voluntarily listen to AM.

This is a shame, because many listening hours are spent in cars and, in mobile applications. AM is, in most respects, superior to FM. The AM signal covers a greater distance and provides better penetration around tall buildings. The AM mobile listener is less likely to encounter fading, flutter, dropout or the more common loss of stereo or *tinny* sound caused by multipath phase phenomena.

In the home, it is possible to have an AM signal and a receiver that sound good, even to fairly critical listeners. In the car, this is even more true, because of the nature of the background noise.

Background

Several known methods of 2-channel transmission were reviewed in developing AM stereo, including AM/FM, AM/PM, conventional quadrature AM and ISB. Among other problems, some of these methods were found to be comparatively high in distortion in existing monaural radios at normal or moderate mistuning or, in the real world, AM band propagation characteristics.

To solve most of those problems, Motorola decided on a quadrature modulation system modified to make the overall envelope of the broadcast signal look exactly like L + R. Analysis and experimentation showed that this method achieved the desired compatibility with monaural receivers and had many of the desirable tuning and transmission properties of monaural AM. Let's discuss virtues of this approach, along with problems and drawbacks, and how they were overcome.

The earliest C-QUAM concepts were put down almost seven years ago at the Motorola Corporate Research Labs. Development and promotion of the approach has been pursued ever since. Recently, the labs have developed broadcast exciters and monitors that permit easy conversion of an existing AM station to stereo. In the past two years, the system inventors have collaborated with IC designers at Motorola's linear and military integrated circuits division to produce the decoder. These factors permitted realization of the following C-QUAM major objectives:

- compatibility with monaural equipment;
- simple, low cost AM stereo receivers;
- simple, low cost transmitter conversion;
- good mobile and stationary performance;
- freedom from *funny* sounds, false triggering, distortion and noise; and
- good stereo separation.

Achieving compatibility indistinguishable to the millions of existing AM radios was the main requirement of this AM stereo system. In QUAM, L + R is normal (amplitude) modulated on the 0° phase of carrier and L – R is modulated on the 90° relative phase, suppressed carrier. (See Figure 1.) This is a satisfactory 2-channel information system, if detectors are synchronous and can be properly locked to the original 0° and 90° phases. If we were starting from scratch and transmitter non-linear phase modula-

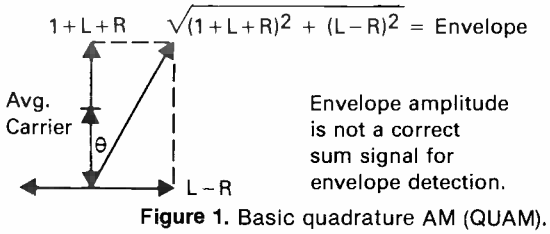


Figure 1. Basic quadrature AM (QUAM).

*C-QUAM®, a registered trademark by Motorola, stands for Compatible Quadrature Amplitude Modulation. The Motorola AM stereo decoder chip for C-QUAM is the MC13020P. P designates the plastic package case 738-01.

tion were kept low, this would be the best answer. All receivers would be synchronous, even monaural ones. The system also works fine on envelope detectors only when L – R is nearly zero, which corresponds to almost no stereo information. So, it is a method that works only with synchronous detectors or monaural information.

The following illustrates what goes wrong when QUAM, as defined previously, is required to handle a strong stereo sound, say left only, at a high modulation. Figure 2's vector diagram depicts this condition.

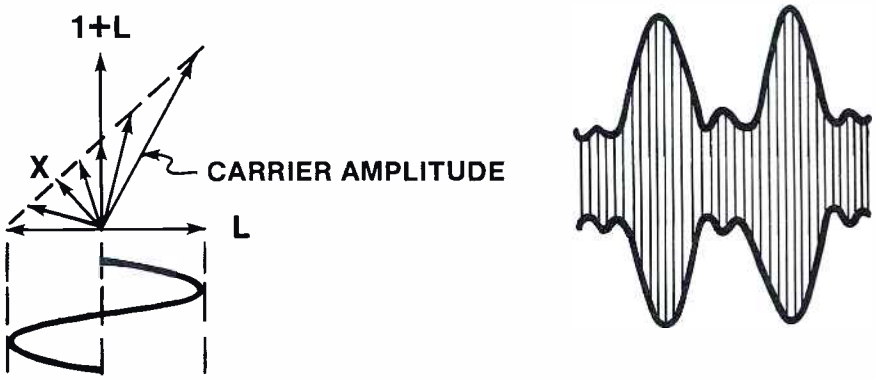


Figure 2. Basic quadrature AM modulated with strong *L-only* input.

The resulting envelope, described by the heavy arrowed vectors, shows the extreme distortion that occurs from a strong *left-only* sine wave at high modulation percentage. Note the resulting double dip (flattening occurs long before) as the function passes through x. Even if this is prevented, by keeping modulation level below 70% for L-only or R-only, the distortion is still high and noticeable in an envelope receiver.

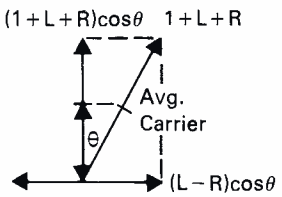
The solution offered by C-QUAM is to amplitude modulate the transmitter with L + R, while causing the carrier phase to be modulated according to the angle:

$$\Theta = \tan^{-1}\left[\frac{L-R}{1+L+R}\right]$$

In other words, Θ is the carrier angle that results in the original QUAM method. The desired 1 + L + R envelope is shown in Figure 3.

Obviously, this 1 + L + R envelope is the desired result, but there is one drawback that must be examined. The resultant carrier's phase is now varying in a complex manner; as cos Θ. This produces higher-order sidebands in the transmitted spectrum under continuous tone conditions.

But examination shows that mono and stereo spectra are nearly identical, even with today's typical and somewhat excessive high frequency pre-emphasis; hence, FCC spectral regulations are easily met. It can be shown that even with approximately 30dB of pre-emphasis at 7.5kHz, all guidelines are met. Future trends will undoubtedly include wider band-



Envelope is compatible with existing monaural receivers.

Figure 3. Motorola C-QUAM.

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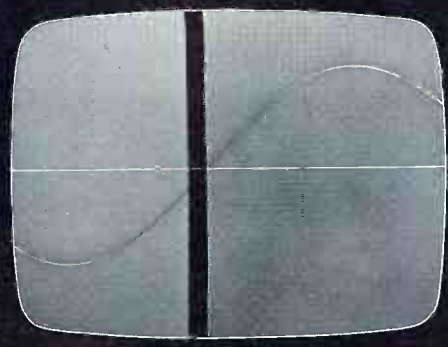
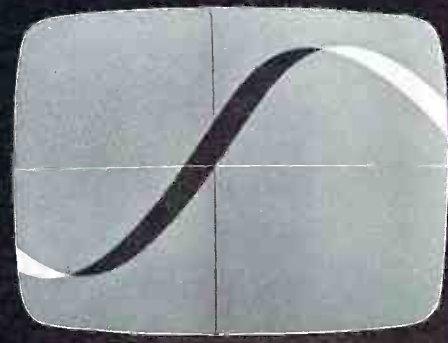


Set system timing.



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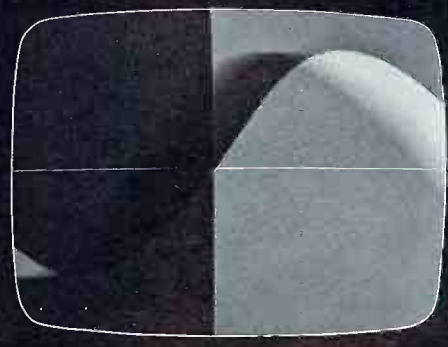
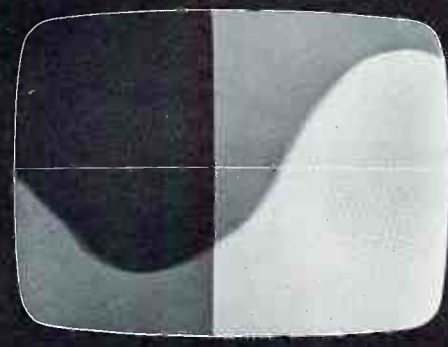
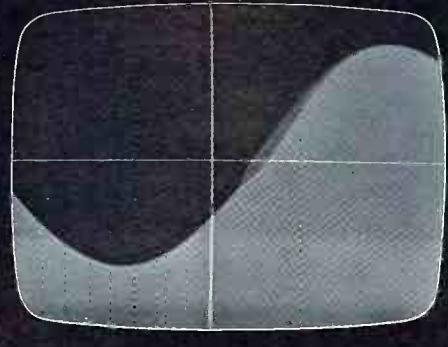


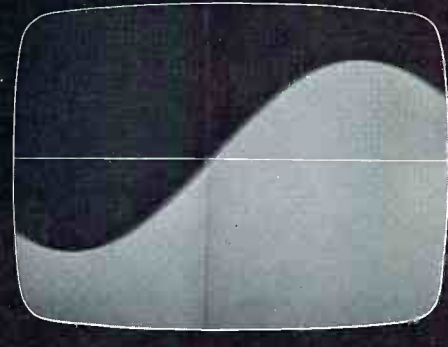
Set subcarrier frequency to network.



Find timebase error.



Pinpoint sync to subcarrier jitter.



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width receivers and will force less peaking at the transmitters.

A common problem inherent in all of the proposed AM stereo methods is spurious phase-related stereo information. This problem is not reduced by C-QUAM.* Although it has little, if any, impact on monaural receivers, it is an important factor in constructing the stereo receiver. It follows that any equipment that can detect stereo is phase sensitive. It also follows that the receiver front end (local oscillator) may be microphonic. In mechanical tuners, using adjustable inductors or capacitors, most of today's receivers are far too microphonic for portable or automotive use. Even the close proximity of the speaker to the front end is a problem. C-QUAM neither causes nor relieves this difficulty.

The solutions to microphonism are to use a synthesized or otherwise electronically tuned front end or to greatly improve the tuning structure. For the present, AM stereo usually goes into radios with electronic tuning. (For the future, which must include lower cost radios, a small phase-controlled LO chip is being developed.)

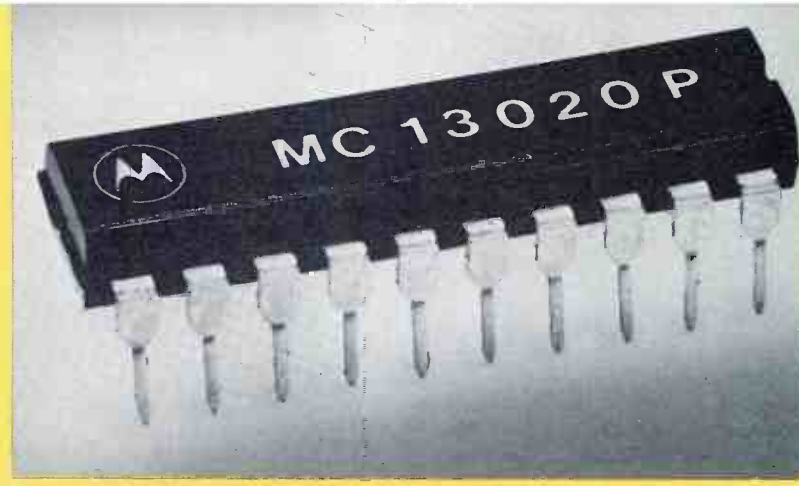
MC13020P C-QUAM decoder

The C-QUAM decoder chip contains all functions necessary to implement high performance operation. It uses few and inexpensive peripheral components, and can be applied to an existing AM monaural design with no extra adjustments or alignments.

The device goes into a radio where the detector would normally go (in other words, after the last IF stage), as shown in Figure 4. It requires about 100-350mV rms of IF input. The IF frequency can be any of the standards: 260kHz, 262kHz, 450kHz or 455kHz. The only limitation is that the on-chip VCO will always be 8X the IF frequency. MURATA has developed a 3.6MHz ceramic resonator for use

Continued on page 26

*C-QUAM reduces effects of high non-linear IPM in the troughs of modulation.



The cover of this issue shows an enlargement of the Motorola AM stereo decoder chip contained in the MC13020P package.

Some notes of interest about the device include:

- actual package pins 20
- die size . . . . . 85x87 mils
- transistors 210
- I^2L gates 110
- double-layer metal
- standard case 738 plastic, 300-mil-wide dual in-line package

Until now, no component video system on Earth has been complete.

Editing suite courtesy of WNEV-TV, Boston, MA

Shintron 390. The world's first and only component video switcher and editor-interface.

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In fact, during computer editing, 3M lab tests have shown 480 is capable of delivering over *1,000 edits from the same preroll point,* with no significant reduction in playback quality.

And in today's tough video production environment, that kind of durability can mean a lot.

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Magnetic Audio/Video Products Division/3M.

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3M

Continued from page 22

with a 450kHz IF. This choice is growing in popularity because it simplifies front-end design in frequency-synthesized receivers. If one of the other IF frequencies is used, a special resonator or adjustable coil will be required, necessitating one alignment step.

The MC13020P function looks for 25Hz stereo pilot tone (transmitted in the L–R at 4% modulation level), checks signal levels and freedom from excessive noise or co-channel, and, if satisfied, enables the C-QUAM decoding process.

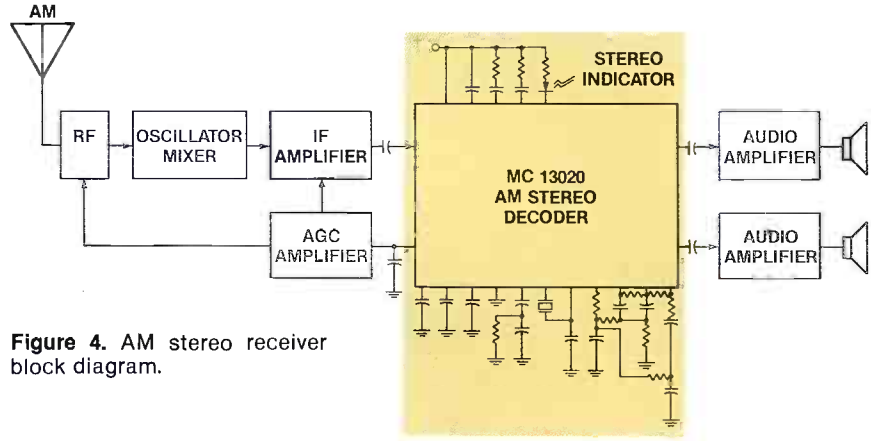

Figure 4. AM stereo receiver block diagram.

The block diagram of the MC13020P (Figure 5) seems, at first glance, to be complex, but much of it would be required for even basic quadrature detection. (There are a few extra features aimed at refining field behavior that will be discussed later.)

One of the first things to note is that L + R is always envelope detected. The IF signal comes into the envelope detector block, is filtered at Pin 2 and sent to the output matrix. Whether mono or stereo transmission, the L + R recovery is the same as for monaural radios. If the signal is monaural or if the stereo mode is inhibited for any reason, the L and R outputs each deliver about 100mV of L + R to the audio amplifiers that follow, at 50% modulation level.

The IF signal also comes into a variable gain block and then onward to I, Q and loop driver (phase detector). These three detectors are the basis of any conventional quadrature detection. The loop driver VCO loop locks at 90° with the incoming IF frequency. This ensures 0° reference to the I detector and 90° reference to the Q detector. (The ÷8 block in the VCO loop means that the actual VCO is 8X the IF. This was not mandatory but has several benefits. It means that the VCO is above the AM band, even if the IF is 260kHz. Also, the prospect for a low cost ceramic or crystal resonator is improved. Finally, the means to do a good 0° and 90° reference is easily done in the divide chain.)

The only extra parts needed to do

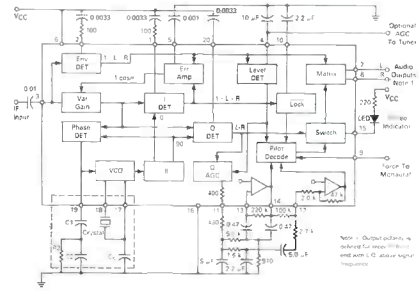

Figure 5. Block diagram of the MC13020P AM stereo decoder.

C-QUAM decoding are the error amplifier and the variable gain stage. The output of the I and Q detectors would be (L + R)cosΘ and (L – R)cosΘ, except for the additional comparison of the I detector and the envelope detector outputs in the error amplifier. This error signal is 1/cosΘ, which, applied to the variable gain block, corrects the outputs of the I and Q detectors to L + R and L – R. In other words, the error loop gain works to make the I detector output look like the envelope detector output and applies the same correction to the Q detector to give L – R. Then, all that is needed to produce a stereo output is for the L – R output of the Q detector to be delivered to the output matrix through the switch. Before that happens, the pilot decoder must be satisfied that all conditions are correct.

The level detector checks the level of input signal and tells the pilot decoder when it is sufficient. The level detector also provides an auxiliary AGC output (at high impedance, Pin 4) and adjusts the gain of the QAGC block to deliver a more constant amplitude of pilot to the pilot and co-channel filter amplifiers (shown as op amps). Remember, the 25Hz pilot tone is in the L – R(Q detector output).

When the pilot bandpass filter (Pins 13, 14) has acquired a good 25Hz signal and there are no low frequency beats greater than 14% modulation from the co-channel interference filter at Pin 12, the pilot decoder is satisfied and stereo can be received. Actually, the decoder also contains several counters that require that good pilot be delivered for 7-37 cycles (0.3-1.5s) depending on the type of interruption. This has been carefully selected to discourage the mono/stereo mode from flickering in and out in poor signal areas in the mobile application.

Once in stereo, the lock detector can put the decoder back into monaural if it observes a negative excursion from the I detector of greater than 20% modulation. Such a negative swing could be caused by excessive co-channel or noise.

In summary, the MC13020P is a conventional, synchronous quadrature detection system with an on-board oscillator reference system. Plus, it has an envelope detector, a feedback corrector for the compatibility component of the signal and a group of *watch-dog* circuits that observe signal level, pilot, co-channel and noise.

Incidentally, this AM stereo approach introduces a degradation in S/N ratio of only 3dB, theoretical maximum (no stereo present), or 1.5dB for typical modulation levels, over monaural reception. This is a big plus, compared to FM, which can produce 20dB S/N degradation going from monaural to stereo. No blend or softened mode switching is required.

The MC13020P's cost in high volume is approximately one dollar. The total cost of adding AM stereo to a suitable AM mono/FM stereo receiver is about $2.30. The part is now available in large quantity. The receiver is easy to convert and, at most, requires only one adjustment.

Signal construction can be accomplished more easily than might be expected from what we've discussed. (See Figure 6.) The L and R informa-

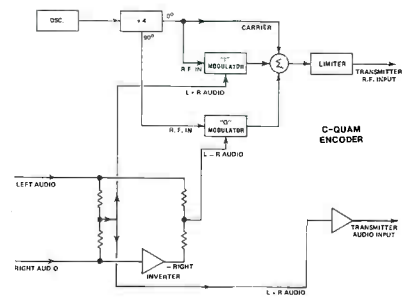

Figure 6. C-QUAM transmitter block diagram.

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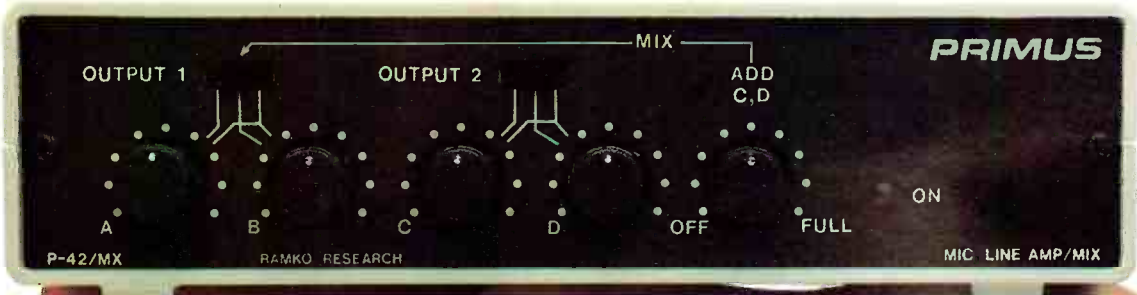

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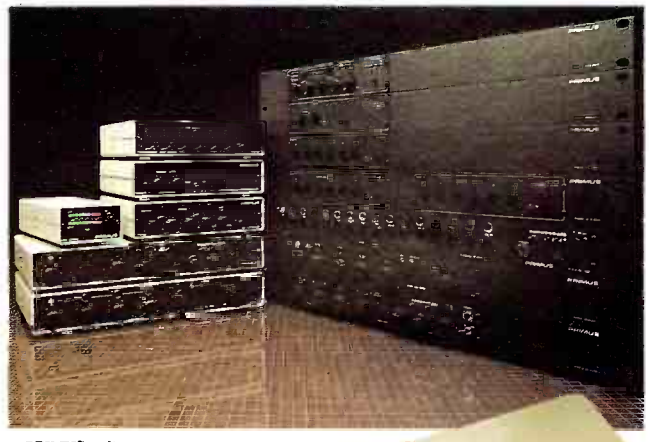

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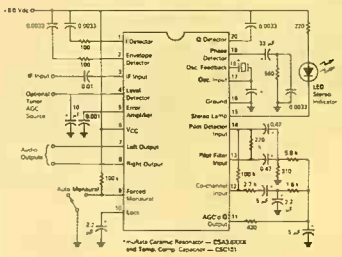

The new Motorola MC13020P decoder provides the complete decoder function for the C-QUAM system in integrated circuit form. It represents the heart of an AM stereo receiver and takes the place of the standard detector in a conventional AM radio. It accepts a 200mV rms IF signal and puts out approximately 100-200mV of audio. In addition to a small number of resistors and capacitors, the only other detector circuit component needed is an inexpensive ceramic resonator for the phase-locked reference oscillator.

Selected features include:

- full-wave envelope detection of L+R;
- PLL detection for L–R;
- 25Hz pilot presence required to receive L–R;
- internal level detector used as AGC source;
- few peripheral components required; and
- no adjustments or coils necessary.

Typical specifications include:

- THD monaural 0.5%
- THD stereo 0.75%
- channel separation 30dB
- stereo lockup time (on retuning).....300ms
- adaptive pilot tone detection circuit 1.5s
- L–R rejection in monaural mode 50dB

tion are matrixed to provide L+R to an I-balanced modulator at 0°, and L–R to a Q-balanced modulator at 90°. Each modulator is double sideband, suppressed carrier. The outputs of these modulators are added together, along with the 0° carrier and passed through a bandpass filter into an amplitude limiter. The limiter output is used to drive the oscillator input of the transmitter final amplifier, instead of the usual crystal oscillator. A second L+R matrix provides the audio input to the transmitter.

To date, the C-QUAM transmitters on the air are driven by Motorola exciters and monitored by Motorola modulation monitors. Motorola is building exciters and monitors. Several other major equipment builders have been licensed to manufacture C-QUAM equipment and have begun developing exciters and monitors. These manufacturers include Belar, Broadcast Electronics, Delta and TFT.

Present station conversion may be accomplished in a few days and exciter and monitor costs are about $10,000.

Stations on the air include WJR–Detroit; WIRE–Indianapolis; KZLA–Los Angeles; KRZY–Albuquerque, NM; KGW–Portland, OR; KYA–San Francisco; WSAN–Allentown, PA; WAIT–Chicago; WFAA–Dallas; WISM–Madison, WI; KFMB–San Diego; and KIDN–Pueblo, C O.

Motorola expects that C-QUAM stereo will be on the air in the major markets before the end of 1983.

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Circle (26) on Reply Card

An AM stereo perspective

By Chris Payne, AM stereo broadcast manager, Motorola

In April 1982, when the FCC tossed AM stereo to the marketplace instead of choosing a technical standard, each AM stereo proponent found itself in a considerably different marketplace posture. Since that time, there has been quite a change in the various systems' relative strengths in the marketplace, with the Motorola system finding its acceptance constantly growing in the receiver and broadcasting industries.

However, even now, about one and a half years later, less than 2% of US AM stations are on the air with AM stereo, with the remaining stations left to decide on AM stereo and a system. This gives most broadcasters time to evaluate each proponent's technical and marketing strengths carefully and independently.

Although multiple-system receivers have been announced, it is unlikely that these receivers will substantially reduce the pressure for a single system. I understand that most receiver manufacturers and broadcasters continue to look for evolution of a single technical standard. Motorola believes that, in order to get AM stereo to the consumer with competitive cost and quality, a single technical standard must evolve that will be acceptable to receiver manufacturers and broadcasters.

Whereas early interest from broadcast stations focused on systems that had broadcast hardware available—regardless of system characteristics or performance—one receiver manufacturer, Delco, took time and effort to find out which system would best meet its requirements. Delco's choice was Motorola. Shortly after Delco's decision, the Motorola MC13020 IC decoder was introduced, and many other receiver manufacturers began working on receivers for the Motorola system only, using this integrated circuit.

I cannot impress too strongly the importance of a full-featured decoder IC for AM stereo. To date, only Motorola has such an IC. In today's consumer electronics industry, a technology cannot be seriously considered unless there is a low cost/high performance IC to do the work.

I say "full-featured" because the MC13020 takes an IF signal and does the rest (as Ben Scott discusses in the accompanying article). This IC makes it possible for a receiver manufacturer to add Motorola AM stereo to an existing AM/FM stereo receiver design at an attractive price.

In this difficult 2-industry AM stereo standardization competition, I think the MC13020 IC may be the catalyst needed to establish the standard for AM stereo.

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Circle (28) on Reply Card

Bessel-function calibration of FM modulation monitors

By Dane Ericksen, Hammett and Edison, San Francisco, CA

At the 1982 NRBA engineering panel on FM modulation in Reno, NV, all three panelists recommended using Bessel functions as the best method for calibrating FCC type-approved modulation monitors. Questions following the session clarified that only a fraction of FM broadcast station staffers use this method. Here I review the use of Bessel functions as a convenient, accurate method of calibrating these monitors.

The Bessel function

Bessel functions of the first kind and of zero and first orders define the amplitude of the carrier ($J_0[x]$) and the first-order sidebands ($J_1[x]$), where x is the modulation index. The modulation index is the ratio of the frequency deviation and the tone causing the deviation. For example, an FM signal with a 10% (7.5kHz deviation) sterophonic pilot subcarrier would have a modulation index of (7.5kHz)/(19kHz), or 0.3947.

We use the fact that $J_0(x)$ and $J_1(x)$ pass through zero (possess roots) for certain modulation index values. The first root of $J_0(x)$ occurs when $x = 2.4048$. The first root of $J_1(x)$ occurs when $x = 3.8317$. Because we easily can select the frequency of the modulating tone and use a spectrum analyzer or communications receiver to detect the null, we can use the Bessel-function relationship to accurately generate a known frequency deviation, and therefore check the accuracy of the modulation monitor.

Roots of J_0 and J_1

Table I tabulates the first four roots of $J_0(x)$ and $J_1(x)$ and the tones necessary to generate 100%, 50% and 25% modulation levels. Although higher-order zeros of J_0 and J_1 (or J_n, for that matter) could be used, resolving higher-order zeros quickly becomes impractical, because of difficulties in counting the order of the zero and detecting the zero.

Table I.
Tabulation of tones necessary to produce 100%, 50% and 25% modulation levels using the first four zeros of J_0 and J_1 is shown. Modulating tones less than 5kHz may not be practical to resolve.

Roots of J_0	Tones for 100% modulation (75kHz deviation)	Tones for 50% modulation	Tones for 25% modulation
1st; = 2.4048	31,188Hz	15,594Hz	7797Hz
2nd; = 5.5201	13,587Hz	6793Hz	3397Hz
3rd; = 8.6537	8667Hz	4333Hz	2167Hz
4th; = 11.7915	6361Hz	3180Hz	1590Hz

Roots of J_1	Tones for 100% modulation (75kHz deviation)	Tones for 50% modulation	Tones for 25% modulation
1st; x = 3.8317	19,574Hz	9787Hz	4893Hz
2nd; x = 7.0156	10,690Hz	5345Hz	2673Hz
3rd; x = 10.1735	7372Hz	3686Hz	1843Hz
4th; x = 13.3237	5629Hz	2815Hz	1407Hz

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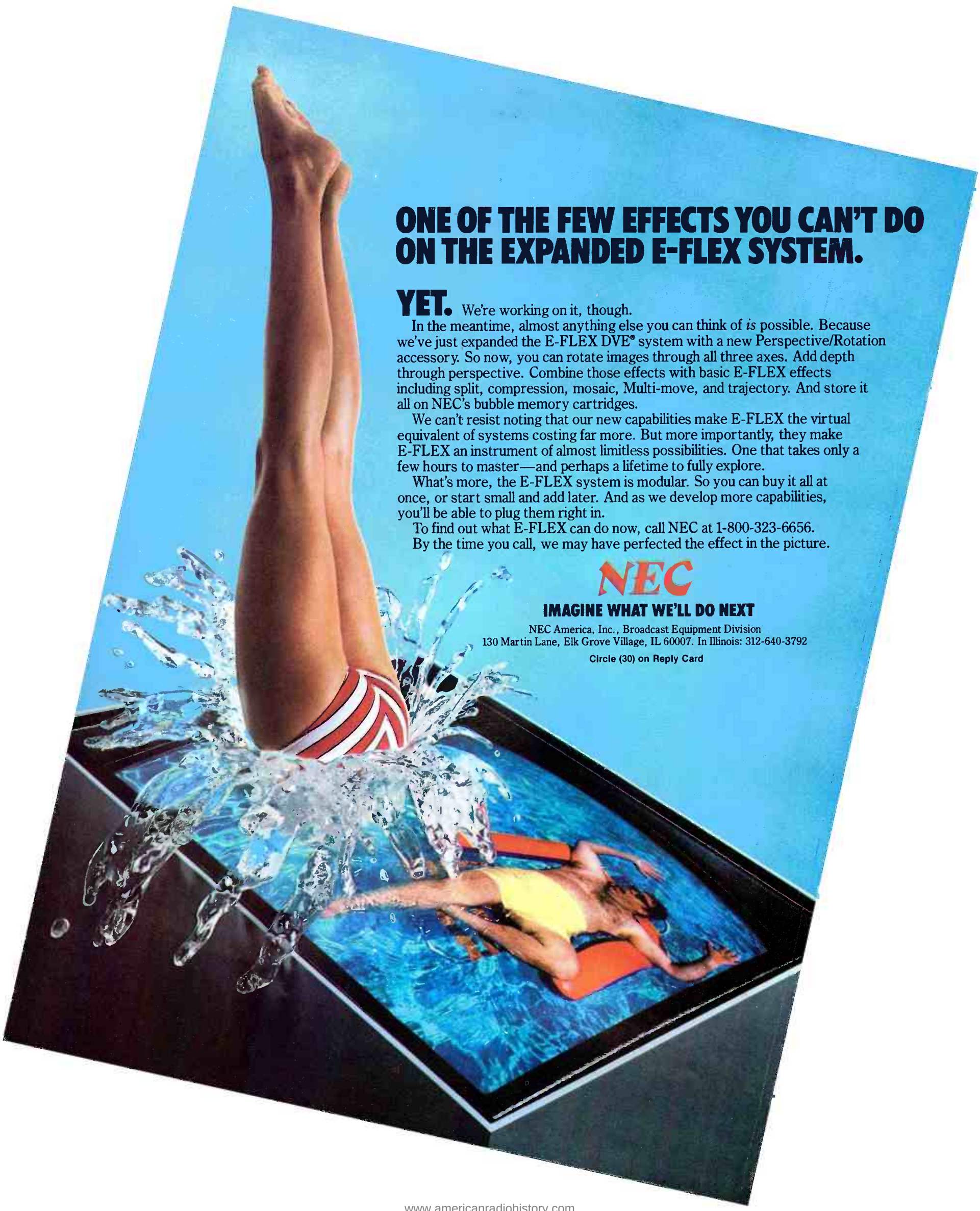

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SONY
Broadcast

Continued from page 34

Therefore, this technique should be limited to the first two roots of J_0 and J_1.

You are not limited to generating Bessel nulls that occur at nominal modulation percentages. You can alternatively modulate the transmitter with, for example, a 10kHz tone and increase modulation, until the second first-order sideband null is detected. The modulation index would be 7.0156 and the deviation 70.156kHz (93.54% modulation). You would then adjust the modulation monitor to read 94%.

Detecting Bessel zeros

The preferable method for detecting Bessel zeros uses a spectrum analyzer. Stations with a QEI modulation monitor can use that monitor's convenient capability for turning a dc-

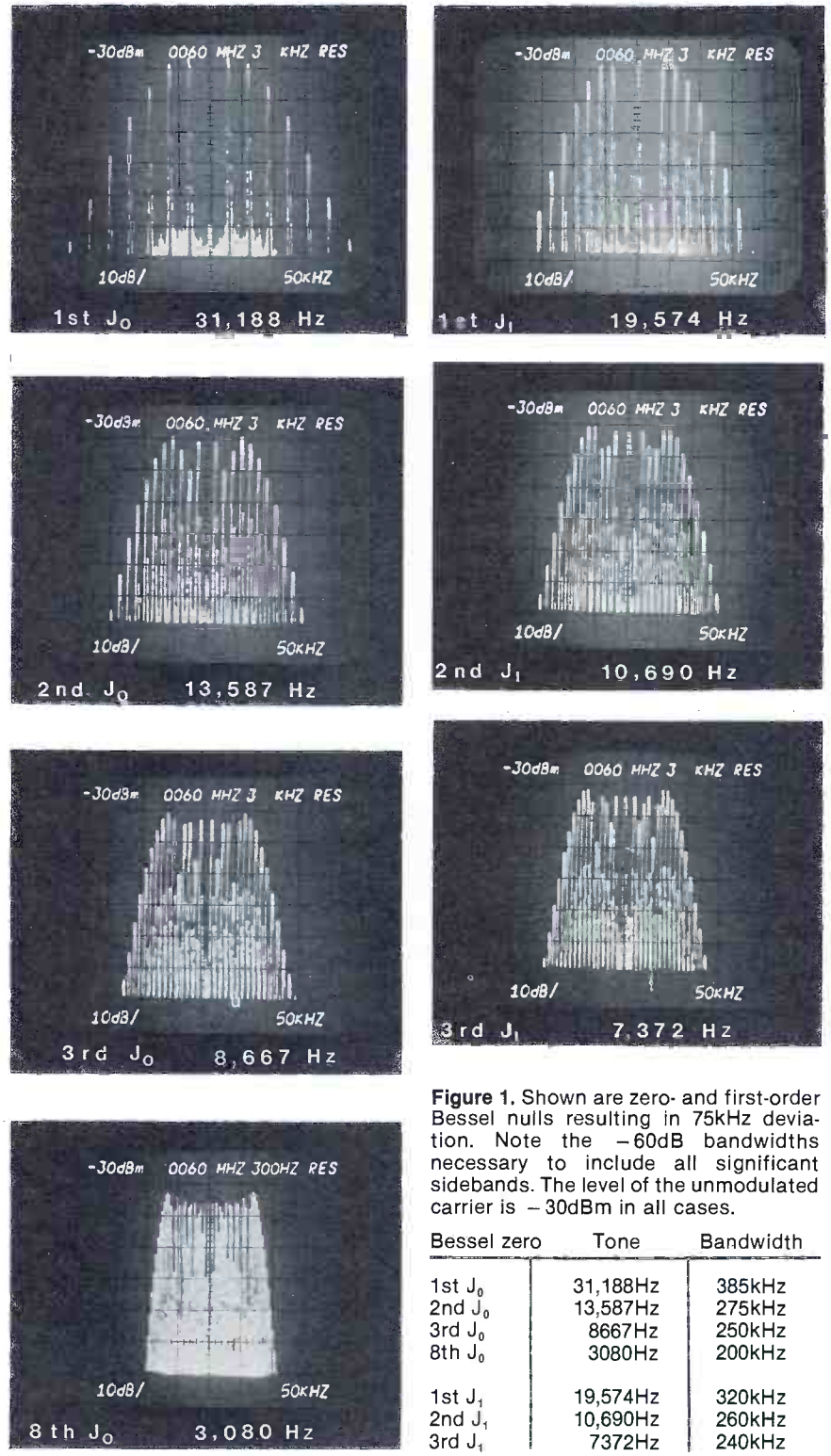

Figure 1. Shown are zero- and first-order Bessel nulls resulting in 75kHz deviation. Note the −60dB bandwidths necessary to include all significant sidebands. The level of the unmodulated carrier is −30dBm in all cases.

Bessel zero	Tone	Bandwidth
1st J_0	31,188Hz	385kHz
2nd J_0	13,587Hz	275kHz
3rd J_0	8667Hz	250kHz
8th J_0	3080Hz	200kHz
1st J_1	19,574Hz	320kHz
2nd J_1	10,690Hz	260kHz
3rd J_1	7372Hz	240kHz

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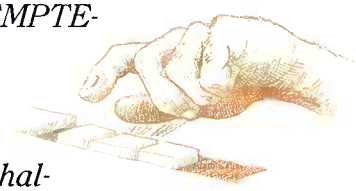

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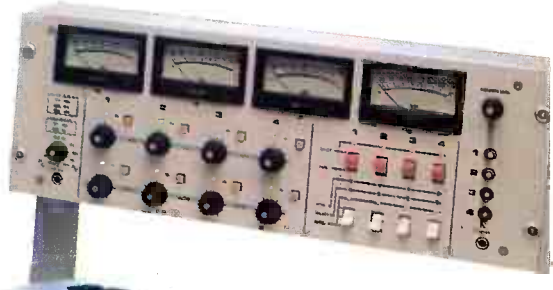

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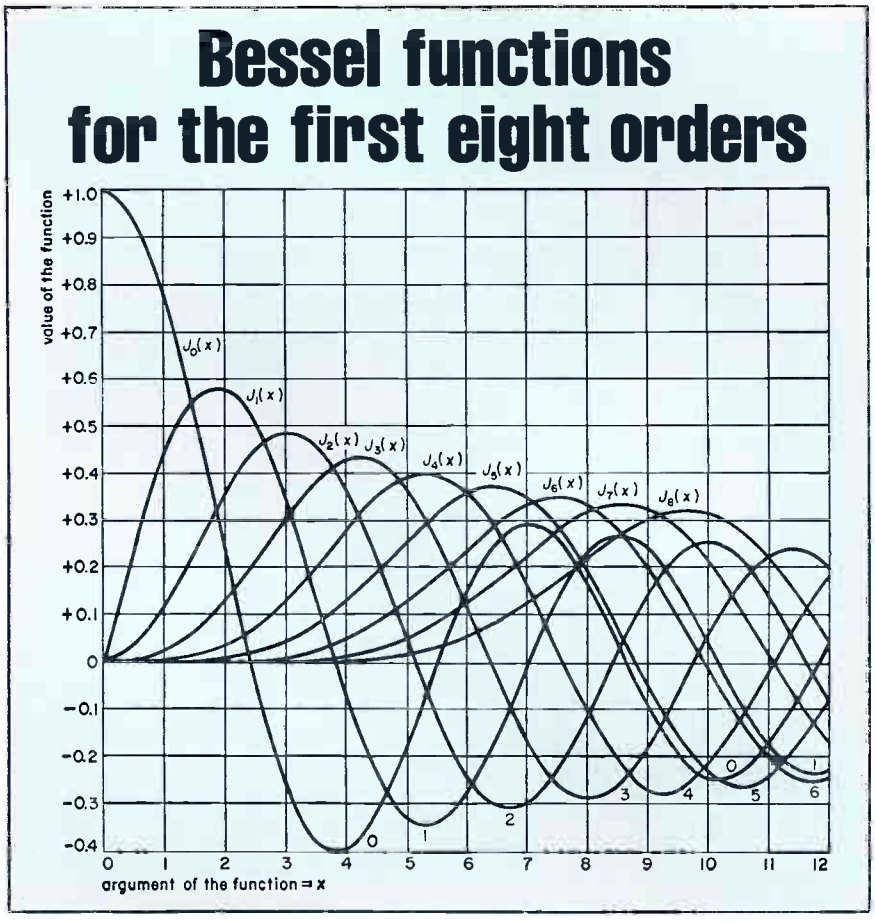

coupled X-Y oscilloscope into a spectrum analyzer. The monitor's front-panel outputs may drive vertical and horizontal oscilloscope inputs, allowing easy detection of the Bessel zero and the order of the zero.

Engineers lacking a spectrum analyzer may connect a communications receiver to their modulation monitors' IF output. The communications receiver must have sufficient selectivity to resolve the carrier or first-order sidebands. You must ensure that the receiver is tuned to the proper component. A simple method of identifying the carrier from first-order or higher-order sidebands is to reduce modulation to zero (including any stereophonic pilot and SCA subcarriers, if used). The only remaining signal will be the carrier. If higher-order zeros are used, be careful not to miscount the order of the zero.

These caveats are not as ominous as they might seem at first. Generally the error that results, if the carrier or first-order sideband nulls are interchanged (or miscounted), is so large that it will be obvious when a J_1 null has been mistaken for a J_0 null or vice versa. For example, if the communications receiver was mistakenly tuned to the first-order sideband rather than the carrier, the detected null would give a

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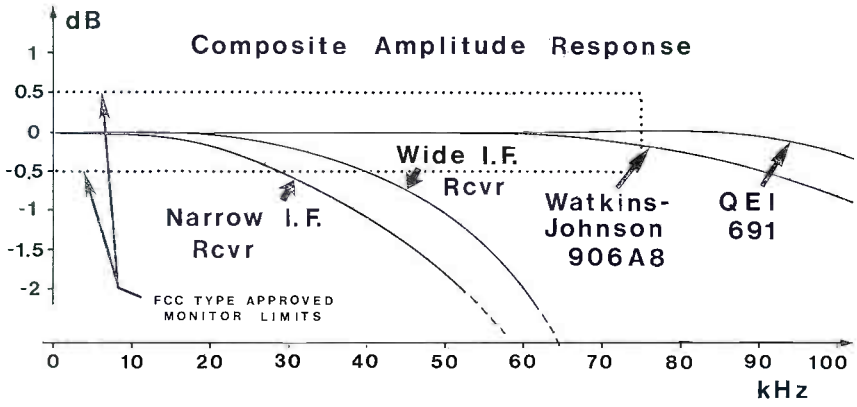

Figure 2. Shown are composite amplitude responses of wide and narrow IF receivers, the QEI 691 modulation monitor and the Watkins-Johnson 906A8 receiver used in FCC monitoring trucks (broadbanded to 445kHz at −3dB points). FM tuner response data courtesy of QEI Corporation.

modulation index of 3.8317, rather than 2.4048. Then the deviation would be (3.8317) (31,188Hz) or 119.5kHz. This would be so far removed from the expected 75kHz deviation that the error should be obvious.

Necessary bandwidth

This technique will be accurate only if the equipment being used to demodulate the FM signal has adequate bandwidth to pass all significant sidebands. (See Figure 1.) If the receiving equipment is a type-approved modulation monitor, this is a good assumption, because one of the requirements for type approval is flat frequency response to 75kHz (Section 73.332[d][4], FCC rules). However, if the proposal to eliminate FCC type-approved modulation monitors is adopted, there will no longer be a guarantee that the device being used as a modulation monitor will have sufficient bandwidth. This will be especially true if you attempt to use even a high quality FM tuner as a modulation monitor. Although FM tuner manufacturers must design receivers that have sufficient selectivity to resolve signals every 400kHz, there is usually some trade-off in bandwidth. Figure 2 shows the results of measurements by QEI[1] on several commercially available FM receivers. As you can see, even wide IF receivers may lack sufficient bandwidth to act as an accurate modulation monitor.

If type approval of modulation monitors is eliminated, it seems likely that manufacturers will introduce basic total modulation monitors that will still have the necessary bandwidth to ensure flat response to 75kHz (and to 99kHz, if proposed SCA deregulation is adopted). Broadcasters should be able to rely on these manufacturer's specifications and appreciation of the need for sufficient bandwidth to ensure that all significant sideband components are passed.

Conversely, broadcasters should exercise caution in using even a *top of the line* FM tuner with an oscilloscope connected to the discriminator output as their monitor. Such a combination may appear to calibrate properly, but may not accurately indicate actual modulation due to bandwidth limitations.

[1]QEI Corporation, Route 73, Kresson, NJ 08053; 1-609-767-8052.

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Then came the new Shure M267. One look will tell you why we moved ahead.

Here are all the improvements audio engineers have asked for.

Every channel on the mixer now has a mic/line level switch for maximum flexibility. There's also a built-in limiter to keep the M267 from overloading at critical moments. The unit contains a built-in battery pack that utilizes three standard 9-volt batteries. Simplex (phantom) power and a peak LED are standard, too.

The M267 oscillator provides a clean 1 kHz tone, and is located on the front of the unit for simple access. The headphone output is also on the front and includes a level control.

And IC design, along with active gain controls, provides greater headroom and quieter operation.

For location work or even studio post-production, the M267 carries on Shure's reputation for reliability and ruggedness.

After all, just because you create one legend doesn't mean you can't build another.

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The new Saticon II camera tube. Clearly superior to lead oxide.

Compare the unretouched photos below and see for yourself how the new RCA Saticon* II camera tube reduces specular highlight memory, without red trail.

You no longer have to choose between lead oxide's good handling of highlights and Saticon's well known superiority in other critical performance factors. Now it's a whole new ball game.

Computer-aided deposition and advanced material purification technologies have given Saticon II a considerably improved photoconductor. Your benefits: less highlight trail, reduced highlight memory (as much as 75% less than that experienced with earlier Saticon tubes), improved resistance to image burn.

What's more, you still get all of the recognized advantages of Saticon: high resolution, distortion-free colors, very low lag, and extremely long tube life. And Saticon II is backed by a warranty that's second to none. RCA offers full replacement for any failure in normal use for six months, compared with only two months for Plumbicon™.

Your choice is now clear. For more information on the complete Saticon line, contact your RCA distributor or write to RCA Camera Tube Marketing, New Holland Avenue, Lancaster, PA 17603. Or call (800) 233-0155. In Penna., phone collect to (717) 397-7661. Overseas, contact RCA Brussels, Belgium. Sao Paulo, Brazil. Sunbury-on-Thames, Middlesex, England. Paris, France. Munich, W. Germany. Hong Kong. Mexico 16 DF, Mexico.

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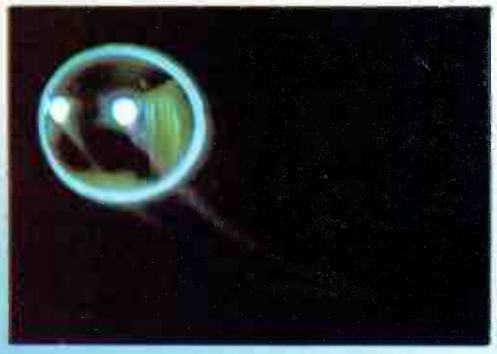


Good. Plumbicon XQ1427.

Photograph of direct reflection of flood lamps, produced by camera with CTS circuitry. Note highlight memory with red trail.

Better. Saticon II BC4390.

Same subject and conditions as in photograph at left. Note reduced highlight memory without red trail.

RCA

Circle (38) on Reply Card

Cont ol ng dynamics

An audio processor roundup

By Carl Bentz, technical editor

The degree to which audio should be processed for control of signal dynamics is debatable. Many stations process for a maximum modulation level, because management and sales personnel think that loudness sells. Others process as little as possible, because management and programming personnel think that a quality product sells. Particular formats work best with one approach or the other. For that reason, manufacturers produce a variety of processors to handle those approaches.

Audio processing encompasses a wide variety of system types. This equipment roundup focuses on dynamic or signal-level controlling types: AGC, compression, limiting and expansion. Other types of processors are also important. Typically, however, the equipment most needed for FCC compliance involves the on-air chain, where signal-level control is most crucial. (For notes on other types of processing, see "An Overview of Other Audio Processors" on page 56.)

The companies included here were contacted in late May to provide information for the listing. Roundup materials were derived from the manufacturers' input and from **BE** data files. Each company was limited to three products for space considerations. To obtain complete information on the products discussed, Reader Service Numbers have been provided.

AEG-TELEFUNKEN (GOTHAM AUDIO)

Telcom C4 compander. This compander is particularly valuable in reducing and recovering the dynamic range for recording. Compression before A/D conversion and expansion after D/A conversion of analog signals decreases the amount of conversion required, as well as suppresses noise.

Circle (371) on Reply Card

ADVANCING TECHNOLOGY

Discriminate Audio Processor III. Multiband leveling action uses VCA control with user-adjustable gain, compression ratio, attack time and release time. Crossover points are variable, including change of slope. Bar-graph displays use 200-segment formats to show individual band and overall operation.

Maximod. Studio, AM, FM and TV applications are suggested for the Maximod. The peak limiting system is digital. With microprocessor control, hard limiting produces less than 0.01% distortion. Clipping is not used.

Circle (370) on Reply Card

APHEX SYSTEMS LTD.

Compellor. Combining audio compression and a leveler, the Aphex 1537A VCA chip produces high quality audio processing. The chip is controlled by two interdependent side chains. Attack and release times are controlled by program dynamics to eliminate *pumping*.

CX-1 module. Soft-knee compression and limiting is combined with a switchable expander/gate circuit. A multifunction LED display shows input, output, compression or expansion levels. The adjustable expansion (to 100dB) is guaranteed not to clip or pop.

Circle (372) on Reply Card

ASHLY AUDIO

SC-50 peak limiter compressor. Once a *ceiling* peak level is reached, gain is reduced to keep the signals within specified limits. Gain, output, ratio and attack/release times are front-panel adjustable. Uses include broadcast chains, tape-disc transfer, effects systems and speaker protection.

SC-55 stereo limiter/compressor. Left/right balance and separate channel output controls add stereo versatility to the mono capabilities of the SC-50.

Circle (373) on Reply Card

AUDIOARTS ENGINEERING

Model 1200. Engineers have full manual control of compression attack/release times, threshold and ratio with compression metering and circuit overload indications. Patch points are included for side chain applications, as well as a de-ess mode and auto release mode.

Circle (374) on Reply Card

AUDIO & DESIGN RECORDING

F601-RS Super-Dynamic Limiter. Designed for the challenge of the digital era, the F601 includes a dynamic range of more than 100dB to protect PCM inputs to satellite links and transmitters. Options include an *automatic program-to-voice ratio control* in voice overs and a *feed forward delay line* to obviate clipping.

SCAMP. The Standardized Compatible Audio Modular Package consists of 17 different processing modules, including the S27 4-band processor, for a 4-band processing system for AM, FM or television. An octave equalizer improves AM, while a dynamic noise filter aids sound on old movies for television.

F769X-R vocal stresser. A unique package combines program dynamic control and spectral energy balance for frequency-conscious compression. A sweep/parametric equalizer switches in front of, behind or directly into the control voltage input of the Compex-Limiter.

Circle (375) on Reply Card

AUDIO TECHNOLOGIES INC./ATI

Emph'a Sizer. This unique speech processor more equally matches the DJ/announcer voice to heavily pre-processed music. A density-increasing, gated compressor/limiter includes four preset, switchable parametric equalizers and connects in the mic line to minimize sibilance, room resonance and boomy mics with pumping and background noise reduction.

Circle (376) on Reply Card

BROADCAST CONTROLS

Audio Mate processor. The 1000A conditions the input signal for a controllable dynamic output range for AM broadcasting objectives. Functions include preamp, compressor/equalizer and audio DA. Front-panel controls simplify adjustment.

Circle (377) on Reply Card

BROADCAST ELECTRONICS

AM compressor/limiter. Symmetrical or asymmetrical processing for AM broadcast applications may be selected in the AM-400 processor. Also, operation may take one of three modes, compression/limiting, compression only or fixed-gain line amplification.

AM-500 compressor/limiter/expander. For AM stations, the AM-500 may operate as a compressor/limiter/expander, compressor only or line amp only. Gating involves a processor gain control adjustment with a maximum 17-second period before reverting to the fixed gain point. For fast, short duration peaks that may occur before limiting action, a peak clipper is included.

FM-600/601 AGC/limiter. Mono and stereo compression and expansion are separately adjustable to attain the preferred station sound, from the loudest sound in town to wide dynamic range classical music. With an automatic, level-controlling gating mode, the FM-600/601 system is compatible with Dolby B.

Circle (378) on Reply Card

CRL AUDIO/ CIRCUIT RESEARCH LABS

FM4 and AM4 processors. AGC, 4-band processing and limiting combine for FM and AM fidelity, loudness and maximum control. The systems provide peak control without overshoot and high frequency pre-emphasis for improved fidelity on typical receivers. They also protect FM pilots through low-pass filtering.

AM stereo processor. A matrix processor maintains maximum modulation to prevent coverage loss. The unit is compatible with all AM stereo exciter systems.

SCA processor/generator. Main-channel interference protection involves multiband AGC, precision multiband pre-emphasis filtering and a main-channel protection filter in a high quality SCA generator system.

Circle (379) on Reply Card

COMREX

AGA Auto Gain Adjuster. Program levels over a 30dB range are leveled to a constant output with a feed-forward con-

cept circuit. Althoughly uniquely suited to telephone line interfacing requirements, the AGA serves any general-purpose level riding application.

Circle (380) on Reply Card

dbx

#160X compressor/limiter. Infinite compression provides negative gain control for dynamic reversal effects in the 160X. Front-panel controls handle threshold, compression and output gain settings, while metering is selected for input, output or signal gain change.

Series 900 processors. Combining a 907 stereo-gated compressor with a 903 compressor/limiter module offers Over Easy compressor/limiting action with a high speed release gate and true dual RMS-detected stereo compression.

Model 165. The single-channel Over Easy compressor/limiter is strappable for stereo application. Attack and release rates may be automatically controlled or manually controlled via front-panel switching. Gain control involves true RMS level detection and feed-forward gain reduction.

Circle (381) on Reply Card

DORROUGH ELECTRONICS

Discriminate Audio Processor 610. Digital technology determines if the input signal requires input pads to be switched in or out in the 3-band AGC control with peak limiting. Controls allow response peaking of four frequency bands before the peak suppression amplifier. LED metering includes a *relative loudness to peak modulation* display.

Circle (382) on Reply Card

EMT-FRANZ GmbH (GOTHAM AUDIO)

EMT 266 transient limiter. For FM broadcast and other uses, an input signal to the EMT 266 is delayed 0.3ms, allowing the limiting control system to respond to the signal level. Variable pre-emphasis is included and stereo operation is possible.

Circle (383) on Reply Card

EVENTIDE CLOCKWORKS

Omnipressor. For dynamic modification, the Omnipressor combines a compressor, expander, noise gate and limiter in a single package. Dynamic reversal provides unique effects with high level signals lower than corresponding low level signal inputs.

Circle (384) on Reply Card

FURMAN SOUND

LC-2 limiter/compressor. Front-panel push-buttons select normal compression, de-essing and sidechain modes. Attack/release times and compression ratio adjustments complement input/output levels, while LEDs indicate overload and gain reduction conditions. A program-adjusted release time avoids breathing/pumping.

Circle (385) on Reply Card

GREGG LABORATORIES

2540 AM processing system. An HF reciprocal equalizer corrects severe roll-off common to most AM receivers, along with giving added base punch and low end definition. Multiband gain and peak control deal with five filters on logarithmic frequency crossovers. With assymetric modulation capability, the 2450 includes a phase/amplitude equalizer to improve transmitter/antenna system performance.

Circle (386) on Reply Card

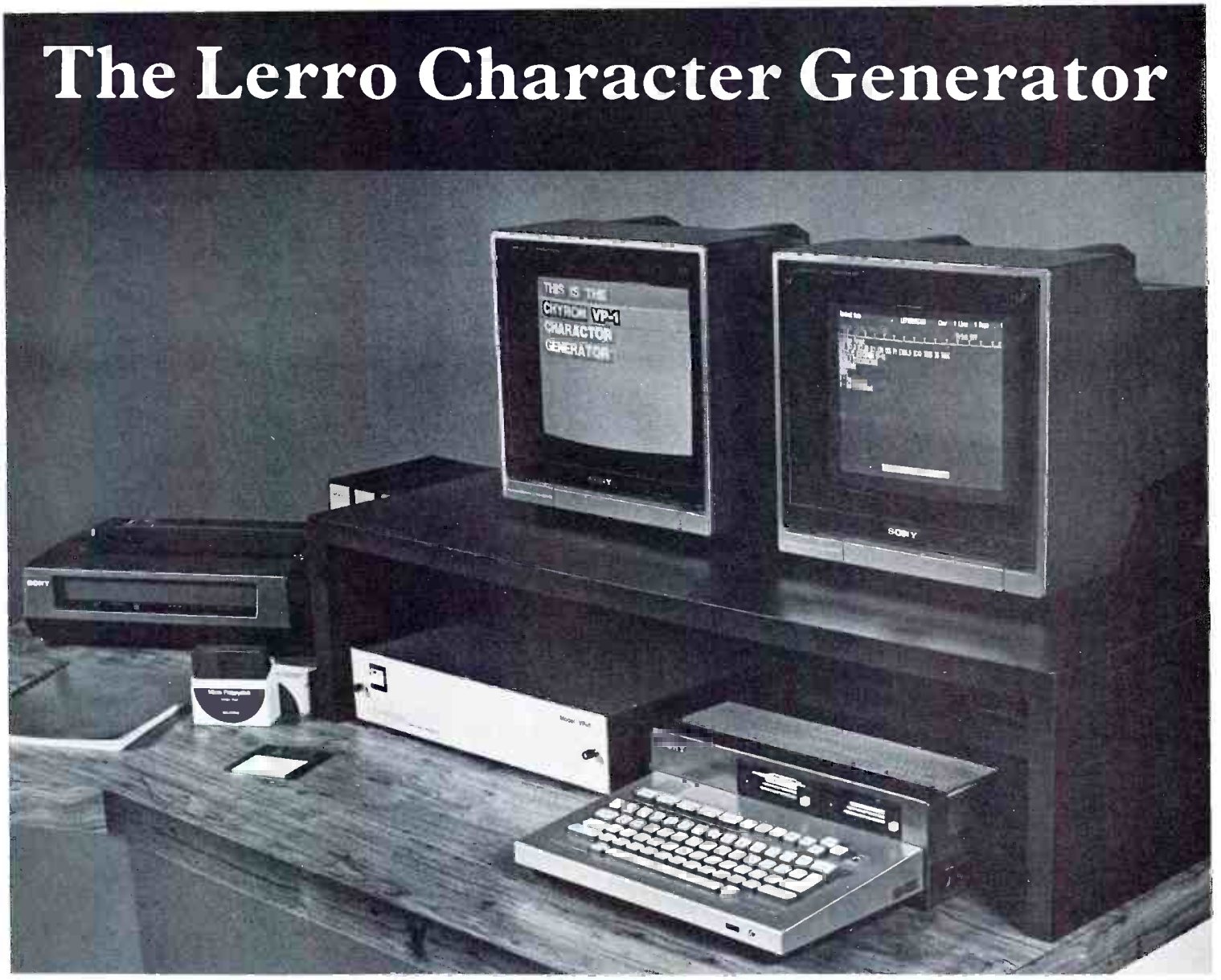
HARRIS/BROADCAST DIV.

FM stereo processor systems. Stereo audio processors use the MSP-90 stereo tri-band AGC unit in combination with the MSP-90 stereo FM limiter. The limiter prevents FM overmodulation, while retaining maximum loudness, minimum noise and minimum distortion. LEDs indicate operation of clamping and limiting functions.

MSP-90 AM mono audio processing. In AM applications, an AGC amp offers a wide range of controls to ensure maximum processing flexibility. The AM limiter is designed to provide 125% positive peak modulation through innovative circuitry. Other features eliminate audio "holes" produced by some other techniques.

AM stereo processing system. For AM stereo installations, an MSP-90 tri-band AGC amplifier is used with the STX-1 AM stereo exciter's integral limiter. The MSP-90 features true automatic gain control, time-averaged true rms power control, phase-coherent filtering, adjustable crossover frequencies, program-dependent attack time and mix control for

The Lerro Character Generator



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The SONY SMC-70 microcomputer includes the software needed to format and execute commands to the VP-1, and of course when you're not generating CHYRON screens, the SMC-70 can be used for program scheduling and billing, keeping track of your tape library, or customer mail lists, plus many other uses.

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audio chain equalization.

Circle (387) on Reply Card

INOVONICS

250 programmable processor. Pulse-width modulation in this microprocessor-controlled system offers predictable colorless gain control from a 100kHz sampling rate. Static control uses a circuit board with four manual presets, as well as *Flat* and *Proof* modes. A dynamic control board allows an 8-bit RS-232C interconnection to an external computer.

Circle (388) on Reply Card

KAHN COMMUNICATIONS

NSM-125 processor. Called the Non-Symmetra-Mod, the NSM-125 uses proprietary processing to produce full AM modulation without introducing clipping products. Symmetric or asymmetric limiting may be selected.

Circle (389) on Reply Card

LPB

Model S-2 compressor/limiter. For AM use, a resistor value change provides assymetrical modulation up to 120%. S-2 units intended for FM broadcast may include 75μs pre-emphasis and de-emphasis circuits. Strapping connections allow stereo operation of two S-2 systems. Front-panel controls include input and output levels and compression threshold.

Circle (390) on Reply Card

MARTI ELECTRONICS

CLA-40A compressor/limiter. With a built-in AGC amplifier, the CLA-40A meets its published specifications when used in AM or FM applications involving wired or RF links. Strappable for stereo configurations, the system handles any radio format, but may work equally well for SCA programming or in-studio feeds to recording equipment.

Circle (391) on Reply Card

McMARTIN INDUSTRIES

BFM-1514R. The nickname MAXI-1 applies to a dual-channel audio processor with switched pre-emphasis and fast AGC circuitry. Low frequency gain reduction of 20dB and high frequency reductions to 30dB produce optimum compression without other processing devices. A front-panel release time control may choose between maximum loudness and best quality. For mono requirements, request the BFM-1515R.

Circle (392) on Reply Card

MODULAR AUDIO PRODUCTS

#3320 compressor/limiter. Each 3320 module includes a 10μs attack time constant with automatic, variable release times for instantaneous peak limiting and smooth dynamic control. Up to 30dB of reduction may begin at -50dBm, if desired. The amount of reduction is shown by LEDs.

Circle (393) on Reply Card

MOSELEY ASSOCIATES

TFL-280B limiter. In FM mono, stereo or SCA systems and TV aural installations, the TFL-280B delivers loudness and clarity without compromise. Modulation levels of FM transmission systems are precisely controlled by frequency-conscious limiting. Agile circuitry eliminates clipping and its attendant products.

TAL-320 AM limiter. Maximizing modulation of the transmitter, the TAL-320 brings high quality sound to AM. An efficient all-pass network combines with trebel equalization and adjustable, positive peak clipping. AM stereo is accommodated by two TAL-320 limiters.

TGR-340 gain rider. The TGR-340 automatically rides gain on a program line, providing maximum modulation on a long-term basis with a minimum of audible or measurable byproducts. STL, tape and satellite circuits are protected from overload. A switch-defeatable, multistage, all-pass network increases signal symmetry, which is useful in television and FM.

Circle (394) on Reply Card

NTP ELEKTRONIK A/S

Type 179-400 limiter. Operating with a supply voltage from 22-32Vdc, the 179-400 limiter module uses VCA circuitry, adjustable gain, threshold level and recovery time with switched pre-emphasis. The modules follow the EURO-card design with 100mmx160mm dimensions and mate with a 32-pin DIN connector.

Type 179-160 compressor/expander. Separate modules or 2-unit, 19-inch packages with the 179-160 compressor/expander systems combine limiting and gat-

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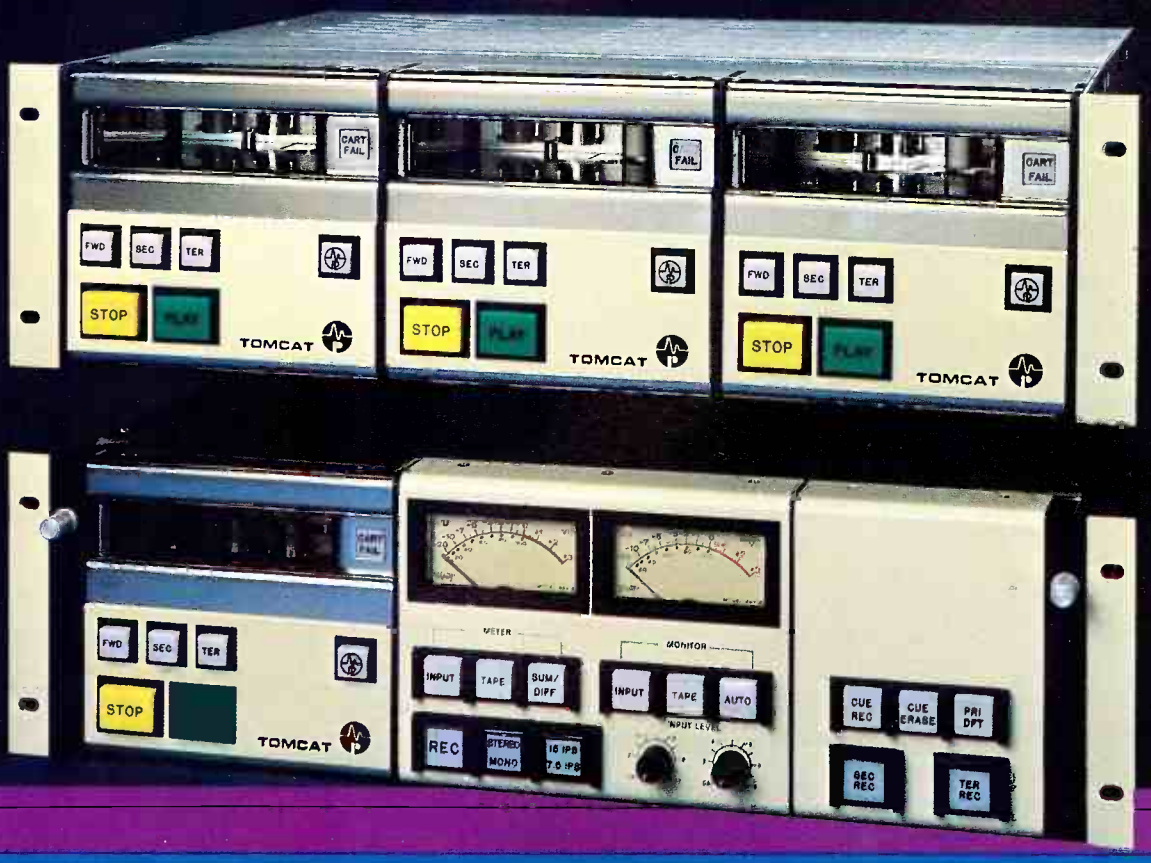

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Circle (42) on Reply Card

ing functions with compression and expansion. Two-part design includes the processing circuit and an analog-computer scheme to control the processing through dc signals.

Circle (395) on Reply Card

OPAMP LABS

Plug-in modules. The octal-based modules of the 325L and 37 (in-phase) limiters may be used in a variety of systems. Application notes are available for proper interconnection to other equipment.

Circle (396) on Reply Card

ORBAN ASSOCIATES

Optimod-AM 9100A. A complete audio processing system for AM mono or stereo broadcasting maintains peak modulation control to 3%. The 25dB headroom allows sloppy board control. Four transmitter equalizer outputs for main and auxiliary during day and night compensate for plate-modulated transmitter tendencies toward low frequency tilt and high frequency ringing.

Optimod-FM 8100A. One chassis includes compressor, limiter and stereo generator. Bassband (to 200Hz) may be independent of the masterband or partially or totally controlled by the masterband. Configurations allow compressor functions at the studio, in front of Telco lines or a dual microwave STL link to minimize overmodulation and signal-to-noise.

Optimod-TV 8182A. The 8182A, ready for stereo, incorporates the CBS Technology Center loudness controller with improved clipping to enhance on-air performance. Using design concepts of the 8100A, the 8182A does for television what the earlier unit does for FM. Applications in satellite SCPC uplinks demonstrate the improved S/N capabilities.

Circle (397) on Reply Card

PROCESSING PLUS

IMP 3 processor. A tri-band scheme in the IMP 3 is designed around VCA ICs. The 3-band design with peak limiting effectively controls processing artifacts without introducing audio phase problems. Except for brightness enhancement, all adjustments are internal, avoiding knob adjusters.

Circle (750) on Reply Card

PROTECH AUDIO

663LC/CL1. Up to +27dBm signals from the balanced transformer output shows the frequency response, low noise and low distortion capabilities of the 663CL system. Front-panel controls include the threshold and output-level knobs with screwdriver adjusts for attack and release times, as well as metering selection and a bypass mode.

Circle (398) on Reply Card

QUAD-EIGHT ELECTRONICS

CL-22 module. An advanced feedforward, VCA-controlled circuit helps eliminate control and distortion problems often found in conventional compressor/limiter systems. The CL-22 compressor/limiter/expander incorporates a threshold control to deal with inputs from -40dB to +26dB and provides ratio control between 2:1 to 20:1. Attack/release time, expansion threshold and output gain adjustments are also available.

Circle (399) on Reply Card

RCA

BA-145/145S AGC amp. For AM, TV and FM stations, mono or stereo systems provide up to 24dB of compression or a maximum of 16dB expansion. Program-controlled release times may be selected for formats from rock to classics.

BA-146A/147A limiters. The BA-146A for AM radio offers fast-acting limiting for high peak modulation levels with little waveform distortion and overmodulation protection. The BA-147A includes a peak clipper for use in FM and TV aural applications.

BA-150 DOC processor. Inaudible action results from Digital Overshoot Control in the BA-150. For FM use, the system allows consistently high modulation levels without overshoot problems experienced with even fast peak limiters.

Circle (401) on Reply Card

RAMKO RESEARCH

Primus processors. The single- (P-VG1) and dual-channel (P-VG2) processors include mic amp, compression and noise gate. Both Voice-Guard models include balanced input/output connections, adjustable compression ratios and thresholds and LED compression-depth metering.

Circle (400) on Reply Card

REBIS AUDIO

Series RA200. A number of different modules fit the RA17R 17-channel rack frame. Among the sections is the RA203 compressor/limiter with soft knee threshold, 1:1 to 40:1 ratio control, link switching for voice over and stereo image maintenance, LED metering of compression and infinitely variable attack/release control. Additional modules include noise gate, de-esser, equalizer, effects/delay, metering, mixing, modulation and VCA functions.

Circle (402) on Reply Card

RICHMOND SOUND DESIGN LTD.

Processor/mixer circuit board. The VCA-4 includes four voltage-controlled amplifiers for mic or line with on-board limiting and compression. Attack and release adjustments may be ganged for multiple-channel control.

Circle (403) on Reply Card

SPECTRA SONICS

#610 complimiter. Fast peak limiting (from 100ns to 2μs) allows average levels much higher than conventional. One indicator lamp shows peak limiting taking place, while a second lamp warns of overload conditions. Variable ratio/slope control covers a 1.1:1 to 100:1 range, while variable release gives smooth dynamic action.

#601 compressor/limiter. Volume compression and peak limiting are provided by the modular circuit card. Variable release time, compression ratio and automatic attack time combine with a constant threshold attack level, eliminating a need to reset input levels for each compression ratio setting.

Circle (404) on Reply Card

SYMETRIX

#501 peak rms compressor/limiter. The

Continued on page 54

Optimod-FM. The Preeminent Processor

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WBZ Boston	WLUP Chicago	WXKS Boston	KSCS Dallas	KUTE Los Angeles	KOST Los Angeles
WCCO Minneapolis	WLLZ Detroit	KIQQ Los Angeles	KILT Houston	WKYS Washington, DC	WJR Detroit
KRTH Los Angeles	WAPP New York	WCAU Philadelphia	WWWW Detroit	KRLY Houston	KMEZ Dallas
WBBM Chicago	WCOZ Boston	KRTH Los Angeles	KSAN San Francisco	KACE Los Angeles	KSFI Salt Lake City
WRAL Raleigh	KMEL San Francisco	WKQX Chicago	KZLA Los Angeles	WGPR Detroit	WEZI Memphis

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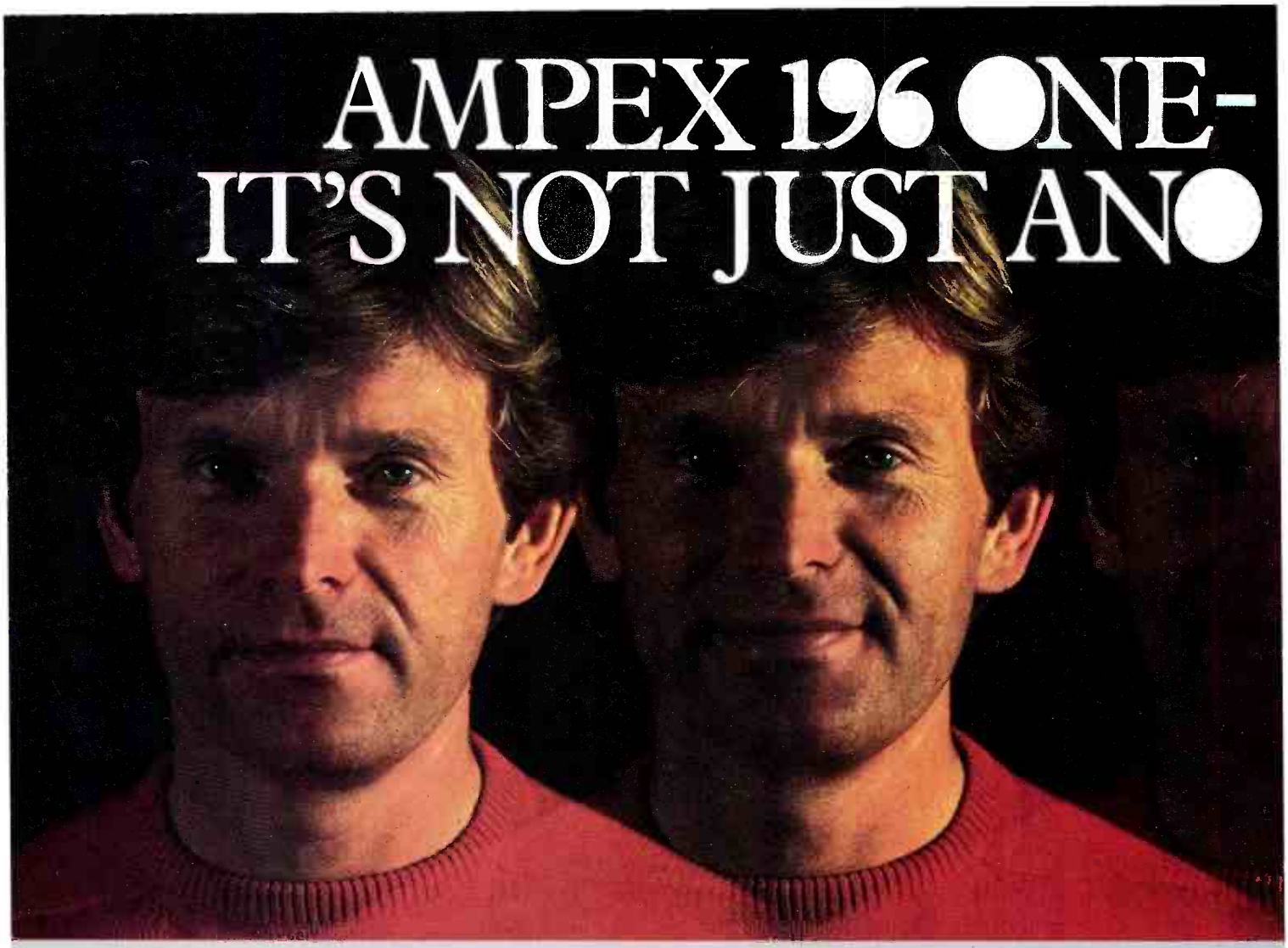
Circle (44) on Reply Card

AMPEX 196 ONE-
IT'S NOT JUST ANO

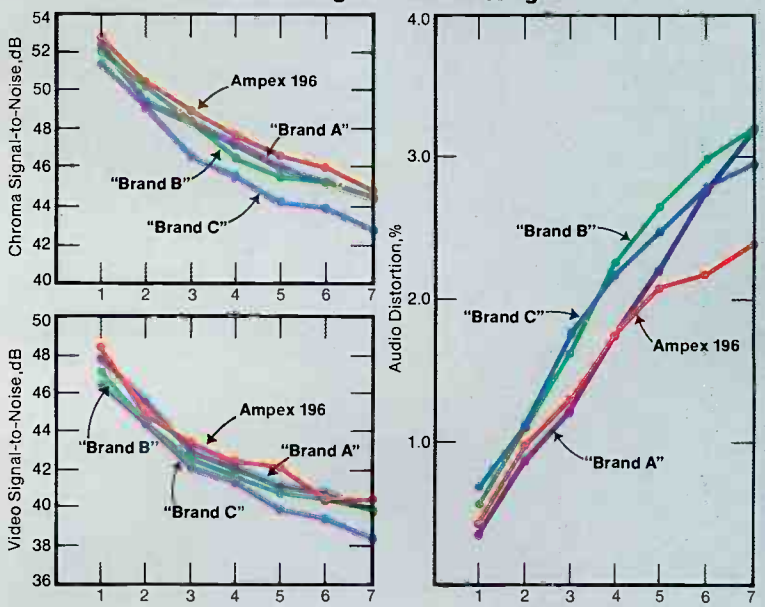


Beautiful pictures generation after generation.

The high energy formulation of Ampex 196 has been designed to give you pictures of perfection time after time. With clarity and color rendering that's truly amazing even after many generations.

Recent laboratory tests comparing signal loss after multiple generations demonstrated Ampex 196 is measurably superior in chroma signal-to-noise, audio distortion and video signal-to-noise. These tests put Ampex directly against all other leading brands in multi-generation uses.

Multi-generation Testing



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Circle (45) on Reply Card

Continued from page 50

single-channel system features independently adjustable thresholds for peak and rms detectors. Rms ratios range from 1.4:1 to infinite:1. Peak threshold is infinite with a soft knee transfer characteristic. Attack and release times are manually or program-material controlled.

CL-150 fast rms compressor/limiter. Manual adjustment of attack, release, ratio and threshold combines with a program-dependent attack-release mode. In the single-channel unit, fast rms detection provides low distortion with fast attack characteristics, when needed.

Circle (405) on Reply Card

TTC/WILKINSON

LA2-C/LA2-CS limiters. A 35:1 compression ratio helps eliminate overmodulation. Limiting action consists of a symmetrical clipper followed by gain reduction, producing a typical distortion of 0.25%. Mono and stereo systems are available.

GCA-1/S AGC amp. A wide range of automatic adjustments (30dB) results from an rms detector rather than peak detection. Gain is not changed if the audio input signal is removed. Decay of action is program-dependent. The compression ratio is approximately 5:1.

Circle (408) on Reply Card

TEXAR

Audio prism. Four-band processing drives M-100 digitally controlled processor boards. Instructions to the processors come from non-volatile devices. For AM applications, the Audio Prism drives a TEXAR Eagle modulation controller. In FM installations, the Orban 8100A or 8000A limiter/generator is used.

Circle (406) on Reply Card

THOMSON-CSF BROADCAST

4300 Volumax. Overmodulation is prevented by the 4300 automatic peak-controlling Volumax. The design is specialized for AM with accurate, silent, negative peak limiting. Symmetrical or assymetrical limiting of positive peaks is selectable.

#4440A/4450A Audimax. Automatic level control by mono or stereo Audimax units accepts varying input levels to produce a constant output level. Degradation of short-term dynamic range, clipping, limiting or unnecessary gain increases during program pauses are avoided.

FM Volumax. A clean sound without audible side effects results from the 4101/4111 mono/stereo auto peak-controlling FM Volumax systems. Multiband limiting includes 4-way signal control with compatibility for Dolby and encoded or discrete quadraphonic applications. With overmodulation protection, the units allow the highest possible average modulation.

Circle (407) on Reply Card

UREI ELECTRONICS

LA-4 compressor/limiter. Selected compression ratios from 2:1 to 20:1 modify the rms value of program material. Variable threshold and program-dependent attack and release times achieve a smooth, natural sound without objectionable breathing and pumping. The result is an efficient use of available transmitter power and extended fringe coverage.

1176 LN (1178). The monaural and stereo compressor/limiters handle the peak amplitudes of program materials. Compression ratios from 4:1 to 20:1 select the amount of limiting. Variable threshold and attack/release times optimize the system for demanding requirements from compact discs and other program sources.

Circle (409) on Reply Card

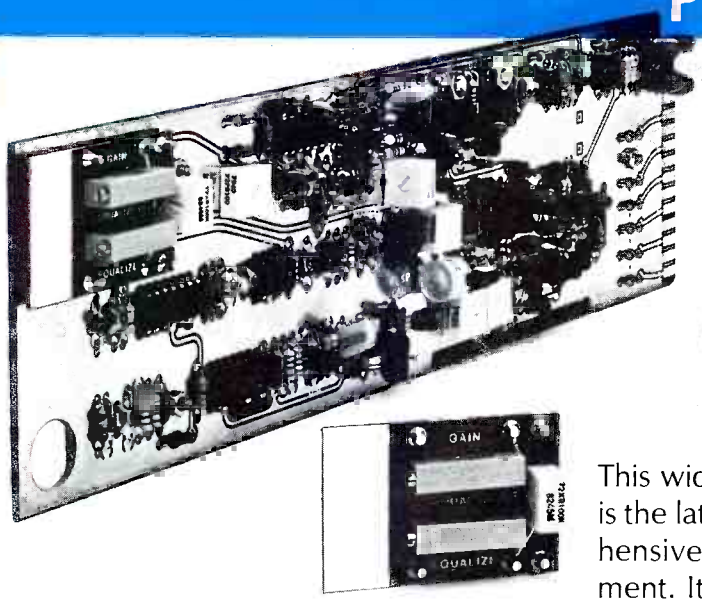
VALLEY PEOPLE

Series 430 processors. Three versions of the 430 processor include the 430 2-channel Dyna-Mite, the 431 Dyna-Mic/Dyna-Mite and the 432 2-channel Dyna-Mic systems. Independent channel functions of the Dyna-Mite include Linear Integration Detector controlled limiting, expansion, noise gating, keying, de-essing and voice over. The two channels may be coupled for stereo operation.

610 dual system. Two-channel compression and limiting control a common-channel VCA with special release coupling for symmetrical release characteristics. Each channel allows compression threshold/adjustment, expansion threshold/range control and gain and release time adjustments for the VCA section.

Circle (410) on Reply Card

HIGH PERFORMANCE



Video Equalizing Amplifier VEA-662

$265.00

This wideband, six-output amplifier is the latest addition to our comprehensive line of distribution equipment. It features differential input, soft backporch clamping and easily set, continuously variable equalization from zero up to 300 meters (1000 feet) of Belden 8281 or equivalent coaxial cable. Delay trim and common mode hum null controls are also provided. A unique feature of this ultrastable, low power amplifier is a removable sub-module which contains the operational controls for gain and equalization. This allows instant, adjustment-free amplifier substitution.

Here are some prominent **SPECIFICATIONS**

Input

Return loss	> 54 dB to 5 MHz > 46 dB to 10 MHz
Common mode rejection	> 60 dB to 1 kHz

Outputs

Return loss	> 40 dB to 5 MHz > 36 dB to 10 MHz
Output isolation	
Signal (3.58 MHz)	> 48 dB
Load	< 0.05 dB/load at 10 MHz < 0.15°/load at 3.58 MHz
Output DC	< ±25 mV at back porch

Timing

Delay	25.4 ns (32.7° at 3.58 MHz)
Adjustment range	typically 6° at 3.58 MHz

Power Requirements

Total power dissipation	< 2 W

Performance

Frequency response	< ±0.02 dB to 5 MHz < ±0.1 dB to 10 MHz +0 -0.2 dB at 15 MHz typically -0.6 dB at 20 MHz
Differential phase	< 0.1° 10% to 90% APL
Differential gain	< 0.2% 10% to 90% APL
H tilt	< 0.25%
V tilt	< 0.25%
S/N ratio	> 70 dB to 20 MHz (rms noise/0.714 V) unweighted

Equalization

Range	0 - 300 m (0 - 1000 ft) Belden 8281, Northern Electric 728, or equivalent
Response	< ±0.05 dB to 5 MHz < ±0.15 dB to 10 MHz typically -0.2 dB at 15 MHz typically -1.0 dB at 20 MHz

Compare price and performance . . . then give us a call.

Leitch Video of America, Inc.
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Chesapeake, VA 23320
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Telex II: 710 882 4342

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Don Mills, Ontario M3B 1V5
Tel.: (416) 445-9640
Telex: 06 986 241

Circle (47) on Reply Card

An overview of other audio processors

By Carl Bentz, technical editor

Audio processing equipment comes in widely varying types, which include level controllers, noise reduction systems, low frequency extenders, audio/time compensators, equalizers and delay/reverb/effects systems.

Level controllers—compressors, limiters and expanders—make up the first category. This equipment is most often found in the broadcast chain between the on-air mixer and the transmitter. Such dynamic control units also may be found in mic and input source lines entering the mixing console. For more information, see "Controlling Dynamics: Audio Processor Roundup" on page 45.

The second group is noise reduction equipment, which involves several circuit types. Noise reduction systems most often involve general compression and expansion principles, with the signal divided into frequency bands. Each band is then processed separately, if required. These systems are used with audiotape or videotape equipment and disc systems. Dolby has developed a valuable system for FM broadcasting. Table I lists manufacturers of audio noise reduction equipment.

Noise reduction is an important by-product of low frequency extenders. These systems, which form the third equipment category, translate the audio signal upward in frequency at the originating end. At the receiving end, a decoder translates the desired intelligence back down, in the process removing hum and other low frequency impurity induced by Telco lines. The process also improves the signals' low frequency response, because frequencies normally lost during the telephone line transmission mode have been raised. Companies listed in Table II manufacture low frequency extenders. A related product, the dbx subharmonic synthesizer, recreates low frequencies without the translation.

A fourth group of processing systems compensates the signal in regard to time. The small collection of digital units can lengthen or shorten the play-time length of taped material with few, if any, effects on the sound quality and pitch. Extensive use of time compensation systems fits a 35-second commercial into a logged 30-second time slot. With the appropriate interfacing, several systems are available to work with audiotape, videotape and film for production and on-air operation. A review of the Lexicon 1200 system appeared in the **BE** *Spec Book*, December 1982. For a list of time compensator processor manufacturers, see Table III.

The fifth category includes a host of equalization systems. EQ, as it is sometimes called, comprises a variety of devices to alter the shape of a system's audio response. Equalizers and filtering may be used to compensate for deficiencies in microphones and less than perfect physical studio layouts. Even RF transmission systems may benefit through equalizer de-emphasis and pre-emphasis. EQing also may be used to purposely alter tonal sound qualities for special effects. (See Table IV.)

A sixth group of processors is based on delay and psychoacoustics concepts. At one time, audio delay resulted from cartridge tape loops, such as the 7-second profanity delay for a telephone talk show on radio. Cart delay systems still may be purchased from machine manufacturers,

Audio processor manufacturers

Individuals wishing more information on various types of processors may use these Reader Service Numbers.

Table I.
Noise reduction systems

AEG-Telefunken .....(415)
BEL Electronic .....(416)
DB Electronics .....(417)
dbx .....(418)
Deltamod .....(419)
Dolby .....(420)
MICMIX .....(421)
MXR Innovations .....(422)
Straight Wire Audio .....(423)
Peter Struven GmbH .....(424)
tts-Electronic GmbH .....(425)
UREI .....(426)

Table II.
Low frequency extenders

CN Rood BV .....(427)
Comrex .....(428)
EELA .....(429)
Kahn Communications .....(487)
McCurdy Radio .....(430)

Table III.
Audio/time compensators

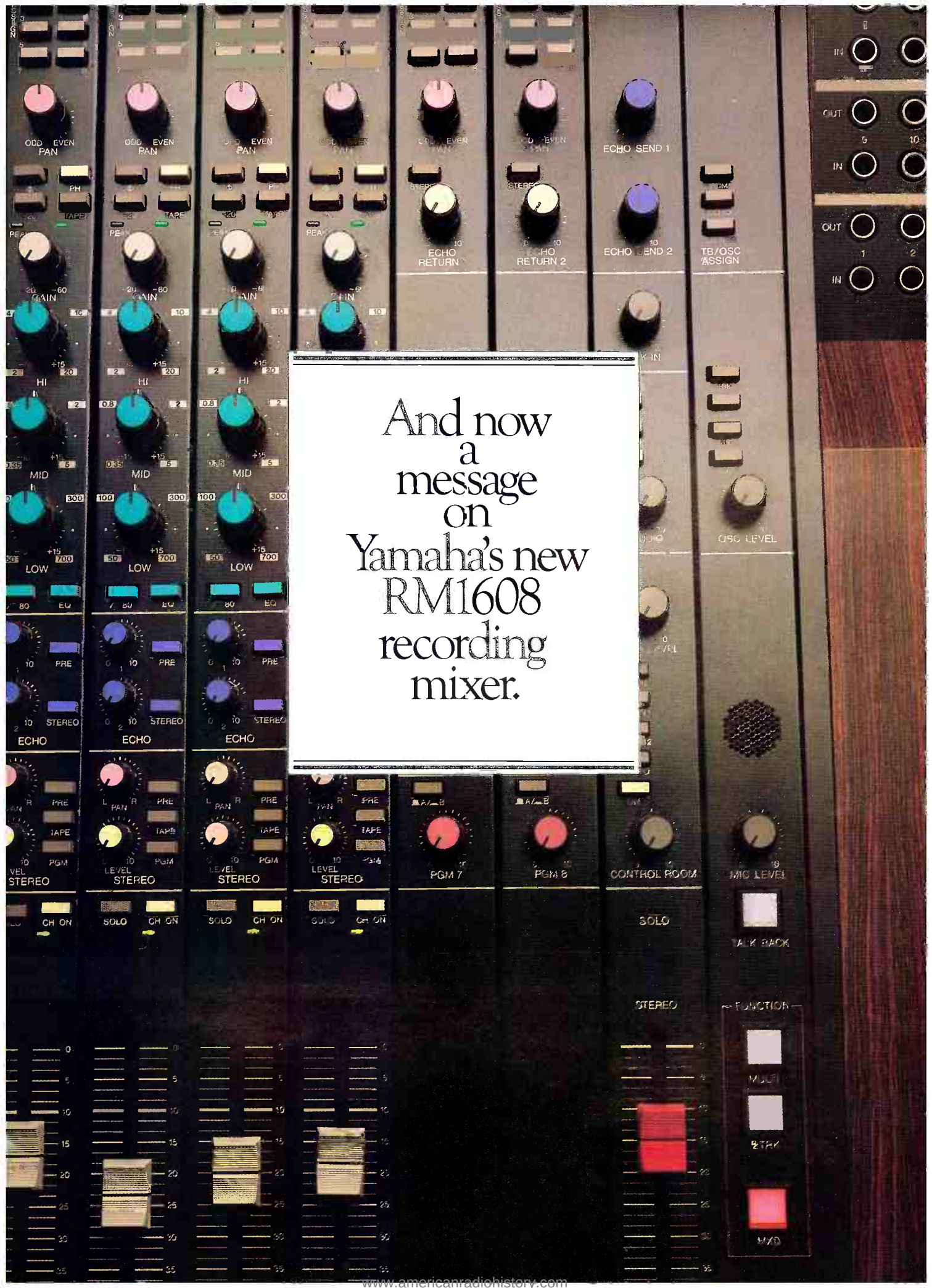
Eventide Clockworks .....(431)
Integrated Sound Systems ..(432)
Lexicon .....(433)

Table IV.
Equalizers

ADM Technology .....(455)
Altec Lansing Int'l .....(456)
Aphex Systems Ltd. .....(457)
Ashly Audio .....(458)
Atlantic Research/API .....(459)
Audio & Design Recording ...(460)
dbx .....(461)
EV/Tapco .....(462)
Furman Sound .....(463)
Gotham Audio .....(464)
Harrison Systems .....(465)
Klark-Teknik Electronics ....(466)
Modular Audio Products ....(467)
Opamp Labs .....(468)
Orban Associates .....(469)
Quad-Eight Electronics .....(470)
Raindirk Ltd. .....(471)
Ramko Research .....(472)
Richmond Sound Design Ltd. .....(473)
Rupert Neve .....(474)
Solid State Logic .....(475)
Sontec Electronics .....(476)
Spectra Sonics .....(477)
Sphere Electronics .....(478)
Symetrix .....(479)
Tangent Systems .....(480)
360 Systems .....(481)
Tweed Audio USA .....(482)
UREI Electronics .....(483)
Valley People .....(484)
Ward-Beck Systems .....(485)
Yamaha Int'l .....(486)

Table V.
Delay/reverb/effects systems

AKG Acoustics .....(749)
Advanced Analog Systems ..(434)
Advanced Music Systems ...(435)
Altec Lansing Int'l .....(436)
Comex Systems .....(437)
db Cassette .....(438)
EMT-Franz/Gotham Audio ...(439)
EV/Tapco .....(440)
Eventide Clockworks .....(441)
Industrial Research Products .....(442)
Integrated Sound Systems ..(443)
Klark-Teknik Electronics ....(444)
Lexicon .....(445)
MICMIX Products .....(446)
Opamp Labs .....(447)
Orban Associates .....(448)
Quad-Eight Electronics .....(449)
ProTech Audio .....(450)
Publison Audio Professional .....(451)
Sequential Circuits .....(452)
Trident (USA) .....(453)
Ursa Major .....(454)



RM1608

SPECIFICATIONS

TOTAL HARMONIC DISTORTION (T.H.D.)
Less than 0.1% at +4dB *output, 20Hz to 20kHz (all Faders and controls at nominal)

HUM & NOISE (20Hz to 20kHz) Rs = 150 ohms
(INPUT GAIN "–60")

–128dB	Equivalent Input Noise (E.I.N.)
–95dB	residual output noise: all Faders down.
–80dB	(84dB S/N) PGM Master volume control at maximum and all CH PGM assign switches off.
–64dB	(68dB S/N) PGM Master volume control at maximum and one CH Fader at nominal level.
–73dB	(77dB S/N) STEREO Master Fader at maximum and all CH STEREO level controls at minimum level.
–64dB	(68dB S/N) STEREO Master Fader at maximum and one CH STEREO level control at nominal level.
–80dB	(70dB S/N) ECHO SEND volume at maximum and all CH ECHO volumes at minimum level.
–75dB	(65dB S/N) ECHO SEND volume at maximum and one CH ECHO volume at nominal level.

CROSSTALK
–70db at 1kHz: adjacent Input.
–70db at 1kHz: Input to Output.

MAXIMUM VOLTAGE GAIN (INPUT GAIN "–60")

PGM	74dB: MIC IN to PGM OUT.	ECHO	70dB: MIC IN to ECHO SEND.
	24dB: TAPE IN to PGM OUT.	C/R	74dB: MIC IN to C/R OUT.
	34dB: ECHO RETURN to PGM OUT.		24dB: 2 TRK IN to C/R OUT.
	14dB: PGM SUB IN to PGM OUT.	STUDIO	74dB: MIC IN to STUDIO OUT.
STEREO	74dB: MIC IN to STEREO OUT.		24dB: 2 TRK IN to STUDIO OUT.
	24dB: TAPE IN to STEREO OUT.		
	34dB: ECHO RETURN to STEREO OUT.		

CHANNEL EQUALIZATION
± 15 dB maximum
HIGH: from 2k to 20kHz PEAKING. MID: from 0.35k to 5kHz PEAKING. LOW: from 50 to 700 Hz PEAKING.

HIGH PASS FILTER – 12dB/octave cut off below 80Hz.

OSCILLATOR Switchable sine wave 100Hz, 1kHz, 10Hz

PHANTOM POWER 48V DC is applied to XLR type connector's 2 pin and 3 pin for powering condenser microphone.

DIMENSION (W x H x D) 37-1/2" x 11" x 30-1/4" (953 mm x 279.6 mm x 769 mm)

Hum and Noise are measured with a –6dB/octave filter at 12.47kHz; equivalent to a 20 kHz filter with infinite dB/octave attenuation.
*0dB is referenced to 0.775V RMS.
• Sensitivity is the lowest level that will produce an output of –10dB (245mV), or the nominal output level when the unit is set to maximum gain.
• All specifications subject to change without notice.

The specs speak for themselves. But they can't tell you how natural, logical and easy the RM1608 is to work. All the controls and switches are logically arranged to help you get the job done quickly and accurately.

And in the tradition of Yamaha's sound reinforcement mixers, the RM1608 sets new standards of reliability as well as ease of operation. For complete information, write: Yamaha International Corporation, P.O. Box 6600, Buena Park, CA 90622. In Canada, Yamaha Canada Music Ltd., 135 Milner Ave., Scarborough, Ont. M1S 3R1.

YAMAHA

Circle (51) on Reply Card

but most delay systems now used involve digital technology. Digital units offer lack of moving parts and compact size as advantages. Versatility is provided by a control knob that adjusts the clocking frequency of shift-register ICs. Whether in manual or microprocessor-controlled units, changing the clock rate provides variable delays. Table V includes manufacturers of simple delays and delay-based equipment.

An application of delay is echo or reverberation, in which part of the delayed output is reinserted at the device input. The same result could be achieved by using multiple pickup heads on a tape deck, but is more commonly developed through using stainless steel plates or springs. Among the various products in the reverb field, the AKG Acoustics BX series of Torsional Transmission Line (TTL) units, MICMIX XL systems and Orban 111B are recognized as high quality, reliable mechanical delay systems. Much engineering has been put into reducing problems caused by ambient conditions and signal overdrive in these units.

Although stainless steel plates or spring reverbs produce a sound quality difficult to achieve digitally, the mechanical and physical problems found with some of them may outweigh the quality. Many older mechanical reverb designs have been silenced by innovative digital systems, because of the system size of springs or plates, the difficulties of mounting to avoid mechanical vibration, and the required isolation from ambient sound.

A touch of reverb applied to the signal from the on-air mixer before the transmitter can add a pleasing sense of excitement, an improved presence and a feeling of depth to an otherwise *dead* studio. The digital reverb systems that cause the most excitement today are small and require little more mounting consideration than the distance limitations between the electronics package and the remote control unit. Lexicon's 224X Alphanumeric Remote Console (LARC), for example, allows up to 1000 feet of 7-conductor cable between the equipment rack and a remote unit that provides total system command with LED readouts of system parameters.

Microprocessors and memories are used in the Lexicon 224X and 200 digital reverb, Advanced Music System equipment, Ursa Major Space Station and 8x32 units, Eventide Clockworks SP2016 processor and broadcast delays, Sequential Circuit PRO-FX system, MICMIX Master Room XL-515, Quad-Eight System 5 and Quantec QRS room simulator (to name a few). The computer-based circuitry allows pre-settable *programs* to be recalled instantly. With automated system interfacing, sequencing of effects, based on reverberation, can place you in a room with acoustics varying from a clothes closet (full of coats) to the Notre Dame Cathedral.

Delay-based audio processing applications are boundless. Just as a hint of reverb gives pleasing warmth and a feeling of spatial depth, blatant use can be effective in dramatic presentations, such as the National Radio Theatre's *Odyssey* series. (See **BE** April 1982.) Care must be taken, however, to avoid effects abuse. Reckless misuse can create disaster in the production studio.

The world of audio processing is so broad that only major points may be touched upon in limited space. Besides the categories mentioned previously, other types of audio processing equipment exist. For example, music recording becomes involved with phasing and flanging sound enhancements. Another example, a unique type of enchancement for broadcasters, is found in the Aphex aural exciter, a device that re-creates sound harmonics that have been lost to heavy dynamics processing.

LEXICON HAS "THE LEADING EDGE" IN DIGITAL AUDIO PROCESSING

Alphanumeric Controller (LARC) for Lexicon 224X Reverb/Effects System

NEW

- 48-character alphanumeric display guides and prompts users and unleashes the full power of the "X".
- Off-line cassette tape storage for 36 user-created reverberation and special effects programs. Saves your creative work.
- Extensive diagnostics for on-line use and off-line storage offers an unequalled confidence factor.

Audio Delay Synchronizer Model 1300

NEW

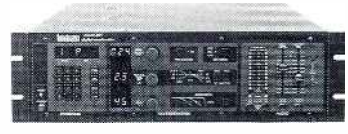
- Intelligent interface provides direct and flexible communication with a growing number of digital video synchronizers and processing devices by sensing their video delay characteristics.
- Assures accurately synchronized audio and video; eliminates lip sync problems.
- Superb audio characteristics; full bandwidth, 16-bit, stereo performance with ultralow noise and distortion.
- Price-performance breakthrough.

Super Prime Time Model 97

- Provides a wide range of high-quality, custom-tailored, programmable, audio enhancements and effects (no operator hassle).
- 32 storage registers and off-line storage on audio cassette allow high-quality audio effects processing to be preplanned and retrieved at the push of a button.
- In production or on the air *Super Prime Time* puts tremendous audio effects processing power at your finger tips.

Model 200 Digital Reverb

NEW



- Quickly and easily creates realistic acoustic environments for live broadcast, production and postproduction. The ambience of concert halls, acoustic chambers, or plates available with a button push.
- Brings Lexicon world-famous reverb sound to all markets in a cost-effective design.
- Streamlined panel and storage registers make the Model 200 a snap to use.
- Unequalled for matching the desired acoustic ambience to the scene for voice-overs and sound effects or for creating reverb enhancements for production and live entertainment.

See these products at AES

Lexicon

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Export: Gotham Export Corporation, New York, NY 10014

Circle (55) on Reply Card

Still-store update

By Carl Bentz, technical editor

Maintaining a slide file is difficult in a small TV station and nearly impossible in a busy production center. Adding an electronic still-store system can simplify the job, improve video production and provide additional production functions as well. Although still-stores are generally an integral part of graphics or character generators, the systems considered here are stand-alone devices used in general video production.

A basic still-store is capable of nonvolatile, mass memory of TV images. TV field or frame pictures may be written into and read out of the memory individually or sequentially. The memory is based on rigid or floppy magnetic discs. Video inputs may include live camera signals, graphic images or any compatible sources. Outputs may be synchronized through frame-store units integral to the system. Less sophisticated models may require an external TBC to allow retrieved pictures to be used with other studio equipment.

As equipment sophistication increases, RAM memories are included, as well as the associated A/D and D/A conversions. Such digital design systems use the RAM to hold an image before storage, after image retrieval or for special processing functions. Additional memory may be included to perform a *library card catalog* system to enable the user easier access to stored material. Interlinking through serial and parallel interfacing allows several systems to borrow material from one another in a distributed networking arrangement.

Two forms of disc memory—floppy and rigid—are found in still-stores. Whether the recording technique is analog or digital, these drives are used to allow random access to the stored images. Typically, larger systems use the rigid (hard) Winchester-type drive, which may use fixed or removable disc packs. The Winchester drive's storage capacity is greater than that of the less expensive floppy disc commonly used with smaller systems. Floppies, however, occasionally are used in addition to Winchester-type drives for archiving. Other off-line archiving systems may include various forms of tape cartridge.

The 1983 NAB and Montreux equipment exhibitions introduced several new models to the marketplace. Each manufacturer's comments about the equipment follow. Reader Service Numbers are included for more data.

Abekas. The VSP 42 is a low-price system, with a 5¼-inch Winchester disc drive that keeps 100 frames (200 fields) in on-line storage. Intermixing of field and frame images is automatic for maximum storage. The VSP 42 EX, an optional expansion unit, provides up to 300 frames, while a digital ¼-inch streaming tape drive provides backup and off-line memory. Stills are stored with serial numbers from 1-9999, regardless of actual location. The serial numbers provide easy references when building up to 100-image sequences.

In optional dual-channel systems, the output may consist of vertical interval switched or cross-faded presentations with control over fade rates. A ±0.25dB response is specified to 4.2MHz for the compact, portable system.

Circle (495) on Reply Card

ADDA. ESP C systems are designed with a building-block concept. Five basic storage units (150 stills/disc, 400 stills/disc and 750 stills/disc fixed pack or 200 stills/disc and 750 stills/disc removable pack) may be combined into highly sophisticated systems. The ESP-150C may operate with up to four Winchester drives for up to 600 stills on-line and a worst-case access time of 450ms. Accessories, such as the Multiple Access Controller (MAC), allow 15 A/D processors to access 12 drives. Drives also may be mixed.

Any ESP system has dual-channel capability with separate channel operation. Channel A may record as Channel B plays, both may be combined in playback for effects, or both may be used in a concurrent on-air and production situation.

Interfacing accessories allow automation or a library control, which keeps on-line and off-line records to help the user find a particular still with a variety of storage reference methods. The ADDABUS interface creates an interface between separate systems for distributive networking.

Circle (496) on Reply Card

Ampex. The newest entry from Ampex, the ESS-3, may be obtained in a basic system consisting of one access station, one disc drive and the electronics for one output channel. In a more sophisticated configuration, the ESS-3 supports five disc systems, multiple access stations and electronics with multiple frame stores for three video output channels. The ESS-3 will be available in 1984.

The Capricorn 330Mbyte 14-inch Winchester drive or a DM-980 80Mbyte removable pack drive store the images. The Capricorn has a capacity of 400 on-line full-frame stills, with a maximum of 2000 images on five drives. Worst-case access time is 0.8s with identification of stills through pack/track or a date/category/title reference system.

Sixteen stills may be placed on the screen simultaneously to make searching easier. Each includes an identifier for quick, full-screen image access. Images and titles may be reduced, repositioned, bordered, cropped and keyed into second images. Also, a keying signal for an external DSK unit is provided. Fonts are scanned in and stored, then recalled for size changes or processing before placement on stills as titling.

A digital component format in the ESS-3 records YUV signals through

8-bit samples at the 4:2:2 (13.5MHz) sampling rate, in accordance with worldwide digital agreements. Conversion to components is provided internally, allowing composite video to be applied to the system.

Circle (497) on Reply Card

Asaca/Shibasoku. With the ADS-1000 digital still-store, up to 218 fields are available on one Winchester drive. Expansion of memory with three additional drives allows 872 fields. An internal floppy disc drive provides archiving.

For easier search and sort functions, a 16-picture display simultaneously may be called up. When the appropriate still is located, it is called up in full-screen format for use.

Circle (498) on Reply Card

Eigen Video. RAM storage in FP image processors hold individual stills before recording on optional floppy disc (FP-1), Winchester drive (FP-2) or combined systems that include both types (FP-3). Up to nine stills in a 512x512x6 or 8-bit format may be transferred to a floppy discette, while the Winchester model allows 120 images on the 5¼-inch disc. Image transfer from the Winchester memory is at 2 fields/s.

Systems may be purchased with compatibility to RS-170 or CCIR standards. Bandwidths to 4MHz result from 10MHz sampling. Dual outputs are optional through addition of a second RAM memory. Noise reduction and windowing are standard features.

Circle (499) on Reply Card

Harris Video Systems. IRIS II, presented at the 1982 NAB exhibition, uses a Z-8000 processor for up to six simultaneous users to access as many as 15,899 on-line stills. One user station may be allocated to an RS-232 computer interface. Control Data Corporation RSO disc drives or removable disc pack units in a new configuration, announced in July, give several users the ability to store on the same disc simultaneously. Each lightweight, compact disc cartridge holds 260 stills.

An optional Winchester system provides a fully indexed library card catalog for more than 80,000 on- and off-line stills. A backup for the library in five categories may be kept on cartridge tape.

Signals in the IRIS II are converted to a 4:1:1 component coding scheme. Digital techniques allow noise reduction for a greater number of generations in production applications of the standard DIGIKEY and compress/positioner unit for multiple image effects. DIGIFONT, a combined effort of Harris and Chyron Corporation, was introduced at NAB-'83/Las Vegas to add titling capability.

Circle (500) on Reply Card

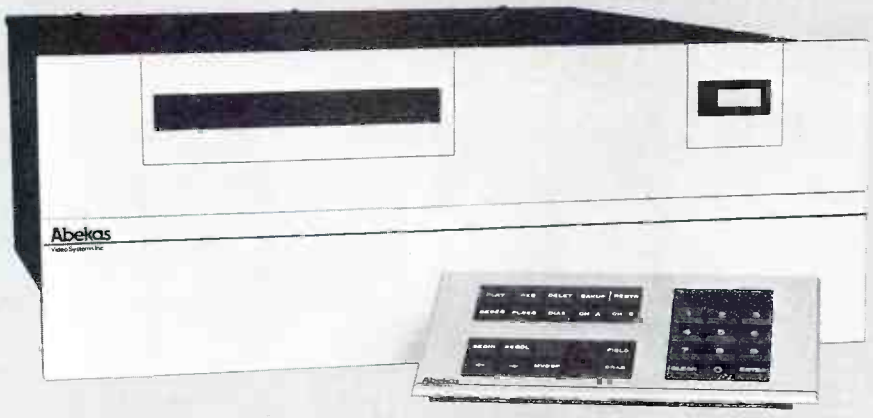
IVC-Carlton Ltd./IVCC. The DM 3000 videodisc recorder uses analog formatting on a Winchester drive. Up to 600 frames are recorded on one disc with an average random access time of 50ms during playback. One disc allows a capability of 60s real time imaging.

Continuously variable slow motion in forward or reverse includes stop action for a field or frame. Digital track counting allows head preset and reset to any pre-selected track. Systems are available in any world TV standard.

Circle (501) on Reply Card

MCI/Quantel. The newest still-store models from Quantel include the Central Lending Library (CLL) and Picture Pack. The CLL holds more than 100,000 pictures on fixed or removable Winchester packs. For use, the CLL is interconnected to DLS 6000 systems, which may borrow a still from the library or offer new ones for

WHAT STANDS SEVEN INCHES HIGH, CONSUMES ONLY A PINCH OF POWER, COSTS LESS THAN $30,000 AND IS THE PICTURE OF QUALITY?



Why, the revolutionary A42 video slide projector, of course.

A digital slide store doesn't have to be a bulky system loaded down with unnecessary features to justify a hefty price tag. We proved that to you at NAB '83 with our latest generation digital video slide storage system—the A42. This rack-mountable little beauty stands only 7 inches high! It combines the very latest in Winchester disk and digital video processing technology to deliver the highest quality images. And the price is right at $29,900. We've got features galore, including: on-line storage of 100 frames/200 fields (expandable to 300 frames/600 fields), automatic intermixing of field and frames, and an optional high-speed digital streaming tape drive for backup and off-line storage.

The A42. It's your opportunity to get full broadcast quality in the world's smallest slide store system. For details, call (415) 571-1711, or write to Abekas Video Systems, Inc., 319 Lincoln Centre Drive, Foster City, California 94404.

Abekas

Video Systems, Inc. 319 Lincoln Centre Drive, Foster City, California 94404

Circle (60) on Reply Card

archiving. Other possibilities include the Paint Box graphics system as a user, which, after retouching of the image, may return the new still for storage.

Picture Pack is an economical digital library system capable of interfacing to the CLL or other equipment, but in itself, Picture Pack is a compact stand-alone version using Winchester technology.

Circle (502) on Reply Card

Nippon TV Industry/NTI. An internal disc gives a 500-field capability to the DSS-11 digital still-store, while the external disc system adds 500 more fields. Read time is 0.35s for 1-, 2- and 4-field storage modes. The three storage modes may be mixed within the memory.

Operation within the DSS-11 is based on 8-bit sampling at 10.7MHz. For user convenience, *On-air* and *Next-preview* video outputs are provided. A monochrome *Comments* channel may be used separately, but also is combined on additional outputs with the on-air and preview video. Programmed sequences may be retrieved in addition to *AS after-setting* selected single images.

Circle (503) on Reply Card

Oktel. The BDR-300 slide file stores up to 1200 frames with full vertical resolution. Preset/reset address control allows heads to be moved to any pre-selected track with a maximum search time of 2.6s. Two buffer channels may be ordered to provide program continuity as optional equipment. BDR systems are available in still-store and slow-motion formats for NTSC, PAL and SECAM standards.

Circle (504) on Reply Card

Precision Echo. When the EFS electronic frame-store systems appeared from Arvin-Echo more than eight years ago, the recording system allowed heterodyne or direct color formats, similar to VCRs. A double-sided enclosed floppy disc cassette handled up to 200 images per side. The EFS-1B system from Precision Echo uses many of the same concepts, but the recording system now is only in direct NTSC color. A time base corrector is required for broadcast and production applications. Variable rate record and playback includes 1-15fps sequences or stop action. With an optional remote controller, random access to any of the 200 frames on a Discassette side is possible.

A second product, the ESF-2 Image Maker, provides 256 frames per Discassette side or 512 frames/disc. The record/play frame rate covers 1-30fps for smoother animation sequencing. Programmable loops and cues are possible, along with random access.

Circle (505) on Reply Card

Rank Cintel Ltd. Slide File, developed with the BBC, uses 8-inch Winchester equipment for 80 stills, four test slides and a contents page. Long-term archiving uses the DC-300 streaming cartridge tape drive to place 20 stills and a contents page on 450-foot cartridges. Picture transfer from tape requires 12 seconds, while picture search of a particular slide may require up to four minutes.

The recording format is a digital YUV format with 8-bit sampling in the 4:2:2 (13.5MHz) standard. RGB inputs and outputs have a ±0.1dB response to 5.5MHz.

Slide location is improved with a *poly-photo* display of 20 slides at a time. Each has an ID number for full-screen recall. In production use, a cross-fade/switcher unit allows fade, dissolve and cut switching between dual-channel electronics.

Circle (506) on Reply Card

You mean, I can get out from under all of this....

for under $60K? With effects?

Problems, problems, problems. The television business can surely be that way. We know, because Harris has been serving the broadcast industry for sixty years. That's why we built IRIS II. To solve some of your most pressing problems now, plus give you the long-term benefits of the world's most advanced electronic still store and digital imaging system.

Lost slides, dirty slides, slides with finger prints? Slide hassles are over! With IRIS II you can instantly access up to 23,000 on-line stills. An off-line library of over 80,000 stills is also available.

Is everyone standing in line for slides? With IRIS II, no more! Production, engineering, art, promotion, and news can all access stills simultaneously. Not that big yet? Buy IRIS II with one user-station and expand it to two or more when you're ready.

Make your stills come alive! Ever wanted to key live video onto a montage of still images? IRIS II is the answer! Create an almost endless variety of digital effects with IRIS II's exclusive DIGIKEY and Compressor/Positioner. Key in an external source for even more visual excitement, or create your own still from live video.

Ever wished your still store had wheels? A small, lightweight data cartridge for van or studio makes the IRIS II just about perfect for mobile applications. Now you can build your stills at the studio, toss the data cartridge into your briefcase and head for the field.

How can you be sure of state-of-the-art technology and digital standards compatibility? IRIS II is a component-coded system, so it won't become obsolete tomorrow. You're not locked into the composite system of yesterday.

IRIS II. The most elegant, and now the most flexible, digital still store and imaging system. Truly, the best solution.

For more information about this solution, and others we're famous for, call us at (408) 737-2100. Or, write HARRIS VIDEO SYSTEMS, 1255 East Arques Avenue, Sunnyvale, CA 94086.

Circle (57) on Reply Card

HARRIS

In the past ten years,
computers have gotten smarter,
cameras have gotten simpler,
ovens have gotten quicker,
beer has gotten lighter,
bodies have gotten leaner,
athletes have gotten richer,
hi-fi has gotten higher,
radio has gotten stronger,
studios have gotten smaller,
towers have gotten taller,
movies have gotten longer,
cars have gotten shorter,
film has gotten faster,
outerspace has gotten closer
and blue jeans have gotten classier.

Now it's our turn.

In the past 10 years, the Premium Line from ITC has seen refinements, but no major changes. Frankly, it hasn't needed any. The Premium Line has been a dependable workhorse that's found its way into more studios than its next two competitors combined.

But we couldn't leave well enough alone. So this year, the Premium Line gives way to the Delta Series, a new generation of cartridge machines that offers you more than ten years worth of improvements.

It's mechanically better. The cart guides are improved. There's a crystal-referenced servo capstan motor with a vapor-honed non-magnetic shaft. Modular construction makes alignment and service convenient. High-speed recue is standard. And the Delta III gives you three independently removable decks.

It's electronically better. There are new, high performance components, including NE5500 Series amplifiers. There's an exclusive ITC/3M playback head for smooth frequency response and improved signal-to-noise. We've added a toroidal power transformer with fully regulated and protected power supplies. And a digital cue tone detector controlled by a powerful microprocessor.

And it's physically better because it's smaller. The whole unit is only one-third rack width (5⅝"). The enclosure is made of ¼-inch milled or cast aluminum, for stability. And the panel inserts are made of Lexan®.

Of course, we left in all the good things that made the Premium Line so popular. The ½-inch tool plate aluminum deck. Durable, high quality switches. And a solenoid-actuated, chain-and-sprocket pressure roller assembly. All backed by our famous two-year warranty on parts and factory labor, plus a 30-day guarantee of satisfaction. If, for any reason, you're not completely satisfied, you can return the unit within 30 days of purchase and we'll refund your money in full.

The good things are still there. But what you'll notice are the improvements. We think they were worth the wait.

For more information, or to place an order, call us collect from Alaska, Hawaii or Illinois, at 1-309-828-1381. From the rest of the U.S., call the following. Toll-free number:

1-800-447-0414.

1983

1973

3M hears you...

3M

Circle (58) on Reply Card

Introducing the New Electro-Voice RE3 omni and RE34 cardioid ENG/EFP microphones

"Sophisticated microphones that simplify field production."

Action doesn't wait. The constant deadlines faced by news gathering and field production crews demand equipment compatibility, fast set-ups, simple operation and absolute reliability.

Electro-Voice knows.

We've designed and built the broadcast microphones that have set performance and reliability standards, and we stand behind EV Professional Microphones with a warranty and service policy that's second to none.

And EV listens.

Properly designed broadcast products are the result of pooled efforts. That's why EV devoted years to research, by working with network and local broadcasters to engineer all of the desired features into a pair of rather revolutionary new microphones for ENG and EFP.

EV confirmed that field microphones should incorporate low handling noise, resistance to humidity and moisture problems, extreme durability, and the same reliability and level of performance that the industry has become accustomed to expect from EV microphones like the phenomenal 635A and RE20.

Introducing the RE30 and RE34.

Because remotes present a variety of acoustic environments, EV engineered the RE30 with an omnidirectional pickup pattern, and the RE34 with a cardioid pattern. Except for their polar patterns, each model has the same features.

Both the RE30 and RE34 have switchable outputs—either line level or microphone level. No longer will field crews

be stuck without the right signal level. A flick of the recessed switch adjusts the output level, producing instant compatibility without the need for extra equipment or cables. The low distortion line-level amplifier allows direct interface with line-level inputs such as those common on microwave and fiber optic transmitters.

Additionally, the RE30 and RE34 will drive and hold telephone lines*.

*F.C.C. approved interconnect may be required.

Each microphone includes a low-distortion limiter which functions at either output level.

The RE30 and RE34 can be powered by either phantom power or a standard, available anywhere, 9-volt "transistor radio" battery. With both power sources present, the battery becomes a redundancy powering system that instantly and silently takes over if ever required.

An LED, mounted so as to be easily visible to the talent only, serves several important functions... it shows the presence of phantom power, monitors battery condition, and offers the world's first hand-held "tally light" to signal on-air personalities from off-camera.

Get the whole story.

No advertisement can hope to explain all of the features of these incredible new microphones. Complete engineering data sheets describing the many features and benefits of the RE30 and RE34 are available free upon request.

Many Electro-Voice Professional Microphone Dealers can arrange a hands-on trial at no cost to you. For more information please write to: Greg Silsby, Market Development Manager/Professional Markets, Electro-Voice, Inc., 600 Cecil Street, Buchanan, Michigan 49107.

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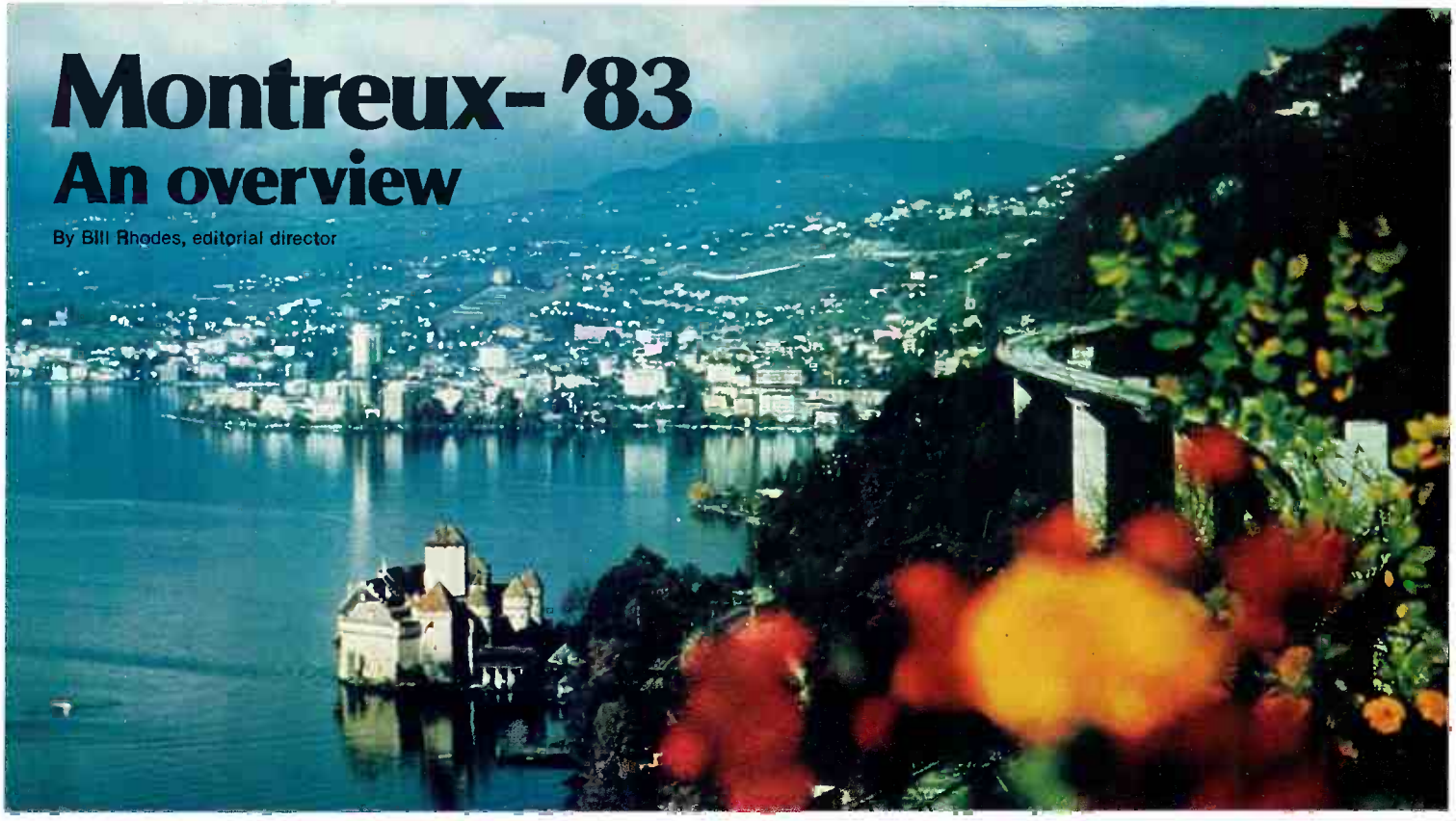
Electro-Voice®
SOUND IN ACTION™

Circle (103) on Reply Card

Montreux-'83
An overview

By Bill Rhodes, editorial director



Montreux, as seen from across Lake Geneva.

- Montreux-'83 Symposium
- May 28-June 2
- Montreux, Switzerland
- Attendance:
  - Paying 2000
  - Exhibitors/guests 7500
  - Press 220
- Exhibits:
  - Booths(stands) 225
  - Space 12,000m²
- Papers:
  - Presented 49
  - Supporting 47
  - Panel discussions 12
- Number of countries represented:
  - Attendees 60
  - Journalists 16
  - Exhibitors 16

From a modest beginning in 1961, the Montreux Symposium has grown to be the world's most important TV technical exhibit and symposium. This year, an estimated 10,000 people participated in the 13th International Television Symposium and Technical Exhibition. As usual, there were many attendees from Europe and North America. However, the exceptionally large delegations from the Persian Gulf states, South America, Central America, Southeast Asia and China had not been expected.

The record-setting statistics for Montreux-'83 can be accounted for by the outstanding forum set up for technical sessions and the superb exhibit facilities. But the central location and vast beauty of Switzerland also provide a neutral ground for exchanging information on emerging TV technologies.

Positive developments

This year's Montreux Symposium will be well-remembered for its presentation of several innovative technologies.

Without question, the HDTV demonstrations (organized by Joseph A. Flaherty, CBS Television, New York) were the major attraction. The symposium opened with an address by Flaherty and an HDTV presentation for an invited audience of dignitaries and press officials. Throughout the convention, demonstrations showed HDTV equipment and displayed the advantages of large-screen projection equipment.

The HDTV demonstrations were prepared by a cooperative effort between Sony Corporation, the CBS Network and a variety of European broadcasting organizations. The equipment used was the same type as shown by Sony at IBC-'82 in Brighton, England. This consisted of two HDTV cameras operating on the NHK-proposed 1125-line, 60-field scanning rate; a pair of special 1-inch helical VTRs built on a Type C support, but modified to accommodate HDTV's higher bandwidth requirements; a switcher; an editing console; high resolution monitors; and a variety of necessary peripherals. This package was moved to London; Paris; Salzburg, Austria; Montreux, Switzerland; Venice, Italy; and Leningrad, U.S.S.R., to produce special HDTV programs for the feature demonstrations.

Cable and DBS

In addition to HDTV, cable and DBS attracted much interest at the symposium. In Europe, cable is becoming a major signal distribution source, finally assuming its natural position beside traditional broadcasting. Because of its growth, cable was noted at Montreux as an emerging technology. Also, Europe is beginning to look seriously at another new technology – Direct Broadcast Service (DBS) for direct-to-the-home satellite service. Because of its imminent nature, many sessions and conversations centered on DBS.

The world's thirst for TV programming was another hot symposium topic. Emphasis was placed on TV production techniques, enhanced picture quality, higher quality TV audio, consideration of alternate signal distribution forms and development of home terminals.

Digital

Because the worldwide digital decade is here, digital technology for broadcast facilities and recording studios was another major part of the symposium. This was evident in technical sessions and exhibits, with many exhibitors showing com-

Julius Barnathan of ABC between sessions, in front of the exhibit hall entrance.

ponent signal processing and digital video equipment.

Opening ceremonies

Since 1963, the Swiss Post and Telecommunications (PTT) Administration has been exercising patronage over the International TV Symposium. This year, Rudolf Trachsel, director-general, telecommunications department, Swiss PTT, became the patron and delivered the opening address.

"Technical progress is causing profound changes in the media world," he said. "While the printed word has long been in competition with radio and television, it is new electronic media and services—private broadcasting, pay TV, satellite TV, videotex and teletext—which are jostling for market positions now in Europe as in

The Montreux-'83 opening ceremonies were packed.

The HDTV demonstrations were one of the symposium's highlights.

Continued on page 74

PROTECT MAJOR INSTALLATIONS FROM LIGHTNING TRANSIENTS AND SURGES WITH "SURGE-MASTER"™ POWER LINE PROTECTORS BY MCG

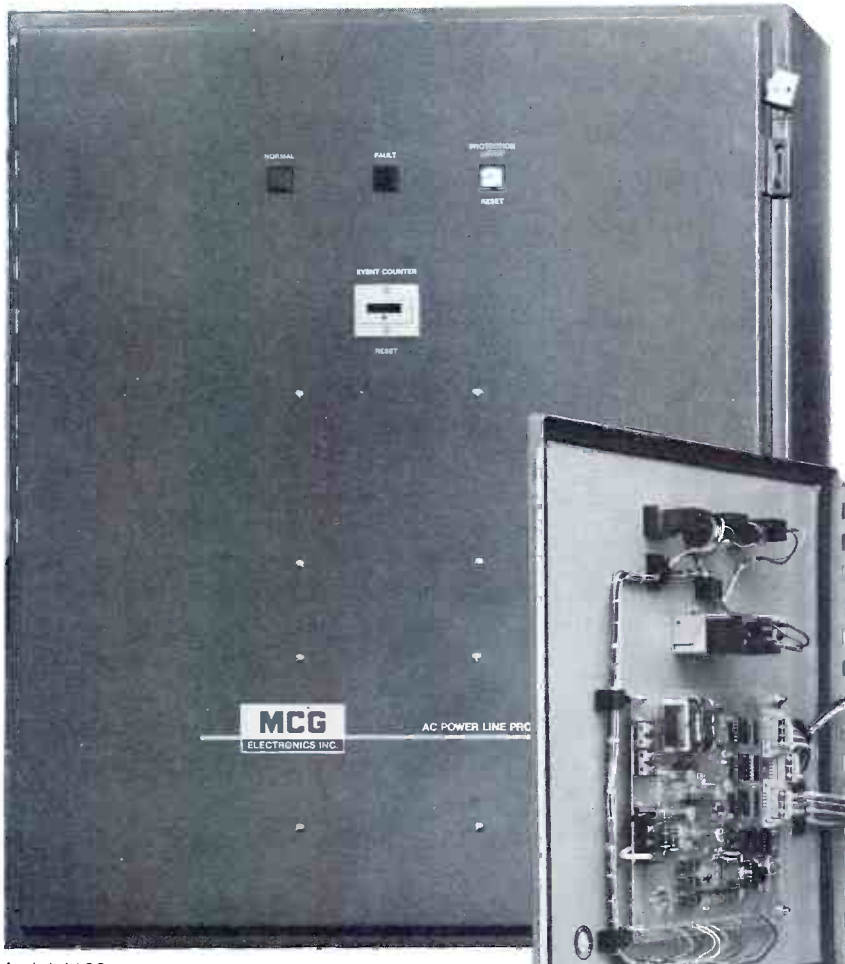
Surges on electric power lines can not only damage the solid state components in your equipment, but a major surge (e.g. one caused by a nearby lightning strike) can completely devastate your equipment. It can even knock out a UPS.

The Surge-Master units react within 5 nanoseconds to protect your sensitive equipment, and automatically reset after each transient.

MCG heavy duty units, with energy handling capacities of 7 to 14 MW (1 ms), voltage range 120 to 570 VAC, 1-phase, 3-phase, Delta, Wye, and current capacities 100 to 5000 amps, are widely used to protect such installations as computer systems, automatic control equipment, radar systems, process instrumentation, marine services, and hospitals. Surge-Masters are easily field repairable: a front panel monitor indicates the presence of a fault, and internal LEDs indicate its precise location; the damaged components can be replaced in minutes.

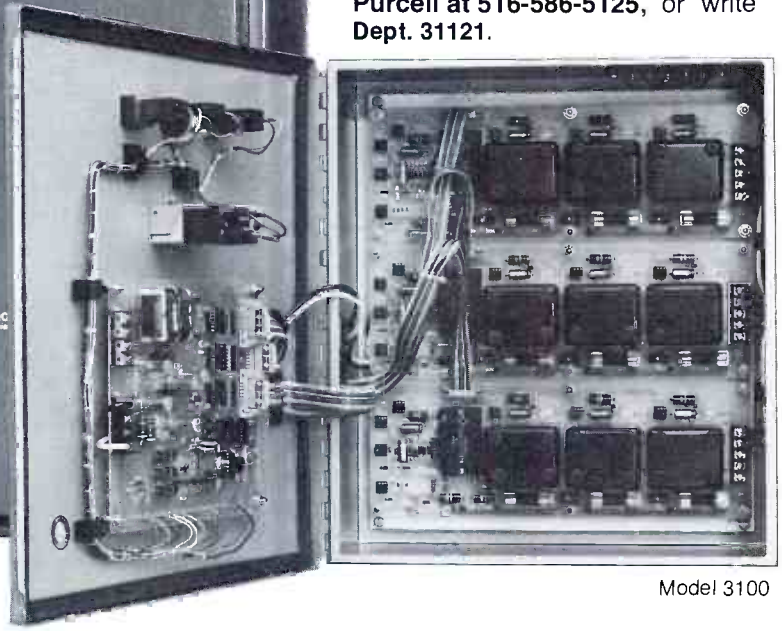
All units are housed in NEMA 12 enclosures, and are covered by a two-year warranty.

For more information, call **Bill Purcell at 516-586-5125,** or write **Dept. 31121.**



Model 4100

Smaller and Larger models available.



Model 3100

MCG ELECTRONICS, INC. 160 BROOK AVENUE • DEER PARK, NEW YORK 11729 • (516) 586-5125

Circle (63) on Reply Card

THE STATE-OF-THE-ART IN ROUTING

There are a number of people in a number of places who claim they're state-of-the-art. But let's face it, the state-of-the-art in routing switchers hasn't changed significantly in years.

Until now. Because 3M is introducing a whole new approach to switching technology. And starting today, you can look to Minnesota for the true state-of-the-art.

Our Series H Switching Systems utilize hybrid integrated circuitry, a technology developed in the aerospace and medical industries.

The results are the best performance specs in the business. Reliability is improved and maintenance is reduced.

Expansion is easier than ever.

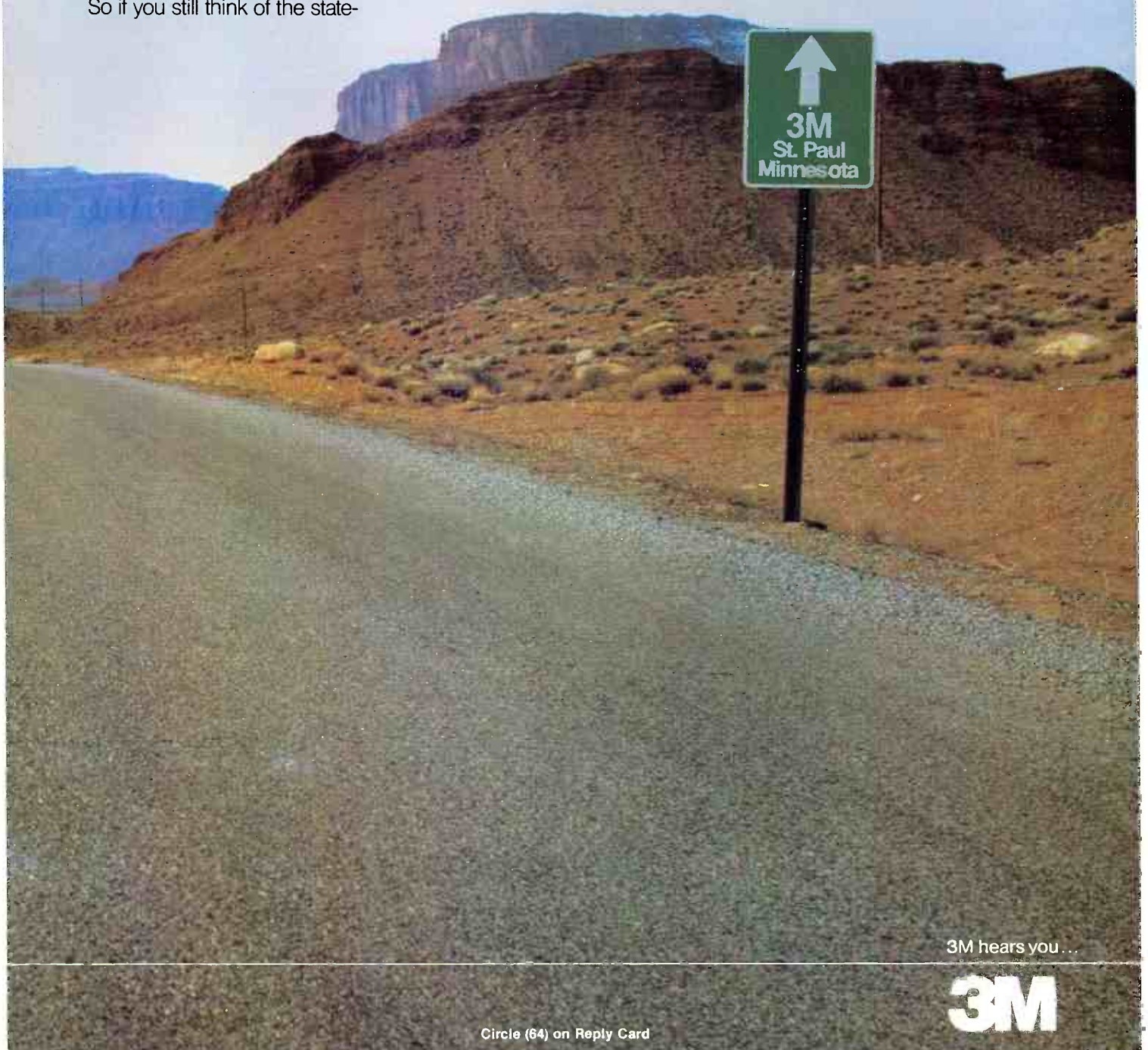
Professional Audio/Video Equipment/3M.

SWITCHERS JUST CHANGED STATES.

And thanks to miniaturization, there's at least a 300% increase in crosspoints-per-rack-unit. What used to take up an entire room can now fit in a closet.

Best of all, we offer all these advantages at a price that's actually comparable to the price of conventional switching systems.

So if you still think of the state-of-the-art in terms of yesterday's technology, call us toll-free at 1-800-328-1684. In Minnesota, call toll-free 1-800-792-1072. Outside the continental U.S., call International Operations collect at 1-612-736-2549. We'll give you a whole new sense of direction.



3M hears you...

3M

Circle (64) on Reply Card

Continued from page 70

Flaherty: HDTV

Flaherty speaking on HDTV.

The first public demonstration of HDTV in Europe represented the work of six European broadcasting and production organizations, with engineers from Sony, Ikegami and Matsushita. Together they produced a series of HDTV program segments that illustrate HDTV's breadth and quality.

The demonstration emphasized the creative use of widescreen HDTV to illustrate the subjective impact such productions will have on future audiences.

High definition is perhaps a misleading term, because the system implies much more than sharper pictures. This creative medium has four specific characteristics:

•First, it has vastly improved definition or sharpness. (The picture has approximately five times more information, or pixels, than a normal TV picture.)

•Second, it offers significantly better color fidelity without many color distortions and anomalies visible in standard TV pictures.

•Third, it offers widescreen or *cinema-like* aspect ratio (five units wide by three units high).

•And finally, it offers multichannel stereophonic sound, which is more dramatic when coupled with the wide screen.

The system used for the Montreux productions operates at a 1125-line resolution at 30fps. The presentations were in stereophonic sound.

The system was developed at the NHK laboratories in Tokyo. That company, along with a number of Japanese manufacturers, have brought the key elements of the system to an advanced state. Camera, lenses, pickup tubes, kinescopes, videotape machines, monitors and large-screen projectors are in an advanced prototype stage. They are sturdy, rugged, field-worthy and generally are the same size as today's standard TV equipment.

Beginning last fall, six European broadcasting and production organizations produced sample program segments to be shown at the symposium. Swiss Television (SSR) produced a segment of the Montreux Jazz Festival; Austrian Television Network (ORF) recorded the *Magic Flute* in Salzburg; the Société Francaise de Production (SFP) recorded *The Monuments of Paris;* Soviet Television (TSS) recorded *The Sleeping Beauty* ballet by the Kyrov Ballet in Leningrad; the British Broadcasting Corporation (BBC) recorded a light entertainment segment; and the Italian National TV Service (RAI) recorded a street festival.

Joseph A. Flaherty
CBS Television
New York

North America, the trendsetter in some of these areas."

Trachsel said that Switzerland was also changing. Applications for radio, local TV and pay TV services have been streaming in, with not enough frequencies to go around. As a result, he said that few broadcasting licenses would be issued, and those only on a trial basis.

Achievement awards

Since its second meeting, the symposium has been holding awards presentation programs recognizing outstanding TV technical developments. The early awards, which honored 42 industry leaders, were designated Montreux Citations. At the 10th Montreux Symposium in 1977, the citation became the Montreux Achievement Gold Medal. A special committee, headed by E. Castelli of Rome, grants the award. The committee comprises eight TV experts from seven countries. This year's Gold Medal was awarded to Ryo Takahashi, retired from NHK Japan, for his pioneering work in HDTV—steering its research and developing its potential.

Exhibits

The list of exhibitors reads like a *Who's Who* in TV equipment manufacturing. What's more, the video and audio side of television got attention, as did equipment for every element of the broadcast chain. Because space is limited, we cannot describe all the new equipment at Montreux. However, we would like to acknowledge a few special exhibit activities.

•**ADDA** sponsored a hospitality room by invitation for conferees to relax and see the company's TBCs/frame synchronizers.

•**Ampex** showed a full line of broadcast equipment at its booth (stand). In the outside exhibit, a mobile TV van scheduled

Achievement Gold Medals

Takahashi (center), this year's Achievement Gold Medalist, with Takashi Fujio (left), NHK Technical Research Laboratories, and Masahiko Morizono, deputy president, Sony Corporation.

The Montreux Achievement Gold Medal honors a specialist's outstanding achievement in developing new techniques or equipment that have significantly improved TV engineering. The Gold Medal winners are:

•**1977. John Baldwin** (Great Britain), for the Digital Intercontinental Conversion Equipment "DICE." 525-625 lines developed under his management. **Claude Mercier,** former technical director of the ORTF (France), for contributing to the European exchange of TV programs.

•**1979. Joseph A. Flaherty** (United States), for pioneering work in electronic newsgathering.

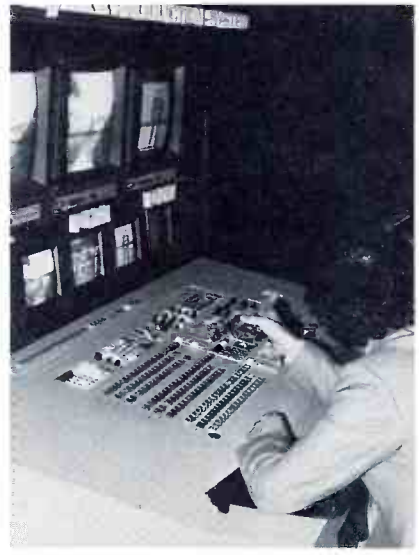
•**1981. Richard Taylor** (Great Britain), for basic development work in digital TV signal recording and processing.

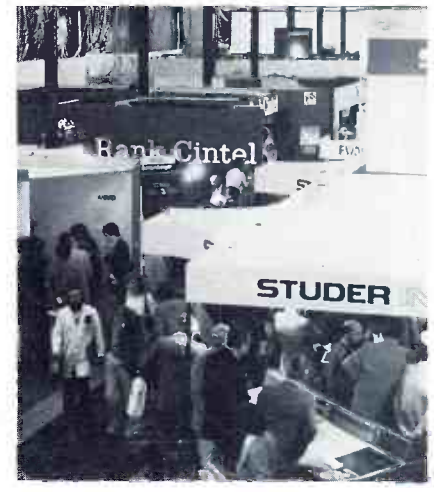
•**1983. Ryo Takahashi** (Japan), for envisioning HDTV's potential and steering its research and development.

for use in the Olympics was on display.

•**Bosch's** night of food and entertainment at the casino was a special event. Its stand drew impressive attendance, especially for ¼-inch videotape equipment and the new graphics system from the US branch (Fernseh). This was also accompanied by news that ABC would soon be field testing the Quartercam system.

•**CMX,** with its booth close to the exhibit





Booth action remained brisk throughout the convention.

When you absolutely, positively, unequivocally, categorically need to look your best.

Available in 2", 1", ¾" and ½" Beta and VHS.

entrance, gained high visibility and high interest in its new videotape editing equipment.

•**FOR-A** showed an impressive mobile production facility in the parking lot.

•**GEC-McMichael** came on strong with new products and an eye to future growth.

•**Grass Valley** and **Tektronix** had an outstanding display of broadcast equipment in a single booth. Also entering into

Vans, dishes and support equipment were located outside the exhibit hall.

Now your ENG units can afford the same "line" microphones bought by every major network!

You can pay as much as $1,500 or more to get a good long-reach line microphone. Or, you can put the new Audio-Technica AT815 in every production unit for under $230 each, or the phantom-powered AT815R for under $300 each.

What you'll hear is performance closely rivalling our more expensive brethren. So close, in fact, that every major network has tried and bought our line microphones. And you'll get some advantages which can be very important in the field.

For instance, the phantom-powered AT815R can interface with supply voltages from 9 to 52 volts without adapters or extra circuits. So you don't have to rebuild present equipment to put it on the air. We also have a neat 2-battery 9V power supply you can use. When one battery is in use, the other is on standby. For your peace of mind.

Our internal-battery AT815 uses a standard AA "penlite" cell available everywhere. And in intermittent use, a premium battery should last about 4,000 hours. That's over a year even if used eight hours every day! Just one less thing to worry about when time is short.

The AT815 and AT815R weigh barely over 9 ounces, to make them easy to "fishpole" or hand hold. And each comes with a foam windscreen which slips on in a second. Our optional shock mount can be added as well. And the AT815R has a bass roll-off switch if needed to control rumble.

Both models are designed to take the rough-and-tumble life of an ENG unit or remote film crew, and keep delivering excellent sound. With the narrow directivity which makes line microphones so useful in suppressing noise and "reaching out" beyond normal mike range.

If you thought line microphones were out of reach of your budget, ask your Audio-Technica sound specialist to show you the AT815 or AT815R. We think you'll agree that the networks are onto something great!

AT815
Line + Gradient Microphone. Under $230. Optional shock mount extra.

AT8410a Shock Mount. Under $40.

AT815R Phantom-Powered Line + Gradient Microphone. Under $300.

AT8501 9V Dual Battery Power Supply. Under $100.

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AUDIO-TECHNICA U.S., INC., 1221 Commerce Dr., Stow, OH 44224 216/686-2600

future technology, Grass Valley displayed its component TV system for conferees.

•**Harris** personnel reported exceptional convention attendance.

•**Philips** displayed its full line of equipment, including hi-fi television and professional digital audiodiscs.

•**Quanta** put on an eye-catching demonstration of its character generator with full PAL color capabilities. The color flexibility was spectacular.

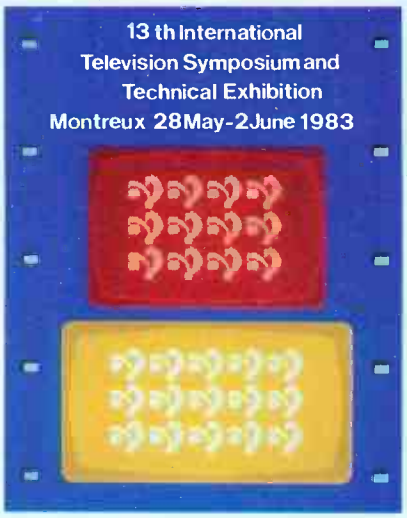
•**Quantel** had a reception at its booth for regularly scheduled demonstrations of its equipment's picture manipulations and video effects. Separately, audiences saw private demonstrations of new equipment prototypes that probably will be available next year.

•**RCA** opened its CCD camera demonstrations for the press. (Our thanks to Arnold Taylor.)

•**Rank Cintel** received close attention for its broadcast telecine equipment and its new Amigo programming system.

HDTV was a hot topic in the sessions and at many exhibit booths.

The RCA CCD camera, held by Sid Bendell, RCA engineer at the symposium.



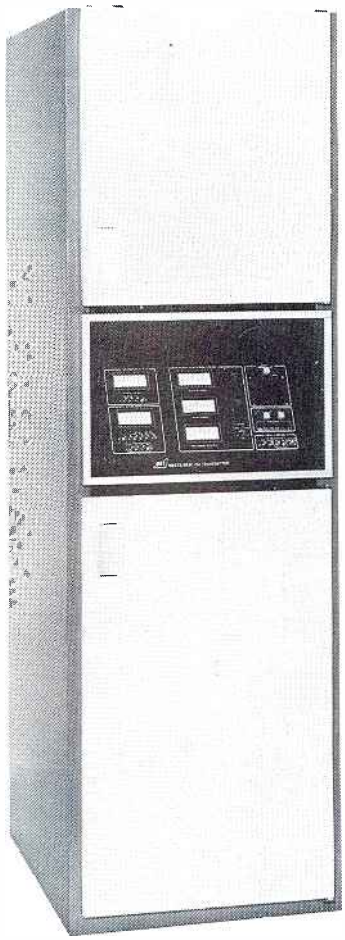
The logo for the 13th Montreux Symposium appeared on covers of the proceedings. It represents the major themes of the conference, including HDTV, digital videographics, present TV systems and their potential impact on the film medium.

The logo design was conceived by Donna Foster-Roizen and Joe Roizen of Telegen and was created on an Aurora 100 digital videographics system by Lisa Zimmerman, the head of Aurora's graphic department, with the cooperation of Dr. Richard Shoup, Aurora's president.

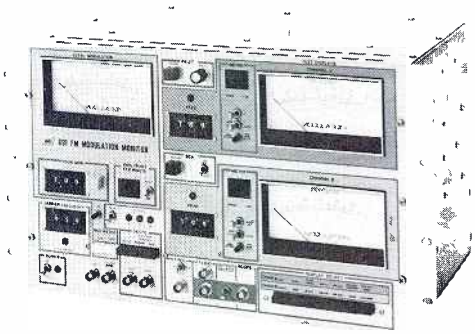
The sprocket holes along the edge depict the continuing role of film in television. The red TV screen represents normal television with its 3:4 aspect ratio and visible line structure. The yellow TV screen symbolizes HDTV with its proposed 5:3 aspect ratio and finer line structure, which will create a future TV image comparable to that of current film quality.

H gh Technology Or Low Price

Do you want a fully remote controlled FM transmitter with features for total automation and satellite feed? Must you have microprocessor logic, digital diagnostics, each with a back-up system? Do you demand a super-low distortion exciter and total solid-state for your new one kilowatt transmitter ...or a 3.5KW with only one tube?
Is it imperative that your transmitter talk to the factory's computer.
Perhaps low price is most important? Look at the deal you can make with companies assembling those 25 years old look alikes.
And maybe you can find a good used remote control unit... cheap.
Prepare for the future, or hold-the-line?
Price or Technology?



The New 695T3.5KW



We make the famous 691 too! A stereo and SCA monitor that can give you accurate readings, even on clipped composite. Over 40 tests performed in minutes on your station, or the competition.

Why not get both,

call John Tiedeck at QEI, 609-728-2020. He will tell you how. Remember, we are the FM people. Monitors, ATS and transmitters from 20W. to 5KW.

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•**Sachtler** personnel were pleased with booth attendance and the industry's acceptance of its tripod equipment line.

•**Sony's** presence was especially noticed in HDTV demonstrations, in separate digital VTR demonstrations and in its impressive booth.

•**Thomson-CSF's** booth was almost always packed for the floor show and the HDTV equipment showing. For the press, the company sponsored a lunch and presentation at a nearby castle.

•**Vital Industries** shared its 25th anniversary with conferees. The booth was an open house of its equipment.

These notes are just a hint of the activity at Montreux-'83. If you would like to obtain data on some of the new equipment shown, see the exhibitor listing, and use our Reader Service Card.

Business activities

One of the exciting aspects of most conventions is the amount of business, especially sales, that occurs. This year, exhibitors at Montreux were surprised and pleased at the amount of booth traffic and accompanying high level of sales.

Although sales were high, few exhibitors reported actual figures. Nevertheless, sales levels, both reported and unreported, indicated a healthy industry.

Business action at the show also took shape with new business alliances being formed to market products internationally. Some of this action follows:

•**Ampex** reported high interest in its mobile (OB) van production capabilities. A van built for the ABC Winter Olympics was shown.

•**Aurora Systems** announced the appointment of F.W.O. Bauch as its UK distributor.

•**Bosch** announced that ABC Network news crews stationed in Frankfurt, West Germany, would soon field test early models of the ¼-inch Quartercam recorder/camera system.

•**Broadcast Electronics** reported sales of 100 stereo cartridge machines, as well as high interest in exciters and generators.

•**CMX/Orrox** announced the opening of its CMX Euroservice office in Amsterdam, Netherlands, to handle sales of the CMX editing products in Europe, North Africa and the Middle East.

•**Marconi** announced further ties with Bell & Howell to market Marconi's broadcast equipment line.

•**PESA** reported recent sales of $150 million in equipment for the PanAm games and high interest in the company's capability of producing specialized OB vans.

•**Sony** had several special announcements. First, CCL Associates was authorized to install and service Sony products in the United Kingdom. Second, Ulster Television was introduced as the latest broadcaster to adopt the Betacam system for all-location electronic production. The Ulster order brings worldwide Betacam sales to more than 800 for the camera/recorder and more than 700 for the replay/edit units. Third, F. Howard Steeele was awarded the Royal Television Society Gold Medal for outstanding service for more than 25 years.

•**Skotel** reported significant progress in acquiring new dealers.

New equipment at Montreux-'83

Convention exhibitors showed their established and new equipment. If you would like to receive data on new equipment displayed, use this exhibitor listing and our Reader Service Card. We will pass along your request, and exhibitors will send you appropriate data, if they have distribution in your country.

AEG-Telefunken, GR ..... (550)
Acron Video, UK ..... (551)
Agfa-Gevaert, GR ..... (552)
Dipl. Ing. P. Albrecht, Elektronik, GR ..... (553)
American Data, US ..... (554)
Ampex Int'l, UK ..... (555)
Angénieux, France ..... (556)
Aston, UK ..... (557)
Audio & Design (Recording), UK ..... (558)
Audio Kinetics Ltd., UK ..... (559)
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Continued from page 16

line. As a result, a technical writer rarely sees the completed item—much less has a chance to use it—before his work is in print. Information gathered during preparation of an instruction book is usually gleaned, distilled, extracted and borrowed from engineering specifications, blueprints, schematics and from fleeting contact with the design and production people.

What a luxury it would be to have a completed working model available to the publications department while putting together the relevant literature. Alas, that's the exception to the rule.

So, please understand the reasons for some of the unavoidable shortcomings in your new instruction-maintenance book accompanying that latest electronic marvel.

Technical writers try to convey as much accurate information as possible. Their work is done to the best of their ability, within a time and money framework over which they have no control.

Merritt F. Malvern
Owner
Merritt Sound Recording
Buffalo, NY

Duly noted. Every story has at least two sides. Your case is fairly presented. Thanks for taking the time to share your views.

Transmitter efficiency

"Improving Tube Life in High Power Transmitters," by David P. Hebert, in April 1983 **BE** (page 81), reminded me of problems we had a few years ago with a 20kW FM transmitter. The transmitter, manufactured by the now-defunct Visual Electronics Corporation, is rated as 74% efficient. Using this figure, we ran a plate input of 27kW to obtain a theoretical 20kW output.

The transmitter exhaust was exceptionally hot and threatened to melt the tar on the roof of the building. PA tubes (3CX10, 000A7s) failed prematurely and autopsies showed damage to the grid structure. Replacement of the blower with a larger unit helped a little, but did not correct the problem.

We borrowed a dummy load and wattmeter from a VHF TV station and confirmed some suspicions. The power output with 27kW input was only 13kW. The heat being exhausted, therefore, was 14kW rather than the 7kW implied by the assumed 74% efficiency. No wonder we had all that tar melting on the roof!

After some research, I decided that the remedy would be to alter the coupling from the previous stage to the PA cathode (the PA is grounded-grid). Lee Melvin, our transmitter supervisor, and I spent a few nights after sign-off experimenting. We discovered that changing the value and physical placement of RF capacitors in the PA cathode circuit increased the efficiency to the 74% figure claimed by the manufacturer. Tube life increased dramatically. Tube discoloration and other problems attributable to excess heat were eliminated.

Based on this experience, I recommend, in addition to the steps outlined in the article, checking the power output with a reliable wattmeter as an aid in diagnosing problems with excessive heating and premature tube failure.

Dan Freeman
TV Engineering Manager
WUSF-FM
Tampa, FL

ZOOM IN ON THE FACTS

If you are about to make a big investment in a telecine for film-to-tape transfers, one factor alone could well influence your decision:

The Rank Cintel MkIIIC is the only state-of-the-art telecine available with built-in zoom/positioner — because the Rank Cintel flying-spot scanner is free from the limitations inherent in CCD scanning technology.

X-Y Zoom now enables you to zoom in and out at full t.v. resolution just like a camera, giving you that extra creative freedom at the post-production stage that our competitors can't offer. No longer are you dependent on what the camera recorded. Your shots can be subtly re-framed or even cropped quite dramatically without loss in picture quality.

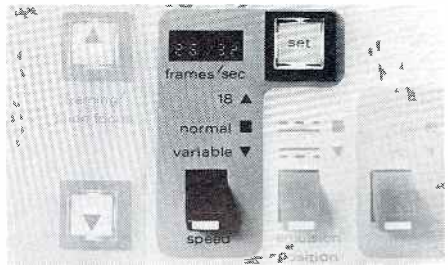
If Zoom isn't enough to convince you, don't forget that the flying-spot MkIIIC stands supreme in many other respects:

For example, the MKIIIC can produce just as good pictures from stationary film as it can from moving film. This means that any correction — including gamma — can be made on a still frame or 35mm slide. And what you see is the frame actually in the gate, not a simulation.

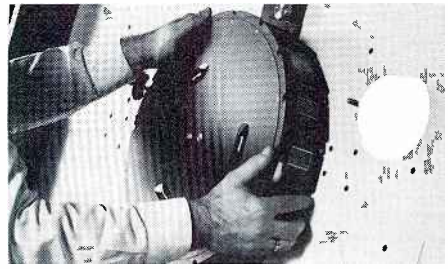
Then there is the ability to reproduce with Panscan all non-standard aspect ratio films at full resolution. Whatever the film, you still get the outstanding pictures for which the MKIIIC is famous.

Famous, and rightly so. No CCD telecine — not even our new ADS 1 for broadcasters — can match the impressive results of a MkIIIC, especially from negative film. High definition; wide contrast range; perfect registration; accurate colorimetry; extended resolution capable of showing even the finest detail — these are the advantages which give the MkIIIC a clear lead over CCD-based film scanners. And if you do choose negative, you simply throw a switch on the control panel from "pos" to "neg". The MkIIIC does the rest.

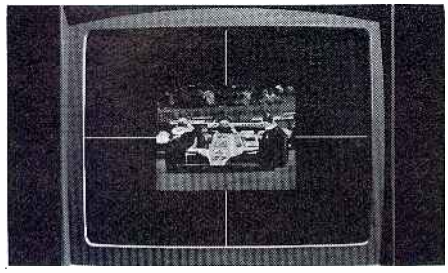
So why not zoom in on the MkIIIC telecine? Some of its features make it unique, others merely make it the best.



Varispeed - *Film speed is variable between 16 and 30 f.p.s. on 525 and 625. System is referenced to TV sync pulses for accuracy of 0.0001%. Essential for time compression or expansion.*

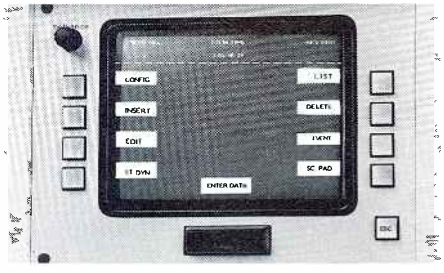


Slides - *Two options for 35mm slides are available: a two-position "push/pull" carrier; a 16-position revolving drum with remote-control panel. Changeover time from film to slide operation is typically 30 seconds.*

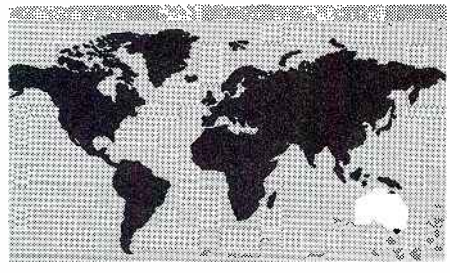


X-Y Zoom - *Overall ratio of 6:1. Joystick control for exact selection of picture area from within the frame or precise positioning of a reduced full-frame insert.*

Panscan - *Allows panning on wide-screen films. The MkIIIC reproduces any non-standard aspect ratio: 1.33, 1.66, 1.85, etc - all at full height and resolution.*



Amigo - *All control functions including X-Y Zoom, Varispeed, Panscan and secondary color correction can be programmed on the latest-generation, scene-by-scene pre-programmer with built-in VDU. A very fast, "user-friendly" computer with powerful editing facilities for all MkIII-series telecines.*



Multi-standard, multi-format - *Operation switchable between 525 and 625. Plug-in vision gates for 35mm, 16mm, Super 8mm, Super 16mm film are readily inter-changeable with each other or with slide carriers.*

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new products

Audio console

Introduced at NAB-'83, the *Howe Audio Productions* 7500 features high quality faders controlling VCA technology and digital remote start/stop controls. Twelve mixing channels handle 22 inputs to produce two stereo outputs and a mono mix.

Circle (510) on Reply Card

Demagnetizer

The *CMC Technology* Videomax TD-800 bulk tape demagnetizer is capable of –60dB erasure of 2-inch tape, because it is designed to demagnetize 1-inch high energy tape formulations with a coercivity to 740 oersteds down to a –80dB level. The unit is capable of erasing all current ¾-inch and ½-inch recording materials as well.

Circle (511) on Reply Card

Coax connector

No soldering is required with a new N-type connector from *Gilbert Engineering*. An attached crimp ring simplifies installation on RG-214, RG-213, RG-8 or RG-11 cable.

Circle (512) on Reply Card

Frequency counter/wattmeter

The FCW-10 digital unit from *Coaxial Dynamics* features a fully integrated, multifunctional digital frequency counter with range dc to 512MHz (1.3GHz optional).

Circle (513) on Reply Card

Reverb variation

The *MICMIX* Master-Room DC-2 allows variation of the reverberation decay time of live chambers, plates or spring reverb systems. It also provides up to 30dB of noise reduction on almost any reverb device.

Circle (514) on Reply Card

Studio monitor speaker

The *Electro-Voice* Sentry 505, an acoustic match for the Sentry 500 monitor, features almost flat frequency response from 40Hz-18kHz.

Circle (515) on Reply Card

Image recovery system

The CEVAX (Contrast Enhancing Video Assist eXpander) from *Simtee* allows the use of video assist in minimal lighting situations where it was previously impossible. It boosts the video signal more than 16dB, increasing the contrast more than four times what is presently available.

Circle (516) on Reply Card

FM exciter

The *QEI* 695 features a built-in modulation meter including a peaks/minute display and a tri-color bar graph. The synthesized, broadband unit will operate with most transmitters and stereo generators, plus it has inputs available for two SCA generators.

Circle (517) on Reply Card

Have you called your switcher lately?

The new Bosch TVS/TAS-2000 video/audio distribution switcher is so advanced you can call it on the phone. And it can talk back to you.

If you're the station manager or chief engineer, you can control all your station's feeds directly from your desk—without affecting the program on-air. You don't even need a control panel. Just a touch-tone phone.

And if it makes you feel more comfortable, the TVS/TAS-2000 will confirm—verbally—what you've done.

Have it your way

Touch-tone control is just one of the sophisticated control options available with the TVS/TAS-2000 to let you fit your needs precisely.

And we know something about your needs because we've been a leading manufacturer of distribution switchers for years with our TVS/TAS-1000 and RKX models.

You can choose from standard control panels with leverwheel and button per crosspoint. Or customized panels for single bus to full matrix control. Or completely automated systems.

Our new 1400 and 1500 series control panels can handle multi-level breakaway—seven levels is standard.

Since the TVS/TAS-2000 is part of a family, you can add most of these control options to existing Bosch-Fernseh TVS/TAS-1000 and RKX switchers.

Outstanding specs.

As you'd expect in a state-of-the-art system, specifications are outstanding. Crosstalk is better than 60dB for video and 85dB for audio under worst conditions. Harmonic distortion is .02%. Impedance, 150 ohms.

We check our specs with the industry's most precise automatic test system, testing all possible signal paths for each measurement. And we record all test data, with a copy to you and one for us.

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And into the future.

The TVS/TAS-2000 has standard and optional features you need today. And will need tomorrow. Such as redundant control card capability. Coax party line or RS-422 control. SMPTE RS-422 computer control. Vertical interval switching. Internal refresh memory. Local and remote alarms. Clamped video inputs. And many more.

Its compact 10 x 10 arrangement gives you a bigger matrix in an 8¾ inch card cage—60 x 10 audio and video or 130 x 10 audio or video.

You can expand in the field without rewire to virtually any size matrix you may ultimately need.

Call your local Bosch-Fernseh office for details on the new TVS/TAS-2000 and other members of the Bosch switcher family. Or write Fernseh Inc., P.O. Box 31816, Salt Lake City, Utah 84131, (801) 972-8000.

We won't give you any backtalk.

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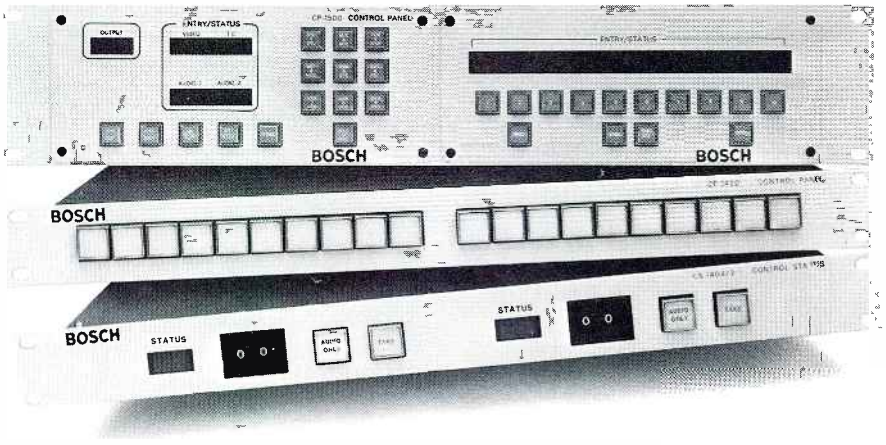
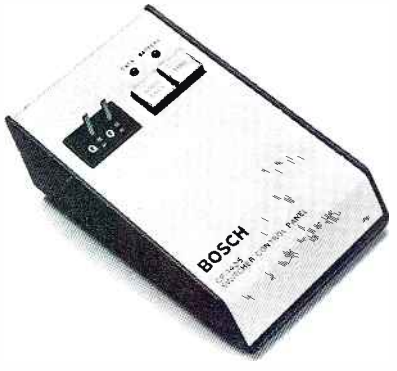
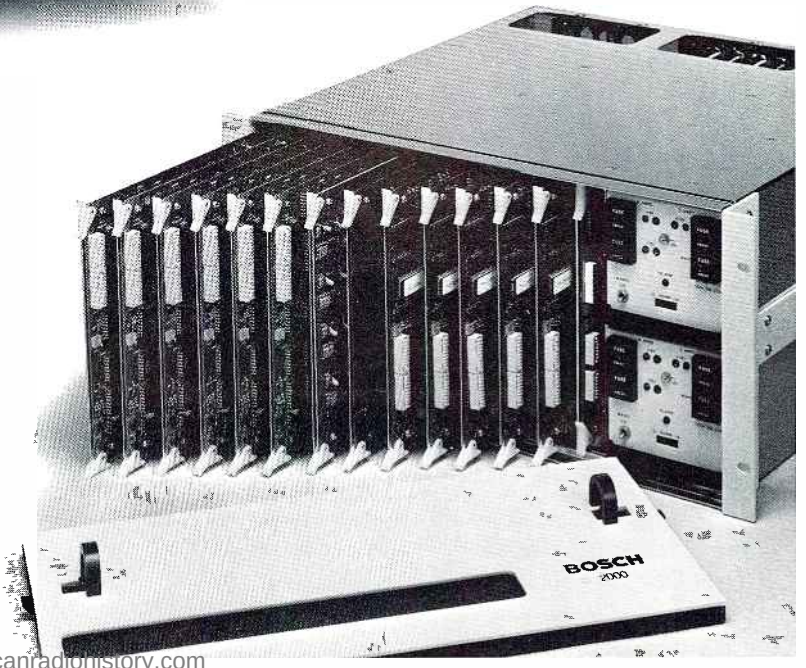






Circle (88) on Reply Card

Setup tape

Monitor setup tape from *Jenel Consultants* allows non-technical personnel to set up and evaluate any black-and-white or color monitor. Simple adjustments and monitor performance assessment are possible.

Circle (518) on Reply Card

Disc cleaning kit

The *Texwipe* Read/Right floppy disc head cleaning kit allows easy cleaning of microcomputer and word processor read/write heads. Capable of cleaning single- and dual-sided heads, each kit contains a Read/Right cleaning disc and a 1-ounce aerosol of Read/Right head cleaning solvent.

Circle (519) on Reply Card

E-FLEX accessory

The Optiflex EPR-400 perspective/rotation accessory from *NEC America* adds a range of 3-D effects to E-FLEX sequences. The image can be rotated around three axes: horizontal, vertical and perpendicular.

Circle (520) on Reply Card

LPTV transmitters

Harris Broadcast's TV series includes VHF highband, VHF lowband and UHF models available in 1kW, 2.5kW, 5kW and 10kW. The transmitters are available for M, B, G and other TV systems.

Circle (521) on Reply Card

Battery belt

Saft America's Portable Battery Division has introduced a battery belt that offers 4-hour continuous power for video cameras and recorders. Charging is completed within 16-24 hours.

Circle (522) on Reply Card

Stereo power amplifier

The *Sescom* SH-1 comes to a 1¾-inch rack-mount

enclosure. It powers small control room monitors and, when used with the Sescom SHB-1 headphone junction box, may power multiple headphones.

Circle (523) on Reply Card

Wireless communication

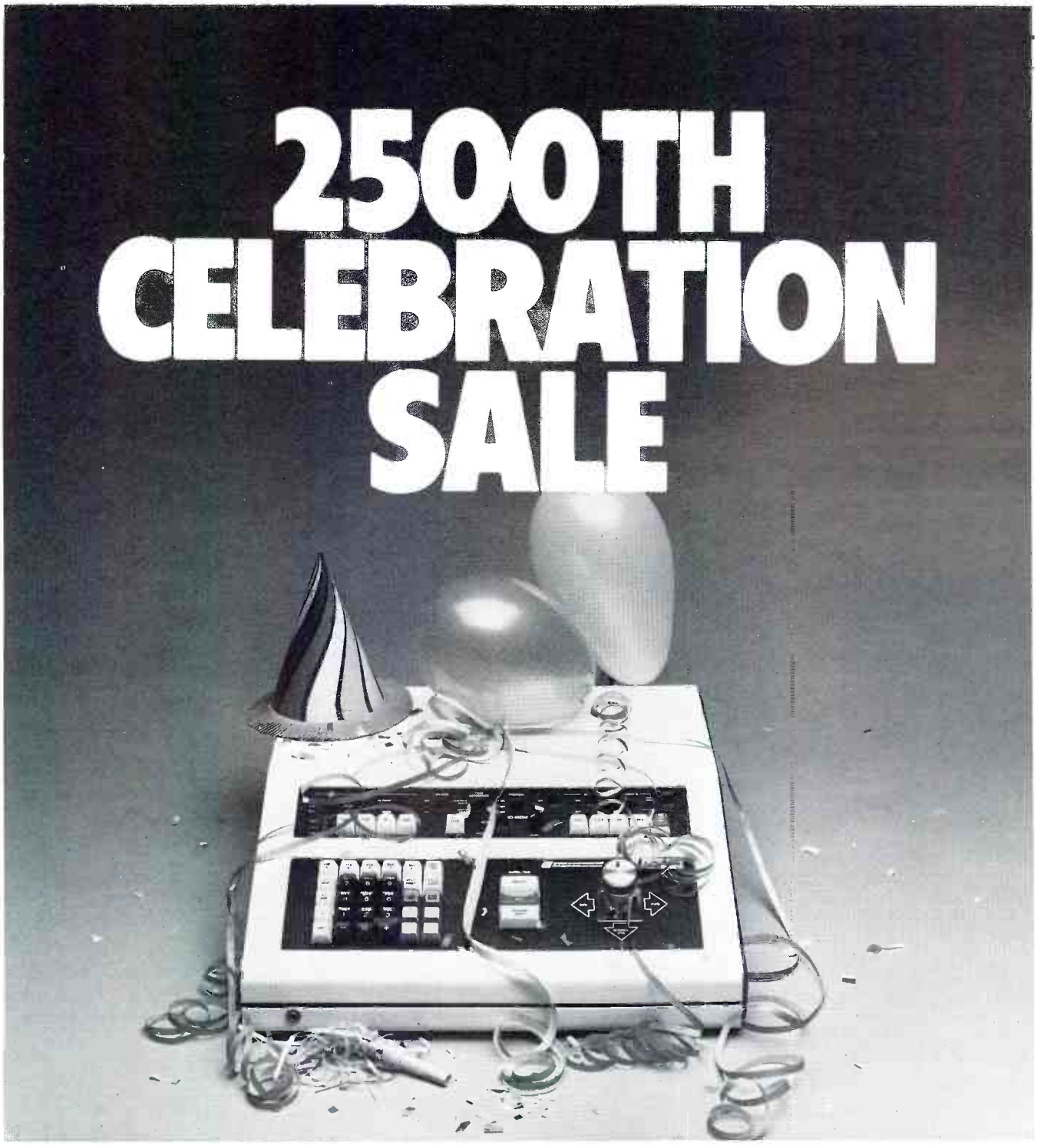
The *Nady* PRC-3 receiver/transmitter includes a headset and body pack system, operating at 49MHz, with full duplex capabilities. No licensing is required.

Circle (544) on Reply Card

Event timer

The AT-1200 audiotimer from *Audiolab Electronics* offers a 4-digit readout of hours/minutes or minutes/seconds on 0.7-inch, 7-segment displays. Three-way operation includes interconnect to audio sources, panel pushbuttons and remote contact closure or pulse.

Circle (545) on Reply Card



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VECTORSCOPE ½ RACK solid state, 26 pin camera cable for KY2700 camera, remote control unit for same. Call Rudy, (213) 877-2218 collect. 8-83-1t

EQUIPMENT FOR SALE (CONT.)

TK-28B Color Telecine witn ASCET (fitted w/saticon tubes). Includes: Remote joystick control panel gamma control panel and extenders. **TP55B** Multiplexer with 3 input and 1 output port. Includes: Internal TK28 mounting package and monitor bridge. TP7B Slide Projector with solid state control unit. Includes: 7½" lens; remote control panel. **FR35B-TV** 35mm Projector (135mm lens). Includes Remote control panel; instant start/stop; variable speed; 6000' modification kit. **PM86SL3** Magnetic 35/16mm 3 track Recorder/Reproducer. Includes: Edgetrack time code capability. **Athena 5000TSM** 16mm Projector. Includes: 1, 2, 4, 6, 8, 12, 16, and 24 fps operation; instant start/stop; still operation; remote control panel; Pi-clear wet gate. **System XL** Color Corrector (scene-by-scene) interfaced to TK28B Film Chain. Includes: Full control of color balance; colorimetry, and luminance components. System in operation approximately 48 months. Package Price—$119,500.00. Please contact Joe Flores for technical questions, Sid Kavenow for purchase inquiries. Also for Sale: Five 3M Color D.O.C. (Part #7680A000) International. Never Used—$5,500.00 each. **RCA TKP-45 Color Camera** with Studio CCU Angenieux 10 x 16T zoom lens—$10,500.00. Swell Pictures, Inc., 233 East Wacker Drive, Chicago, Illinois 60601, (312) 649-9000. 8-83-1t

SCA GENERATOR FOR SALE. Moseley SCG-4T 67kHz, 3½" rack mount. Excellent condition with instructions. Guaranteed, $475.00. McClanathan & Associates, P.O. Box 750, Portland, OR 97207. 8-83-1t

RCA TF-12BH TV ANTENNA PARTS. Junction box with transformer, 3⅛" 51.5 ohm input. Good condition. Two available at $280 each plus freight. McClanathan & Associates, P.O. Box 750, Portland, OR 97207. 8-83-1t

HITACHI 1" TYPE C portable video tape recorder MODEL HR-100, 2 batteries with charger and AC power supply, $21,000. Telephone (405) 348-7790. 8-83-1t

USED, FULLY OPERATIONAL 55kW UHF television transmitter (CH 53), complete with automatic (motorized) high-level RF switching, waveguide transmission system and Bogner BUH32 antenna. This complete RF system is fully available on an "as is—where is" basis immediately. Please respond in writing to: Stuart M. Kravitz, Comark Communications, Inc., P.O. Box 275, Colmar, PA 18915. 8-83-1t

IVC 9000 VTR's: (3) machines fully loaded, post 250 serial numbers. Includes all Tektronic monitoring, spare drum, full documentation. Will be available after November. F.O.B. N.Y.C. $45,000. Large quantity of used stock also available. Call Mike Panico (212) 957-6789. 8-83-2t

BROADCAST EQUIPMENT FOR SALE

(2) Ikegami Demo HL-79DAL Color Cameras with Canon J13X9BIE II Lenses and accessories. $29,000.00 each. Call Steve Detch at Roscor Corporation for addtl. details 312-539-7700.

WIDE SELECTION OF USED BROADCAST equipment including Ampex AVR-2, Hitachi SK-70, complete film chain with RCATP66 16mm, Simplex GPL35mm Gates 245 Camera with multiplexer, 2 IVC 1" video recorders with TBC and editor, Ampex RA4000 editor, 2 Ampex ¼" audio recorders, Scully master audio recorder, 19" equipment racks and a host of associated equipment. For more info call Rick Owen at (214) 630-4848. 8-83-1t

WANTED TO BUY

WANTED: Pre-1923 radio equipment and tubes. August J. Link, Surcom Associates, 305 Wisconsin Ave., Oceanside, CA 92054, (619) 722-6162. 3-76-tf

HIGHEST PRICES PAID for 112 Phase Monitors and for clean, 12 year old or less, 1 KW and 10 KW AM Transmitters. All duty and transportation paid. Surplus Equipment Sales, 2 Thorncliffe Park Dr., Unit 28, Toronto, Canada M4H 1H2, 416-421-5631. 2-79-tfn

WANTED: STATION LIBRARIE'S OF MUSIC, 16" ET's, 12" Transcriptions, 45's, 78's, LP's. Boyd Robeson, 2425 W. Maple, Wichita, KS 67213, (316) 942-3673, 722-7765. 5-82-tfn

WANTED TO BUY (CONT.)

WANTED: GOOD SURPLUS TYPE T12-A AM broadcast crystals for crystal bank; mutually beneficial so contact us for details of plan. BROADCAST CRYSTALS: for AM, FM and TV transmitters. Frequency change, repair or replacement of oven types, also vacuum types available. Over 30 years in this business. Eidson Electronic Co., Box 3751, Temple, TX 76501. (817) 773-3901. 4-83-eom

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We're looking for the right person to handle a variety of TV studio responsibilities. If you have experience with Ampex 1" VTR's, Mach I or CMX editing systems as well as computer based lighting systems, we are interested in you. An engineering degree and 3-4 years' experience with this type of equipment are required.

We are a Fortune 500 manufacturer of electro-mechanical and electronic equipment offering opportunity and a substantial compensation package. Please send your confidential resume or letter (must include salary requirement) to Cynthia Duwel.

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CHIEF ENGINEER FOR UHF CBS AFFILIATE. Excellent opportunity for knowledgeable manager. People and equipment skills a must. Send resume or call Dennis West, WIFR-TV, Box 123, Rockford, IL 61105, 815/987-5300. EOE. 8-83-1t

TELEVISION STUDIO ENGINEER—If you have two years experience as a TV Studio Engineer with a general Radio-Telephone License, you will get great benefits and a great working environment at this station located in the heart of the Permian Basin. Must be flexible. Weekends and evenings required. Contact Grady Woodward, Chief Engineer, KMID-TV, 915-563-2222. EOE. 8-83-1t

TRADE MAGAZINE AUDIO EDITOR

Number one technical publication in broadcast field, BROADCAST ENGINEERING, has expansion opportunity for radio/audio expert. Due to record growth, new radio editor needed to provide expertise and write articles on technical aspects of radio. Will also edit materials from outside contributors and offer technical assistance to other publications within our electronics group. Must have extensive experience and knowledge of radio engineering. Prefer technical degree, and FCC First Phone license required. We offer competitive salary, benefit program of Fortune 100 company and continuing growth potential. Send complete resume with salary requirements to: Personnel Director, Intertec Publishing Corp., P.O. Box 12901, Overland Park, KS 66212.

EOE M/F/H

MOPIX/TV FACILITIES MANAGER (Technical operations Manager): Supervises Washington, D.C. plant of 85 employees. Position requires at least 10 years experience at network or major market television station. Skills should include extensive studio maintenance of state-of-the-art television equipment, hands-on experience with studio color cameras, video tape machines (¾-Quad—1-inch), signal converters, and engineering gear. Must be proficient in the technologies of computer operations, satellite, teleconferencing communications. A strong, technically fluent leader is needed. Graduate engineering degree preferred. Salary range from $56,945 to $67,200. Senior Executive Service. Send resume or application by August 7, 1984 to: U.S. Information Agency, Room 524, 400 C Street, S.W., Washington, D.C. 20547. USIA IS AN EQUAL OPPORTUNITY EMPLOYER. 8-83-1t

PROJECT ENGINEER—SATELLITE COMMUNICATIONS. The Christian Broadcasting Network, Inc., an evangelical Christian ministry, is accepting applications for a Project Engineer-Satellite Communications. Applicants should possess a BSEE Degree plus two (2) years experience or five (5) years experience in directly related fields. Must have knowledge of satellite communications, equipment and technologies including maintenance to handle telecommunications requirements, teleconferencing, and feeds. Ability to arrange uplinks, down links, transponder time, and Telco loops. Please send resume and salary requirements to: Employment Manager, Christian Broadcasting Network, Inc., CBN Center, Virginia Beach, VA 23463. CBN is an Equal Opportunity Employer. 8-83-1t

ENGINEERS, TV Systems Engineers, Electronic Technicians, Technical Supervisors, Maintenance. Immediate openings. Experienced. Full time. Full benefits, plus Pension. Excellent salary plus commissions. Send resume to Technical Operations, Inc., P.O. Box 840, New Hyde Park, N.Y. 11040, or call Personnel Mgr. (516) 352-2238. 9-80-tfn

CHIEF ENGINEER—WHON-WQLK, Richmond, IN. Salary plus fringe benefits. High-power FM, Directional AM, and automation experience a must with at least 2-3 years ex. Send resume to: Richard Huckaba, GM, P.O. Box 1647, Richmond, IN 47374 or call: (317) 966-3932. 8-83-2t

MAINTENANCE SUPERVISOR WANTED for fast growing 38th market NBC affiliate. Good benefits plus excellent southern location. Beach or mountains just two hours drive. Three to five years minimum studio plus TCR-100 experience and general license required. Send resume and salary requirements to Director of Engineering, Durham Life Broadcasting, Inc., P.O. Box 1511, Raleigh, NC 27602. 7-83-2t

FM ENGINEER FOR GROWING AOR Radio Group based in Duluth. Exciting projects, imaginative remotes, maintain best equipment in top notch condition. Top salary and benefits. Resume to KQDS, Box 6167, Duluth, MN 55806. 8-83-2t

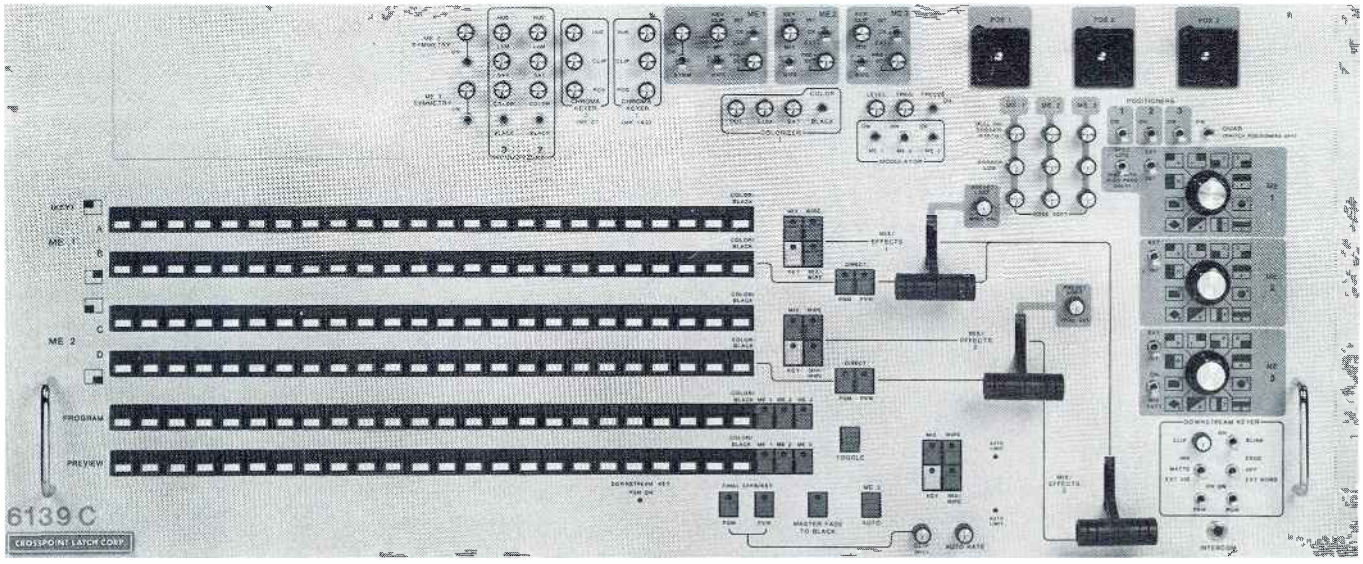
CHIEF ENGINEER: ITFS 4-CHANNEL SYSTEM serving Catholic education in N.Y. area. DUTIES: Maintain and supervise transmission, production and field service operation. REQUIRES: 1st F.C.C., experience with production and transmission and supervisory ability. SALARY: Negotiable (good growth experience). Send resumes to Dept. 519, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 8-83-1t

POST PROD. SUPVR. Minimum 3-5 years supervisory experience. Complete technical knowledge of CMX systems operation and maintenance, all peripheral equipment. Ability to train, co-schedule, and evaluate editing staff. Prefer background in cultural and public affairs editing. **POST PROD. EDITOR.** Minimum 3-5 years experience in computerized post-production. Able to utilize CMX 340X and system peripherals. Assignments: 5-10 min. mini docs, promos, 30-60-90 min. docs, public and cultural affairs specials. Involved with pre-planning, off and on-line creative elements with producing staff. Equal Opportunity Employer. Send resume to: Jerry Huiting/Chief Production Engineer, KTCA/TCPT, 1640 Como Avenue, St. Paul, Minn. 55108. (612) 646-4611. 8-83-1t

VIDEO SALES—Major N.J. video dealer offers a challenging opportunity for professional video sales people. Previous industrial and/or broadcast experience required. Salary commensurate with experience. Commission, car, excellent fringe benefits. Reply in confidence to: Video Corporation of America, 1913 Route 27, P.O. Box 697, Edison, N.J. 08818. 1-82-tfn

6139 SUPERB QUALITY

THE PRINCIPAL FEATURE



The quality of the 6139 is superb. You could not ask for more. Imagine you had to select a switcher for one feature and one feature alone - quality. If you overlooked the tremendous production power of the 6139, overlooked its ability to be controlled from most editors, overlooked its modular state of the art design, you would still end up selecting the 6139, based on that one single feature - its high quality performance.

8, 16, OR 24 INPUTS LED OR ILLUMINATED PUSHBUTTONS

PRODUCTION

- **THREE MIX EFFECTS SYSTEMS**
- **FIVE LEVELS OF KEYS**
- **QUAD SPLIT**
- **DOWNSTREAM KEYER, WITH EDGE, MATTE AND INSERT**
- **DOWNSTREAM FADE TO BLACK**
- **TWO CHROMA KEYERS, RGB OR ENCODED**
- **THREE COLORIZERS**
- **MASTER FADE TO BLACK**
- **AUTOMATIC AND MANUAL TRANSITIONS**
- **MIX PATTERN MODE (DISSOLVE PATTERNS)**
- **TOGGLE**

POST PRODUCTION

THE 6139 INTERFACES WITH MOST EDITORS. It will accept commands directly from their keyboards, when used in conjunction with the CROSSPOINT LATCH 6403 Editor Switcher Interface, or the 7200 AUTO DRIVE. These are not mere "INTERFACES", nor are they merely "PROGRAMMABLE". They are human engineered devices SPECIFICALLY designed for use in editing. Consider just one point; they allow the operator to set the START and FINISH points of a transition precisely, (in order to obtain FRAME ACCURATE edits) while at the same time leaving the editor full control of the rest of the switcher functions; and the ability to insert and control these other functions from the edit list.

THE ELECTRONICS

New state of the art design. Multiple back-porch feedback clamps provide a very high degree of stability. Modular construction, with standardized function oriented plug-in boards facilitate maintenance, and field replacement. We recognize the fact that no matter how reliable a unit is, there is always the possibility that a component can fail. The 6139 has been designed with back-up paths, to reduce the possibility of complete shut down. For instance the PREVIEW system is an exact duplicate of PROGRAM. Several boards are interchangeable, and may be swapped to at least provide essential functions in an emergency.

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- ☐ 25 TV & FM station
- ☐ 26 TV, AM & FM station
- ☐ 27 CATV facility
- ☐ 28 Non-broadcast TV including closed circuit TV (CCTV)
- ☐ 29 Recording studio
- ☐ 30 Teleproduction facility
- ☐ 31 Microwave, relay station or satellite company
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BROADCAST® engineering

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For dependable, quality audio, make sure all the parts get along.

All metalwork is of welded, heavy-gauge steel construction with durable, textured epoxy paint. Dark blue finish.

McCurdy turntables are engineered for broadcast use, incorporating rugged construction, specialized features and weighted, isolating shock mounts.

Convenient housings in matching woodwork are available in a range of sizes for cart machines, auxiliary equipment and jackfields.

This modular stereo audio console (SS8670) is available in 16, 20 and 22 channel standard versions. Custom designs can be produced to meet specific requirements. The control panel is made of mar-resistant, heavy gauge, vinyl-coated steel strips, set into aluminum extrusions.

Sloping, front-hinged mounting panels are available for all popular reel tape machines.

High quality woodwork and trim is custom built to your specifications. Choose from solid oak or walnut.

Let McCurdy put it all together!

Technical harmony is essential to clear professional audio. All the components have to get along before the system can deliver its full potential.

At McCurdy, we strongly believe in technical harmony. It's the basis on which we've built all our dependable, quality audio systems for over 30 years. And because McCurdy can supply the complete system, we can guarantee that it will work together and work right.

Whatever the audio requirement, a McCurdy system can fill the need with quality components. Take our consoles for example . . . from standard versions to custom models, we cover the complete range of audio applications. Or our turntables . . . the only turntable systems designed specifically for broadcast. And all McCurdy audio systems are available with various tape configurations, turrets and/or jackfields.

Let McCurdy put together a complete audio system for your broadcast application. McCurdy components get along so well, you'll agree they were made for each other. And the result of that is technical harmony . . . the best audio possible!

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In an era of escalating technological innovation Ward-Beck continues to expand horizons for the broadcasting industry. Fulfilling the ever more sophisticated requirements of major television production facilities around the world prompts us to develop increasingly comprehensive designs.

Illustrating the scale of current engineering concepts is this custom 64 input, 24 track console system for the innovative studio complex at *Golden West Television* in Hollywood.

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