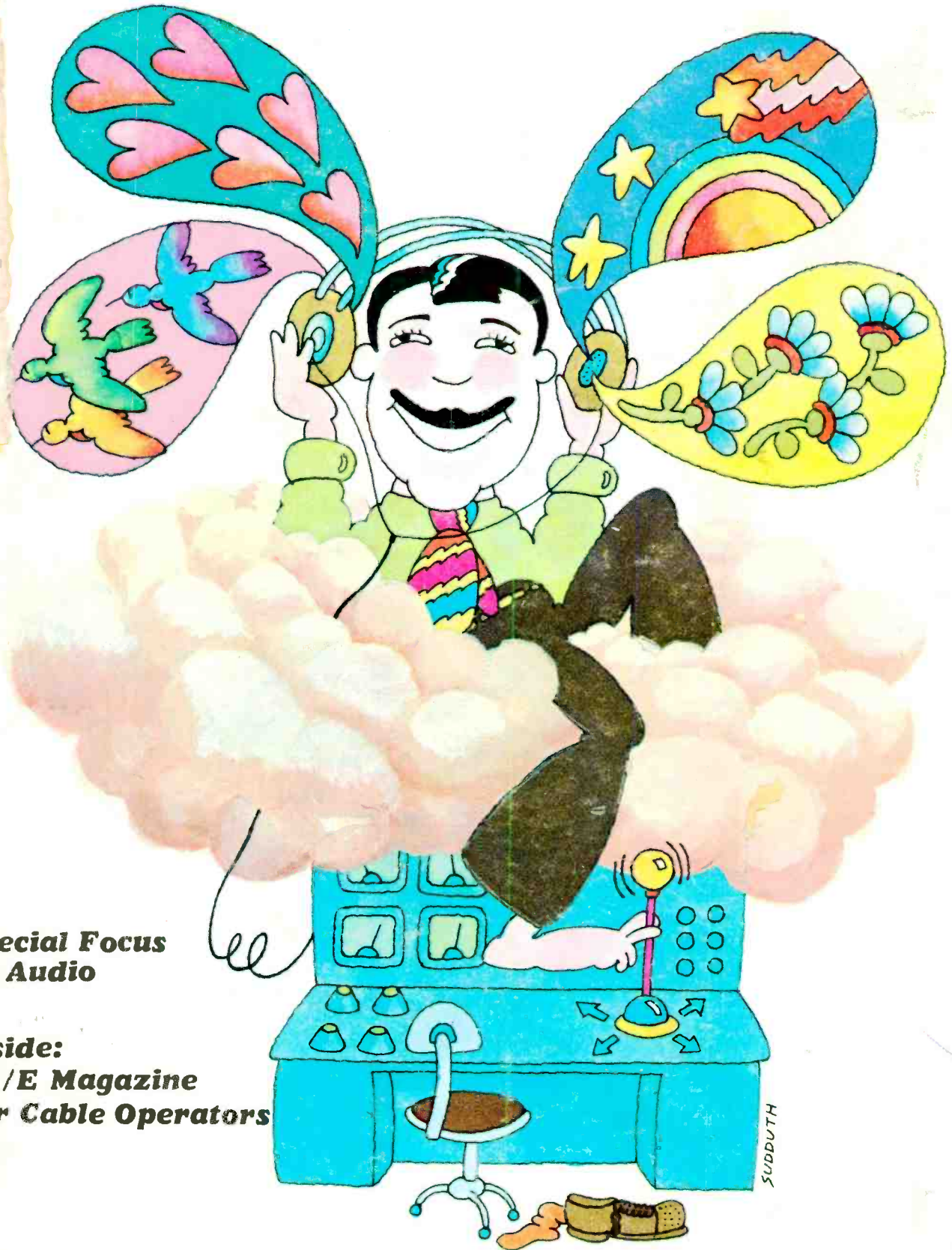


DECEMBER 1971

BM/E

BROADCAST MANAGEMENT/ENGINEERING

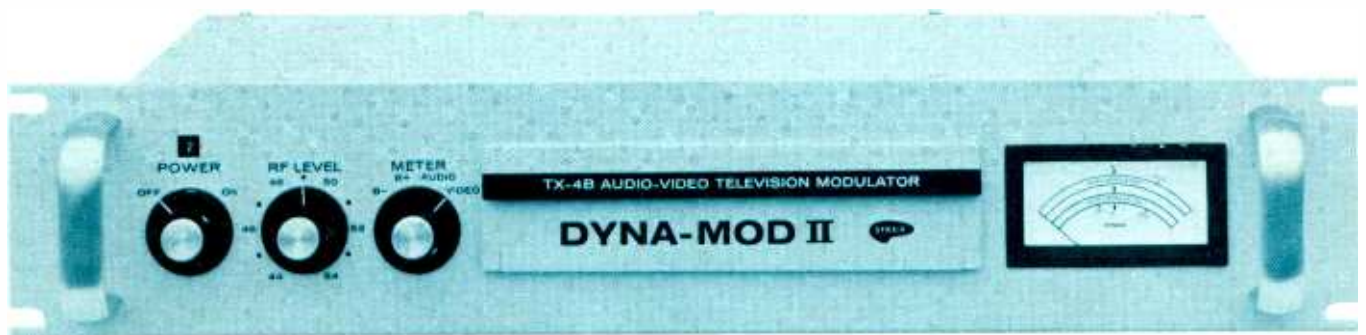


**Special Focus
on Audio**

**Inside:
CM/E Magazine
For Cable Operators**

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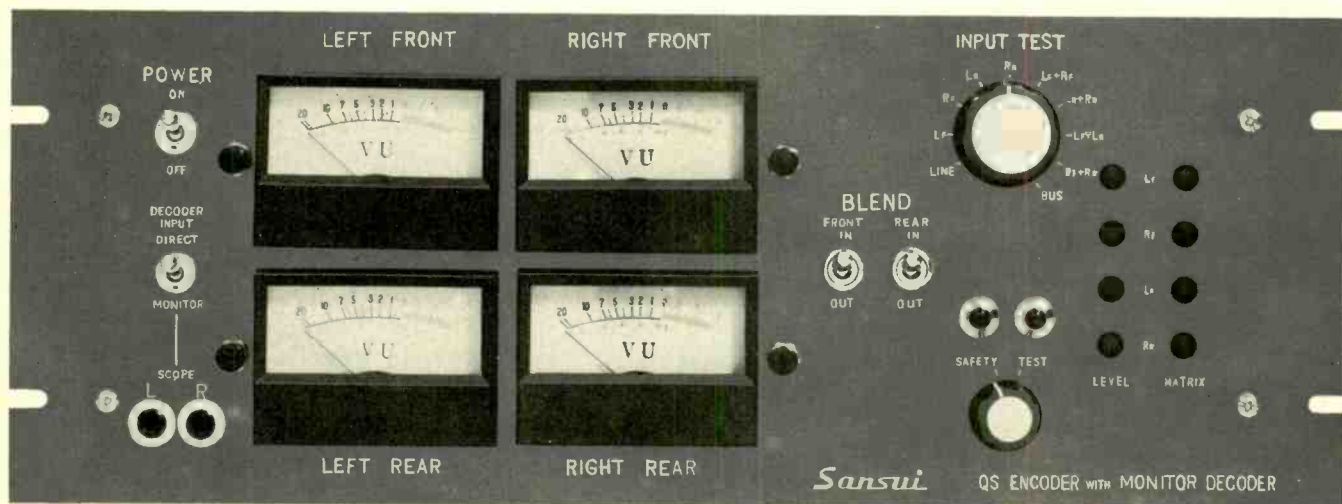
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Happiness comes from a joy stick that moves in four directions. And, believe it or not, in early 1972 you will be able to get four-channel headphones from Electro-Voice (Patent 3-609-240).

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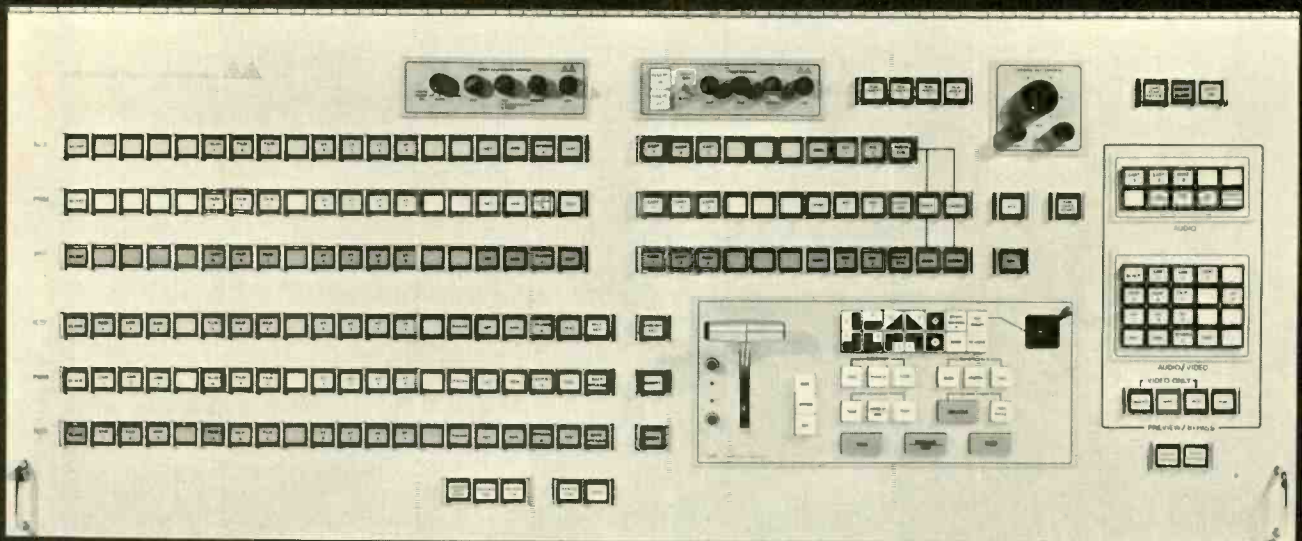


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BROADCAST INDUSTRY NEWS

CATV Industry Prepares For Compromises to FCC Plan

Bowing to pressures believed originating at the White House—and reflected by the stand of Clay Whitehead at the OTP—CATV leaders are prepared to negotiate some of the points contained in the FCC's CATV plan outlined by Dean Burch on August 15. Failure to compromise may mean heavy resistance in Congress to the FCC plan. Fear of Congress stems from pressure that anti-CATV broadcasters are presumably putting on Congress and the White House to restrict distant signal imports and increase exclusivity rights of local broadcasters.

CATV leaders assess the political reality of the day favoring broadcasters—they can offer the administration more help in '72 elections than can cable. This is the conclusion that must be drawn from reports made by John Gwin, NCTA's chairman, and Bruce Lovett, chairman of NCTA's legislative subcommittee at the California Community Television Association meeting last month.

Without wanting to reveal areas that presumably may be negotiated (it may be a fait accompli by the time you read this), Gwin outlined

Compromise settlement reached. By November 11 NCTA, NAB, MST and copyright holders approved the compromise discussed here. Copyright holders gained the most and local broadcasters got better protection against distant signals and "significantly viewed" adjacent market stations. NCTA interpreted the settlement as the end of the freeze. Gwin said expansion-minded CATV operators felt immediate and significant growth would take place to save the order-starved equipment manufacturer. Best growth will be in markets 51-100. New FCC rules should be ready by next March.

four areas of concern to broadcasters: 1) reducing the number of distant signals; 2) more restrictions on leap-frogging; 3) more stringency on defining significant viewing

patterns; 4) more exclusivity protection.

It's exclusivity that is key. Distant signals won't mean anything if they have to be blacked out a great portion of the time.

NCTA made a three-market study of how exclusivity might affect what could be shown. In general, operators would benefit most when they could import strong independents such as WTTG, Washington, or WGN, Chicago. If the imported signal is a weak U, it may be so loaded with film and syndicated returns that it would have to be protected most of the time.

The new OTP proposals made November 2 would require distant signals, if taken from major markets, to come from the two closest major markets. If this signal needed to be blacked out, any other distant signal could be imported.

Other proposed OTP compromises entailed: upping the significant viewing formula for mandatory carriage of neighboring market stations to two percent hours share and net weekly of five percent (instead of FCC's one and five); adding exclusivity protection for local stations against distant signals (market 1-50, no syndicated programs offered to the market could be shown for 12 months, then for term of station's exclusivity contract; market 51-100, one to two years for syndicated and film shows depending on their nature). The OTP recommendations would call for all parties supporting separate CATV copyright legislation which would apply to all except for existing cable operators with fewer than 3500 subscribers.

At the California convention, Sol Schildhouse, CATV bureau chief at the FCC, recommended compromise to move cable forward.

Educational Broadcasters Find Little Sunshine at Miami

The weather was cooperative, and speakers Burch, Marland, and Whitehead were pleasant enough, but gloom settled in as permanent financing blew out to sea. (Part I.) A major bright note in exhibit area was compatible 3/4-in. video cas-



Powerhouse Clay Whitehead

ettes from Sony and Panasonic (Part II.)

Part I At the Sessions

NAEB 1971 certainly tried for an atmosphere of fun and sun and certainly the weatherman cooperated. But the convention goers were seeking something else, namely money. It was supposed to have been delivered by Clay T. Whitehead, director of the OTP, who spoke on the last afternoon of the convention. OTP had previously held up progress toward needed legislation by disagreeing with the Corporation for Public Broadcasting on a financing plan.

But Whitehead didn't deliver anything except a few slaps at CPB's central authority and some salve for those PTV station operators who opted for funded local autonomy. Whitehead's play to localism and his denigration of a central authority drew considerable applause at the time, but when it was over many seemed to realize that what the nice speech on high principles really amounted to was an Administration stall against doing anything. Whitehead said policy should steer clear of government-run broadcast systems. There seemed little danger of that happening as long as public broadcasting is government starved.

In a press interview after the talk, Whitehead gave no indication of a time table or a procedure for resolving differences which he stressed. Faced with the choice of a compromise plan or no plan, most station operators would settle for compromise. (Ed. note: In the weeks following the Miami speech, CPB and NAEB have accused Whitehead of confusing the issue and stalling on financing.)

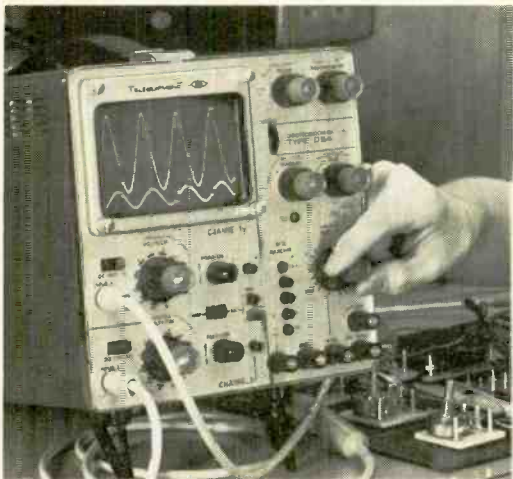
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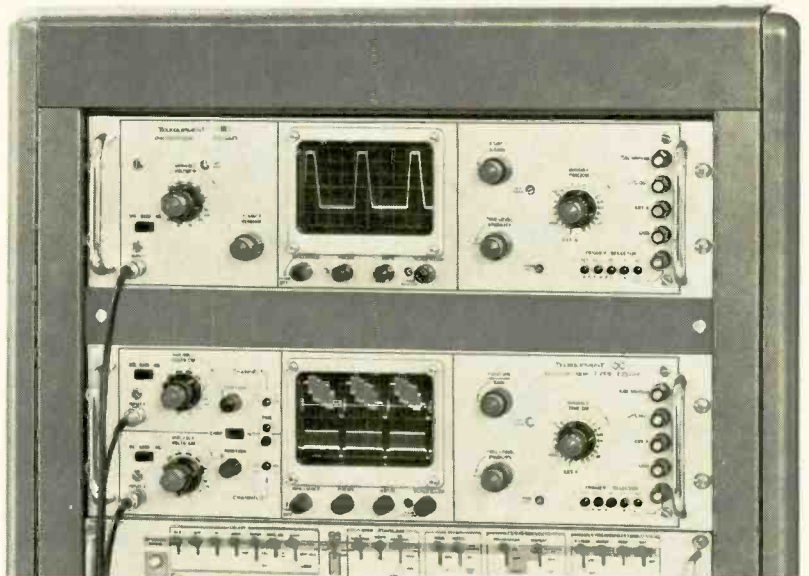
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Earlier during the Convention, Hartford N. Gunn, president of the Public Broadcasting Service, appeared to have the confidence of stations when he outlined the checks and balances that existed with the present system and how PBS will continue to exercise go/no-go decisions on distribution. And at the beginning of the week, William Harley, in stressing the urgent need for legislation to support public broadcasting, saw no real conflict between CPB, PBS, NPR, and the stations since all had

to be accountable to each other.

At other sessions, US Commissioner of Education, S. P. Marland, gave a vote of confidence to ITV when produced well—such as “Patterns in Arithmetic.” “Sesame Street,” and the “Electric Company,” which he cited. He said more technology, if cost-effective, was needed. A forthright paper on how to provide instructional videotape film accountability was delivered by Warren L. Wade of KTEH, San Jose. The validation process for “Patterns in Arithmetic” were

also covered at that session. (See *BM/E*, October, page 31, for more on the subject of accountability.)

In a special cable session, Leland Johnson of the Rand Corporation described the benefits of getting ten communities in the greater Dayton, Ohio, area to cooperate in awarding one large, rather than 10 small, franchises. The potential number of subscribers would then be sufficiently high to make new-type services more likely to be viable and therefore beneficial to the community.

Part II, on exhibits, next month.

Relay Systems for Cable TV Can Keep Some 4- and 6-GHz Bands

Another liberalization on relay systems allows microwave systems serving cable TV on the 4 and 6 GHz bands to file waiver petitions against an FCC prohibition of such use, and would eliminate certain conditions on renewal of licenses for this service. The effect is to make it considerably easier for relay systems now using 4 or 6 GHz to continue to do so. Most of this service is presently limited to the 11 GHz band.

Price Correction

The Sony videocassette player is a bargain at \$800, but the price inadvertently quoted in *BM/E*, November, is a steal. Please add a zero.

Sales, Quadrasonics, Local Sports, Changing Audiences, are Hot Topics for FMers

The profitability of quad broadcasting, the importance of local sports broadcasts, the advantages of complete separation of AM and FM operations, and the necessity of keeping close touch with new audience lifestyles and listening habits, were high on the discussion agenda at a regional conference of the National Association of FM Broadcasters, held September 29 in Dallas.

The conference was the second of a series being held by NAFMB around the country, with the third, covering broadcasters in New England and New York, held in Bridgeport, Connecticut, Friday, November 5. The intent of the conferences, says NAFMB, is to initiate more “grass-roots” contact and discussion among broadcasters around the country.

Stan Wilson, president of KFJZ and KWXI, Fort Worth, told a panel that after starting quad broadcasts

(Continued on page 39)



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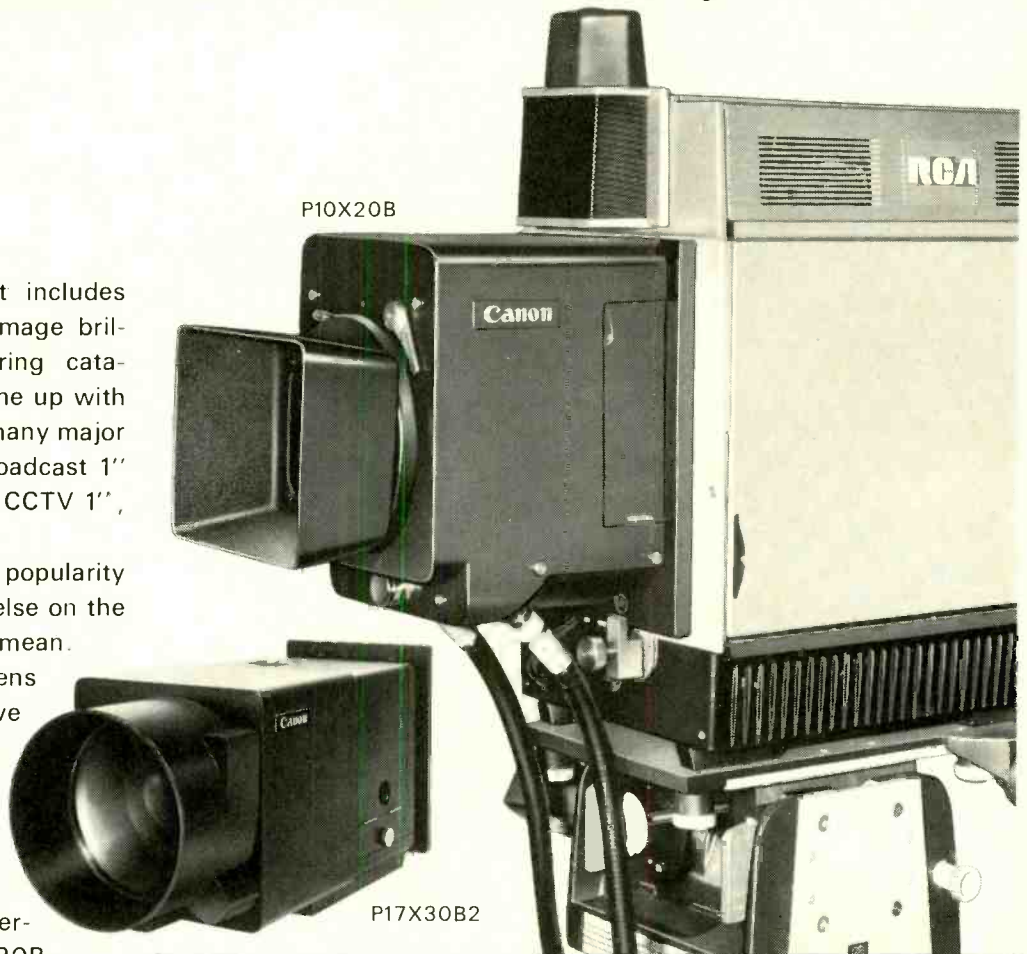
Draw up a checklist that includes price, specifications and image brilliance, then start comparing catalogues. You'll probably come up with the Canon answer, like so many major camera producers—for broadcast 1" or 1 1/4" PLUMBICON® or CCTV 1", 2/3" vidicon.

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	PV10 x 16	16—160mm	1 : 10	F 1.6
	PV10 x 15B	15—150mm	1 : 10	F 2.0
1" Vidicon	V10 x 15	15—150mm	1 : 10	F 2.8
	V6 x 16	16.9—95mm	1 : 6	F 2.0
	V5 x 20	20—100mm	1 : 5	F 2.5
	V4 x 25	25—100mm	1 : 4	F 1.8
2/3" Vidicon	J10 x 13	13—130mm	1 : 10	F 2.8
	J 6 x 13	13—76mm	1 : 6	F 1.9
	J 5 x 15	15—75mm	1 : 5	F 2.1
	J 4 x 12	12.5—50mm	1 : 4	F 1.8
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1 1/4" PLUMBICON	P10 x 20B4	20—200mm	1 : 10	F 2.2
1" Vidicon	V10 x 15R (DC)	15—150mm	1 : 10	F 2.8
	V6 x 16R (AC/DC)	16.9—95mm	1 : 6	F 2.0
	V4 x 25R (AC/DC,EE)	25—100mm	1 : 4	F 2.5

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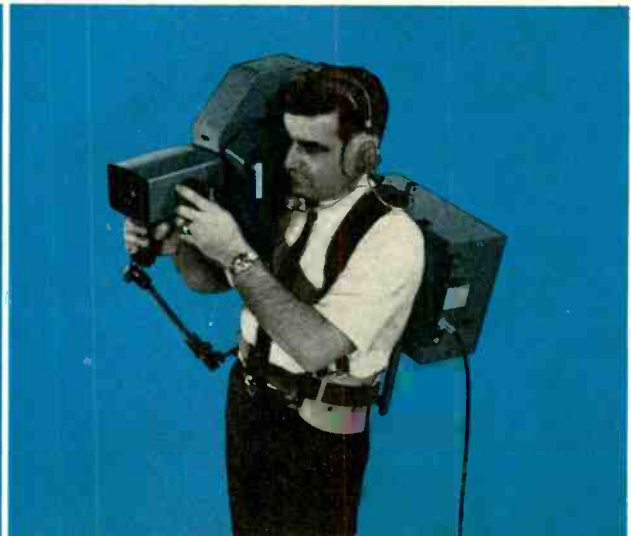
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Boundaries Of "Obscene Or Indecent" Language Over-The-Air

The question as to the scope of permissible language over-the-air has been the subject of heated debate in the courts, at the Commission, and a problem of great dimension to broadcasters. How does a broadcaster best balance the interests of a specialized audience's right to hear speech which is "like it is" with the general audience's right to be free from listening to language which offends their personal standards of decency? To what limits may a broadcaster allow an interviewed guest to come forth with spontaneous utterances of salty language? Will a broadcaster's restrictions on the type of language used inhibit or enhance the desired "robust and wide-open debate" encouraged by the FCC?

In a series of forthright opinions on free speech, U.S. Courts have proscribed certain well-defined and narrowly limited classes of speech, the prevention and punishment of which have never been thought to raise any constitutional problem. These include the lewd and obscene, the profane, the libelous, and the insulting or "fighting" words—those which by their very utterance inflict injury or tend to incite an immediate breach of the peace¹. In all cases, the courts have set standards for proscribed speech which take into account the considerations which gave birth to the nomenclature—the nature of the speech and the circumstances under which it was uttered.

With both the constitutional imperative and historical case precedents in mind, Congress, in 1948, passed legislation which prohibited "obscene, indecent, or profane language by means of radio communication" and imposed a punishment of up to \$10,000 fine or imprisonment of up to two years². Its language was derived from Section 326 of the 1934 Federal Communications Act which expressed, to a substantial degree, that this prohibition was *not* to be construed as giving the Commission the power of censorship over programming.

The few opinions construing the U.S. Code 1464 prohibition have, when taken together, involved a mixing of principles which tend to obliterate any clear demarcation or distinction. Like the "freedom

of speech" cases before them, the FCC and the courts have imposed no semantic straitjacket in defining a standard for "obscene, indecent, or profane language." *Per contra*, in the few pertinent cases, they have attempted to balance a number of considerations, including the following:³

1) Whether to the average person, applying contemporary community standards, the dominant theme of the language taken as a whole appealed to prurient interests;⁴ 2) the subject matter of the program, the context in which the utterance was made, and the value or relevance of the utterance to the segment of listeners to which it was directed; 3) whether the questionable language was essential to the integrity or reality of the presentation; 4) the time of the broadcast, the likelihood that children might be in the audience, and the mitigating fact of cautionary announcements; 5) whether the broadcaster had an opportunity to control the content of the speech, whether the utterance was spontaneous, and whether the program presented was live or filmed.

Like the criterion established in the general "obscenity cases" (*Roth, Jacobellis, Memoirs, Ginsburg*), the prevailing limits of permissible language over-the-air is, at best, confusing. An attempt to cite the perimeters of free speech, in order to give broadcasters some boundaries for judging their own problems in this area, follows.

Marginal or objectionable language, which falls into the category of "obscene, indecent, or profane," often occurs over-the-air during the "talk show" or "personal interview." Such language usually appears in the form of the curse expletive ("hell," "damn," "God damn it!") or the sexual expletive ("f. . .," "m.f.," "s. . ."). In the *WUHY-FM* case, the FCC found the personal interview comments of Jerry Garcia of the rock music group, "The Grateful Dead," to fall within the 1464 prohibition. Garcia's use of sexual expletives interspersed with his comments were found objectionable to the FCC because of the following:

a) Although such language is commonly used in the average person's everyday personal life, it is not commonly used in public (e.g., on an elevator, when testifying in court).

b) Such language has no redeeming social value, is patently offensive, and conveys no extension of thought or meaning to the interviewee's comments.

c) The use of such language has very serious consequences to the "public interest in the larger and more effective use of (broadcast media)."⁵

The Commission distinguished between "obscene" and "indecent" in finding Garcia's language objectionable. Finding that his use of sexual expletives had no "dominant appeal to prurience or sexual matters," and, hence, was not obscene, the Commission found such language "indecent." By this, it meant the "vulgar, coarse and offensive use of sexual terminology in a manner far exceeding the bounds of common de-

(Continued on page 14)

1. *Red Lion Broadcasting Co. v. Federal Communications Commission*, 395 U.S. 367.

2. See *Chaplinsky v. New Hampshire*, 315 U.S. 568, 572 (1942), 86 L.Ed. 1031, 1035, 62 S.Ct. 766, opinion by J. Murphy.

3. 18 U.S.C. §1464.

4. See *In re WUHY-FM*, 24 FCC 2d 408 at 410.

5. *Roth v. U. S.*, 354 U.S. 476, at 479, 77 S.Ct. 1304, at 1311 (1957).

6. Section 303(g).

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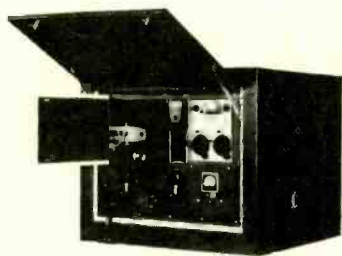
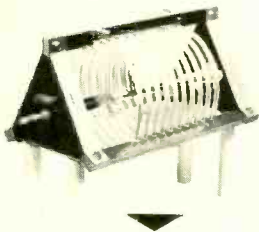
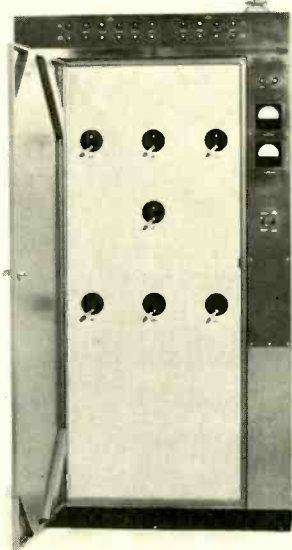
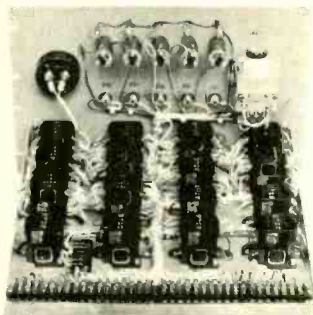
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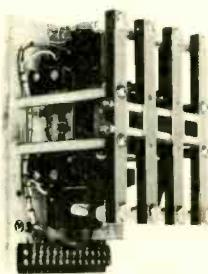
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FCC continued

gency.”⁷ Hence, the broadcaster must be cautious in permitting guest interviewees who tend to use such language to appear lest he be faced with (a) a law suit or (b) the loss of part of his viewing audience.

In another recent case, the courts found the spontaneous use of curse expletives by an interviewed guest not prohibited by 1464.⁸ Here, the words “God damn it” uttered in a moment of anger were held not to be “obscene, indecent or profane.” Determinative factors in *Gagliardo* were:

a) The words were delivered in the heat of debate and were not a matter of course.

b) The interviewee’s intent to use the words uttered could not be proved.

Thus, a distinction emerged which appears to permit the spontaneous utterance by an interviewed guest, but not the voluntary expression—for voluntariness implies the power of choice. It is the duty of the broadcaster to control the language content of his programs. Analysis of the foregoing cases reflects the following general guidelines:

a) If a broadcaster has an interview containing objectionable language on tape or film, he’d be wise to refrain from broadcasting same. That the interviewee has spoken spontaneously no longer prevails as the issue; the *broadcaster* has had time to consider the interview’s contents and, unlike the interviewee, can choose not to air it.

b) It is not so much the words used as the manner and context in which they are utilized which is determinative. If used spontaneously and without warning to the broadcaster, he is not charged with the burden of control.

c) The broadcaster will be held accountable for objectionable language by interviewed guests unless he can show that such language was essential to the integrity or reality of the presentation. In this case, the broadcaster is usually protected if the presentation is limited to readings from classics or descriptions of works of art.

Obviously, the Commission possesses great latitude in proceeding in this area under the “public interest” standard. Heretofore, it has yielded free speech a “preferred position” and given nearly all language full protection of the guarantees. It would prefer not to be responsible for interpreting and applying 1464 at all. Relying on the principle in *Burstyn*,⁹ the Commission regards the interpretation of 1464 as “a matter of first impression which can only be definitively settled by the courts.”¹⁰ With the boundaries of permissible language inconstant and the value varieties utilized by the Commission and the courts for determining language that is “obscene, indecent, or profane” so ephemeral, the broadcaster would be wise to seek the advice of counsel whenever a 1464 problem arises. **BM/E**

7. The Commission relied heavily on *U. S. v. Limehouse*, 285 U.S. 424, 52 S.Ct. 412, 76 L.Ed. 843 (1932) which held that the word “filthy” included language that was “course, vulgar, disgusting and indecent and plainly related to sexual matters.”

8. *Gagliardo v. U. S.*, 366 F.2d 720 (1966).

9. *Burstyn v. Wilson*, 343 U.S. 495, 502-503 (1951).

10. *In re WUHY-FM, supra*, at 342.

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nance all operator-controlled. TeleMation-designed-and-built, the disc memory can be random-accessed line-by-line either from the keyboard or the operator control panel. It uses flying heads for wear-free, clog-free, trouble-free operation.

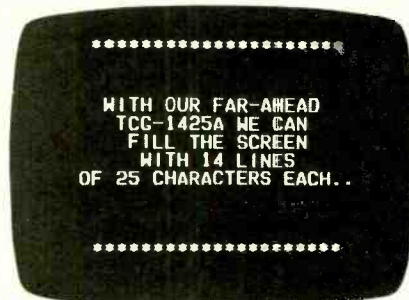
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There's probably only one restriction—you can get only so many VU meters into a foot of panel space, so you have to watch some options. But, it's really only the recording industry that opts for 16 VU meters, so that is no practical restraint. And, if the size of VU meters did genuinely appear to be a design constraint, you could always specify Electrodyne's vertically-shaped electronic level displays which give you about three times the visual capacity in the same area occupied by one VU meter.

We believe these electronic level displays could also be used as peak reading meters to avoid over-modulation as a result of riding gain too high. Units are five times faster than a VU meter and can indicate true peak levels. Combined with a slow release time feature, average rms readings are displayed. Sensitivity is readily adjusted. But overmodulation is a different story for another time.

Modules are available from several sources and previous articles in *BM/E* have discussed what can be done with Fairchild (October 1969) and RCA (October 1970) units.

This time we draw our material from Electrodyne which is now part of MCA Tech, MCA Inc. During a recent visit to Electrodyne's plant, Walter Wilson trotted out his photo collection of customized jobs for KTLA, Ch. 5, Los Angeles; The Hughes Sports Network, Rutherford, N.J.; Lewron Productions (TV), New York City; the production console built for the USIA and others. We became convinced that anything is possible—and always good looking. We also saw the new board built for KYW-AM's new facility under construction in Philadelphia. KYW is getting three boards, one for each of its studios—Studio K, Studio Y and Studio W—and all three can be interconnected and remotely controlled. Duly impressed with the possibilities of customizing consoles, we sought answers to other questions such as “what are the trends in console design?,” “what should the designer be worried about?,” etc.

Reliable operation is on the minds of major station operators, Wilson said. Downtime must never happen. This has led to the incorporation of dual power supplies in a console with automatic switch-over if one fails.

It also means modules should be interchangeable so that pre-amps or distribution amps from an unused channel could replace a malfunctioning one. It means maintenance should be easy, i.e., everything should be readily accessible.

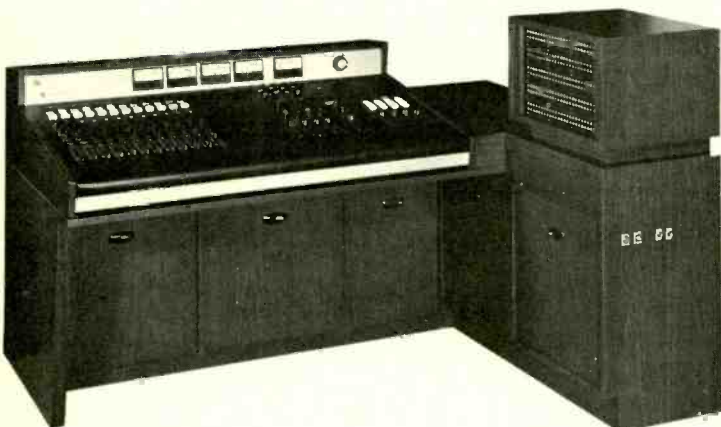
Patch panel design using jumpers with telephone plugs is quite usual practice today. The flexibility afforded by patch panels means one can quickly route around any module that appears to be acting up.

It goes without saying that broadcasters who think custom also think in terms of lowest noise and lowest distortion.

So that noise or signal quality are never compromised, regardless of the configuration picked, Electrodyne doesn't try to cut corners or save on the bill of materials.

For example, shielded wire is all solid foil—not braided. Wilson said foil shields are readily available for two conductor cables, but not single conductor wires. To remedy this, Electrodyne has had its own foil-shielded single conductor cable made up.

To avoid inadvertent grounding of the grounding conductor (drain wire) which might set up unwanted ground loops, Electrodyne makes sure all drain wires are insulated. It uses clear Teflon insulation on this conductor.



A 12-input 20-output broadcast console custom-built by Electrodyne for Hughes Sports Network.

As an extra measure of caution, heat shrinkable tubing is slipped over most all terminations. You have to work hard to find any place to hang on a loose wire.

Prudent design also insists that all contacts on plug-in p-c boards be plated with nickel rhodium to avoid contact potential or excessive contact resistance developing.

From a circuitry point of view, FETs are used in low-level stages to get top performance. Wilson says FETs used are hand-selected and that about 50 percent are rejected as not measuring up.

Generally speaking, you, as a customer, can specify the type of fader you may want or prefer. But before your choice is granted, the engineering department may ask you a few questions to make sure you are aware of the likely performance over the lifetime of the pot. Electrodyne sees a definite trend toward conductive plastic pots for long, noise-free operation. They'll put in 30-step wirewounds if you insist, but they want to make sure you will clean

them regularly. Slidewire mixers with .1 dB transitions, of course, still rank high.

The list of modules offered by Electrodyne tends to read like that offered by others. Input modules (seven types), optional-feature modes for input modules, equalizers (two types), combining networks (three types), dividing networks, switching modules (six types), and a variety of program amplifiers, IF amplifiers and utility amplifiers. There are a few items, such as the electronic level indicator, that are exclusive with the company. A recent addition to the line is a new nine-frequency graphic equalizer. Attenuation is set by positioning slim thumbwheel switches which stack on top of each other. Handles on the thumbwheels indicate the shape of the curve. Each equalizer frequency has six boost and six attenuate steps. The modules are in the standard 1½ width.

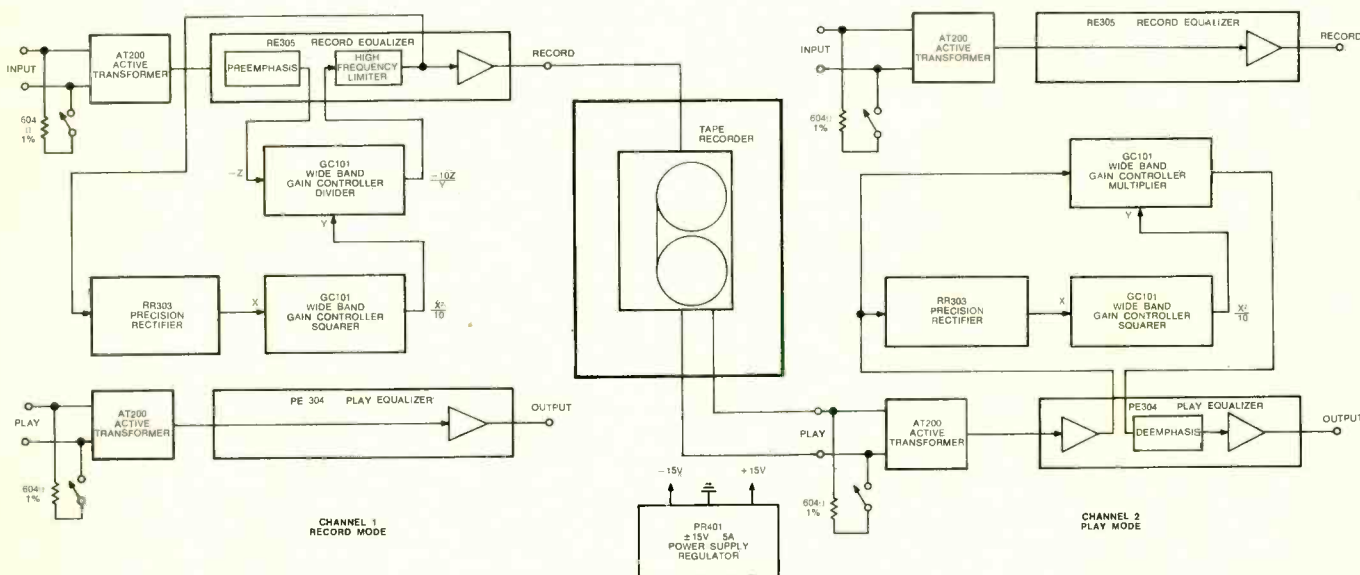
The company has "active" combining networks and audio equalizers including an I-C version so that there is no insertion loss experienced. **BM/E**

Burwen Noise Reduction System

As earlier stories in this magazine have reported, the Dolby system of noise reduction, already heavily entrenched in the recording industry, is beginning to interest FM broadcasters as a possible way of upgrading the signal and expanding the coverage area. Experimental broadcasts have brought highly positive reactions from listeners, especially from those who had the complementary Dolby "decoders," but to a substantial degree also from listeners who simply tuned in the Dolbyized broadcast without the decoders. Dolby has pointed out that the effective 10 dB improvement in S/N ratio produced by encoding the

broadcast and decoding the reception means multiplying a station's effective coverage area by three, and that is certainly a prize worth going for.

It is basically a hopeful development for FM broadcasters, therefore, that several other noise reduction systems are beginning to compete for attention in recording and broadcasting. Competition never hurt a complex technical development like the current noise-reduction systems. It is too early to say which system (if any) is likely to dominate in broadcasting (Dolby's firm hold on recording will be hard to loosen), but it is not too early to say that noise



Block diagram of Burwen noise eliminator system in which channel 1 is record processor and channel 2 is play processor.

levels in FM broadcasting are due to take a nose-dive in the not too distant future. That is a very important forward step in the quality of FM broadcasting, and one that on the early evidence will be highly popular with listeners.

One of the most interesting of the new noise reduction systems is that described in several articles recently, and in a paper at the recent Audio Engineering Society meeting in New York by Richard S. Burwen of Burwen Laboratories, Lexington, Mass. Mr. Burwen has taken a quite different approach from that of Dolby. Instead of expanding low-level material in recording (or broadcast), the Burwen system (which he calls a "noise eliminator") uses heavy across-the-board compression in recording so that, in effect, the average level can be raised well above the noise. Playback requires, of course, the complementary expansion.

The general idea — compression followed by expansion—is very old and, of course, some compression to improve the S/N ratio has been nearly standard practice for decades in both recording and broadcasting. In the past, however, *heavy* compression has always meant distortion of various kinds.

Mr. Burwen has brought to the compression-expansion formula an up-to-date sophistication that, on paper and in the early demonstrations, has produced some extraordinary results. Basic to his scheme is a wide-band cube-root compression circuit, using a new two-quadrant multiplier/divider of extremely low distortion. This circuit is capable of controlling gain over a 60 dB range with 0.1 dB accuracy, which means that a 90 dB dynamic range is brought down to 30 dB, for example. He also uses pre-emphasis in both the low and high frequencies, followed by the complementary de-emphasis in playback.

The system is very complex in detail, handling in what seems to be expert manner subsidiary problems such as signal overshoot, errors due to differential gain in the recorder, etc. The overall result is that the system has a stated frequency response of ± 0.2 dB from 20 Hz to 20 kHz, compression-expansion accuracy within 1 dB, and distortion of 0.1%, and is capable of giving a pro tape machine a dynamic range of 110 dB!

The original intent, according to Mr. Burwen, was to allow professional tape recording of musical instruments with no audible tape noise whatever, and with negligible distortion. His experiments convinced him that standard tape recording practice with levels between 0 and +3 VU produces serious distortion on many peaks. To bring this distortion within acceptable bounds, recording would have to be at -8 VU, which means a poor S/N ratio. That motivated the development of the noise eliminator. With it, he says, virtually the full peak-range of most instruments is recorded without distortion, and noise is totally inaudible from the tape.

The full system producing the 110 dB dynamic range is thus aimed primarily at the professional recording studio, and the "decoder" for it would undoubtedly be too elaborate and expensive for consumer equipment, such as an FM stereo receiver. But Mr. Burwen has a simplification of his system (analogous to the Dolby "B" system) which he says is fully adaptable to consumer units and is capable of reducing recording or broadcast noise in such equipment by 35 dB or more. If that scheme proves to be workable for FM broadcasters, it will obviously be a formidable competitor of the Dolby system. Broadcasters can look forward with hopeful anticipation to developments on the very active noise-reduction front. **BM/E**

Planning a TV/Broadcast Audio System: Q&A

By Norm Farr

Broadcast engineers don't design new audio systems every day and when the time comes to do so, a lot of questions occur. "Video" engineers, in particular, realize that they haven't kept up with trends. Some of the more common questions that get asked are answered here by Norm Farr. And sometimes the answer is another question which only you can answer. Thrown in for good measure are a few guidelines—just in case you were afraid to ask.

Where do people who are not accustomed to planning a system often go wrong?

Many people make the mistake of beginning with an

Norm Farr is custom audio products manager for Visual Electronics Corp., and has spent many years designing audio console systems.

individual *part* of the system and doing the detailed engineering for that part, then proceeding to the next individual part, and so on. I believe the complete project should be laid out in rough block form and decisions made effecting the overall system before individual parts are tackled in depth. The overall grounding system is one of the most neglected areas

unless you think overall to begin with.

Should a station's engineering personnel attempt complete systems engineering required for a new audio facility?

The answer is a *qualified* yes. If sufficient time has been allowed to permit station personnel to do a good job, the final result will be a happy one. If time is short and engineering people are already overloaded, outside help is the only answer.

Can you offer some form of check list which might be useful in the early stages?

This is tough because some projects begin with a new building while others may be a small addition to an existing plant. However let's try:

- 1) Prepare a single line block functional for the new facility or redraw the old one and add the new portion. I find it helpful to start at the output terminals and work back toward the input terminals. May I suggest you make your drawing large to make it easy to add forgotten items without starting over again.
- 2) Come up with an overall system specification you wish to meet when the final proof is to be made. This should include system overall gain, frequency response, noise, cross-talk, distortion etc. The specification should begin with the microphone input and go to the last item in your system (transmitter, de-mod, or what have you).
- 3) List all major active items to be included. Obtain specification sheets on each and carefully check to see that none of these will degrade your spec established in item 2.
- 4) Solicit the help of your operating personnel in planning panel layouts and operational aspects of the project.
- 5) Talk with suppliers for a first reaction to your hard work. During the time that it takes for them to get back to you, review your documentation procedures. Make sure you have a complete wire sheet drawing so that this time every detail will be recorded.
- 6) Plan your coding and grounding. Any good wire sheet will list the two colored wires in your shielded pairs and should tell you what to do with the shield grounding.

What about the grounding system?

Let's break it into two parts—namely, shield grounding for signal carrying cables and equipment grounds. If we are to prevent ground loops, a cable shield should be grounded at one end only. We have two choices—either the source end of the cable or the terminating end. It generally works out best to ground the shield at the terminating end of the cables. For example, let's assume the source is an audio tape machine output and the cable is running to a console. By our rule, the shield would be grounded at the console end only. This fact should be shown on your wire list so that no one makes an arbitrary decision on shield grounding.

The shields should be grounded to a strip which is insulated from the frame it is mounted on, be it rack, console, etc. It is common practice to use a copper



Master audio console KTTV-TV, Los Angeles, customized by Visual Electronics.

strap, which is drilled and tapped for several screws, and mount it clear of the frame on a pair of flexible rubber mounts (Lord mounts). Suitable strips should be obtainable from your local electrical supply house. Each one of these shield ground terminal strips should have an individual insulated wire ($\#8$ A.W.G. for distances up to 50 ft. and proportionally larger thereafter) going back to the station ground location. At this point they are connected together on a common strip similar to that used for neutral connections in power distribution panels. If the station ground is some distance away from the master connecting point interconnections should be made using at least a 4/0 cable.

The use of insulated wire and terminal strips makes it easy to check on unwanted grounds. By removing the main ground lead from the master ground terminal strip and connecting an ohmmeter between the two, a reading will indicate an unwanted ground. It may be isolated quickly by removing one wire at a time from the master terminal strip until the rack or console strip is located. A similar procedure at the strip will quickly isolate the culprit.

The common practice of using a copper strap to bond racks and other equipment together and finally going to station ground is fine *so long as the audio shields are not* connected in any way.

If you want your grounding system to be perfect, begin with a ground drawing which will include grounding information for every shield on all cables used to interconnect equipment.

Number each ground wire the same way as you would the cables used for audio. Include the ground wiring on the wire lists. (It's not possible to cover all the variables which can occur, but if you stay with the basic rules you have established you can't go far wrong.)

Are many stations fabricating their own major items such as consoles, switchers, etc.?

This is becoming increasingly rare. If you analyze the real costs, it's difficult to save any money by doing it yourself. Incidentally, with no serial number or model number, a problem is posed in placing the item on the books at true value for depreciation purposes.

(Continued on page 46)

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Circle 110 on Reader Service Card

Four-Channel Sound: What It Means to the Broadcaster

By Emil L. Torick

Several systems of quadrasonic sound have been proposed or developed. While some present problems to the broadcaster others do not. One of the simplest seems the matrix disc, one version of which is described here.

WE ARE ON THE THRESHOLD of a new era in sound broadcasting, an era as momentous as that following the introduction of commercial FM broadcasting in 1941 and the introduction of stereo FM in 1961. The year 1971 will go down in history as the beginning of the four-channel, or quadrasonic, era.

The use of multi-channel sound sources is not a new phenomenon in the music industry. Early experiments by Leopold Stokowski in the film "Fantasia" (1940) led to Cinerama sound and the formulation of four-track film standards by the Society of Motion Picture and Television Engineers. From the days of the earliest composers, similar effects have been used—the double organs of Soler, the brass choirs of Gabrielli, the off-stage operatic effects of Wagner, and the massed choral and instrumental forces of Berlioz. The advent of stereo added a second dimension to the reproduction of such material; quadrasonic recording now permits full three-dimensional recreation of the original sound field.

Quadrasonic music in the home

Efforts toward the development of a four-channel product for home playback have generally followed one of two approaches: a *matrix* format or a *discrete* format. At first consideration, the discrete method seems the better approach. By definition, a discrete format theoretically maintains the full separation achieved on the original four-track master tape. In contrast, a matrix method, with its processed summation of four channels into two before recording, produces some dilution of the original separation, although with the recently-introduced

Emil L. Torick is branch manager of electronic systems at CBS Laboratories, Stamford, Conn.

Columbia "SQ" matrix system, this dilution is reduced to an insignificant proportion.

Overriding the consideration of separation alone, however, is the overwhelming importance of what constitutes a practical recording system for home use, and the question of how much separation is really necessary to recreate the desired musical effect. Quadrasonic progress in the American recording industry appears to be going in both directions. The discrete approach is being used for pre-recorded tapes. (Available only in the 8-track cartridge so far.) In disc recording the matrix approach has been selected. The announcement of a discrete four-channel Japanese disc notwithstanding, it seems the widely-held opinion of the U.S. technical community that a discrete four-channel disc, with its required high-frequency subcarrier response well into ultrasonic frequencies, does not represent a practical approach to home reproduction of four-channel sound. On the other hand, the recent introduction by Columbia Records of the stereo-quadrasonic "SQ" record, quickly followed by the adoption of the same system by Vanguard, Ampex, and others, guarantees that for some time to come, at least, the major source of program material for four-channel home reproduction will be a matrix-type disc.

Four-channel broadcasting

History repeats itself with the coming of four-channel broadcasting. As in the pre-FM multiplex days when stations joined their AM and FM facilities in the broadcast of a two-channel program, today we hear of experimental broadcasts using two stereo FM stations to transmit a four-channel program. As in the earlier days, we also hear of familiar corporations such as GE and Zenith developing their own multi-channel broadcasting systems¹. A curious paradox in the development of discrete four-channel broadcasting systems is that the bulk of prerecorded music which will be issued by recording companies will be in a matrix format, thus negating the necessity for a special broadcast system. To broadcast matrix-type records, a stereo broadcaster need not add any special equipment. For the listener, the same decoder which extracts four channels from quadra-

1. A newcomer to the scene is the Dorren system, whose sponsors have recently petitioned the FCC to consider a change of Rules and Regulations authorizing that system.

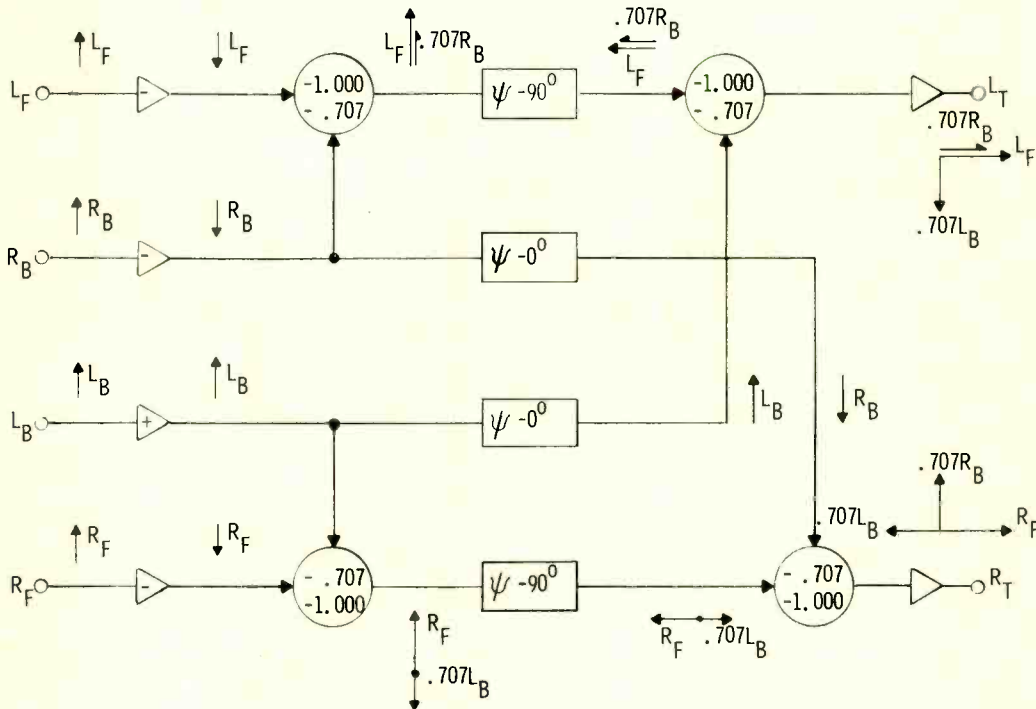


Fig. 1a. SQ encoder.

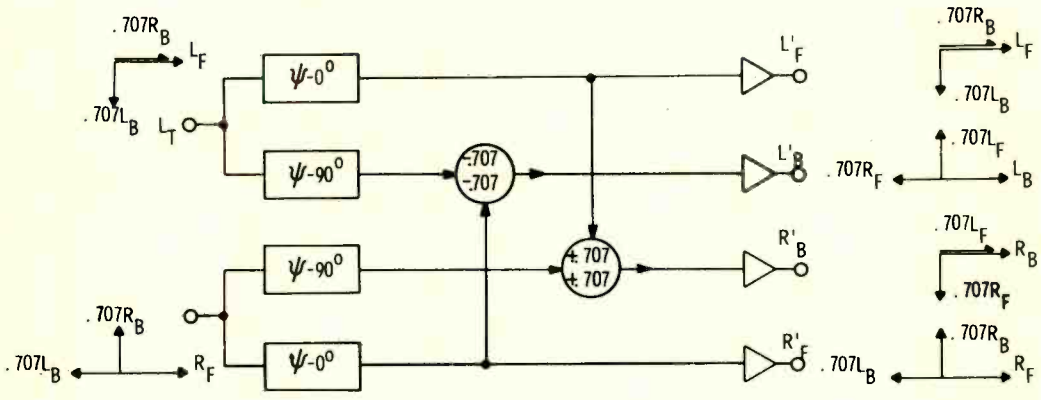


Fig. 1b. SQ matrix decoder.

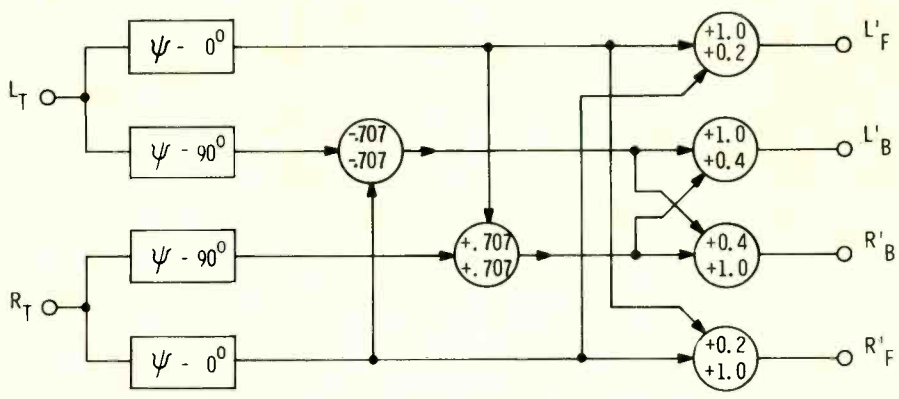


Fig. 1c. SQ matrix blend decoder.

phonic disc recordings will similarly work on the stereo-quadrasonic signal from an FM station. The addition of two amplifiers and loudspeakers will complete the listener's required investment.

Columbia Records "SQ" disc

In a technical paper presented in October at the 41st Convention of the Audio Engineering Society, CBS Laboratories engineers, Benjamin Bauer, Daniel Gravereaux, and Arthur Gust, disclosed the technical details of the new "SQ" disc². While basically a matrix recording system, the CBS system provides an optional "logic" playback mode which electronically enhances the existing matrix separation to be equal to, or better than, that of the original four-track master recording. With this method it is possible to enjoy the benefits of a simple and inexpensive storage medium with a playback characteristic which is psychoacoustically equivalent to the original master tape.

In a matrix disc the four channels must be appropriately encoded and modulated on the left and

right groove walls of the disc. The system input signals are characterized as L_F , L_B , R_F and R_B , corresponding to left-front, left-back, right-front, and right-back, respectively. The encoded signals are identified as L_T and R_T , (for left-total, and right-total). In the SQ disc, the channels are encoded as follows:

$$L_T = L_F - j 0.707 L_B + 0.707 R_B$$

$$R_T = R_F - 0.707 L_B + j 0.707 R_B$$

The significance of the operator $-j$ and $+j$ terms in the above equations is to shift in phase the signal components pertaining to the back channels. The effect results in an interesting modulation of the record groove wall. By recording sine waves in the back channels, the motion of the playback stylus is a clockwise helix when playing back left-back signals, and a counterclockwise helix when playing back right-back signals. This form of encoding results in separation between the two back channels which is as good as that on a conventional stereo disc and separation between the two front channels which is similarly undiluted.

Fig. 1a is an electrical representation of the encoding process. The phase-shift circuits employed are all-pass networks, which provide the required

2. Benjamin B. Bauer, Daniel W. Gravereaux, and Arthur J. Gust, "A Compatible Stereo-Quadrasonic (SQ) Record System," Journal of the Audio Engineering Society, Vol. 19, No. 8, September, 1971.

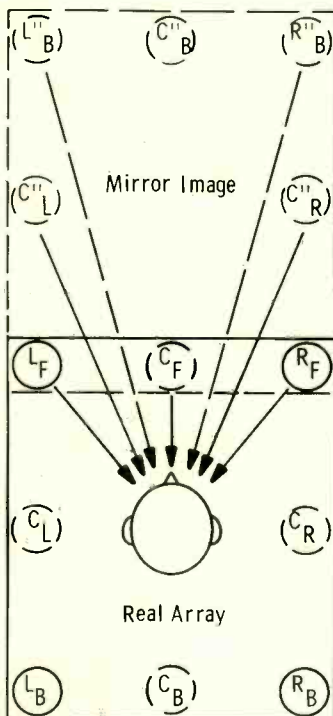


Fig. 2. Display of quadraphonic images in stereo playback.

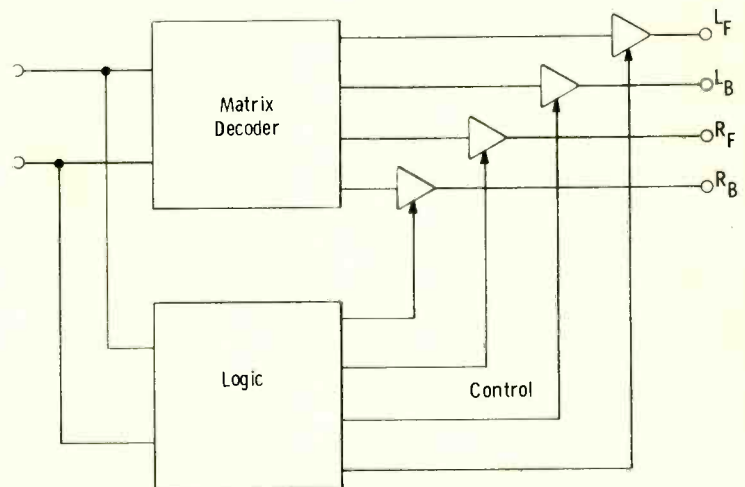


Fig. 3. SQ logic decoder.

phase shift to within $\pm 2^\circ$ over the range 20 to 20,000 Hz, with no change in amplitude response. Fig. 1b shows the basic matrix playback circuit, which is complementary to the one in Fig. 1a. Fig. 1c shows an alternate matrix playback circuit identified as the "blend" mode. This, too, is a passive method of decoding, as opposed to the active or "logic" method to be described later. In the blend mode some of the left right (front and back) natural separation is traded off to increase the limited normal 3 dB front:back separation of the SQ disc. Many cross-coupling ratios for blend may be employed, but the popular one shown in Fig. 1c produces left-right:front-channel separation of 14 dB, left-front:back-channel separation of 8 dB, and a center-front:center-back separation of 7 dB.

Compatibility

Compatibility is of special importance to the broadcaster. There are many levels to the compatibility question. One concerns the compatibility with present playback equipment. Another concerns the level of modulation on the disc and whether it can be broadcast without readjustment of console gain settings. The SQ disc scores high in both respects; it can be used as any conventional stereo disc. Equally important is the quality of reception of SQ broadcast by the listener with conventional stereo or monophonic receivers. Unlike systems announced by other experimenters in the field, the "SQ" record is an excellent stereo record as well, as can be seen in Fig. 2.

Fig. 2 is a graphical representation of the image placement a listener would hear when playing an SQ record on conventional stereo equipment. As the drawing shows, images are placed as though the room were folded forward in a mirror representation of the original array. The original left-front, center-front and right-front signals appear in the usual place, *with no dilution of separation*. The center-left and center-right signals are folded in slightly from the two loudspeakers, and the two back signals appear slightly in from the center signals. The total effect of these real and virtual images is to produce a stereo wall of sound with excellent definition and broad distribution of images. One image, the center back, has not been transferred in the above diagram. The exact center back location is not used in the editing of SQ records. A center back image would have to be produced by equal modulation of the left back and right back channels. Since these channels are in opposite phase to each other, the center back image would disappear in a monophonic playback. However, the four principal corner channels are transmitted to monophonic radio receivers with identical strengths.

Logic playback mode

Matrix, or blend, decoders operate passively, i.e., the signal passes through fixed phase shift and com-

bining networks. In contrast, the logic decoder is an active device, whose amplitude response dynamically changes as a function of the modulation on the disc. A simplified diagram of a logic decoder is shown in Fig. 3. One distinguishing feature is a voltage-controlled amplifier in each of the four output channels. The automatic gain variation in each of these amplifiers makes it possible to isolate a signal in any channel with an arbitrary and selectable amount of crosstalk to the other channels. An accompanying electronic logic circuit continuously monitors the incoming signals. By comparing the various amplitude and phase relationships of these signals, certain command functions are derived and appropriate control voltages are fed to the variable gain amplifiers.

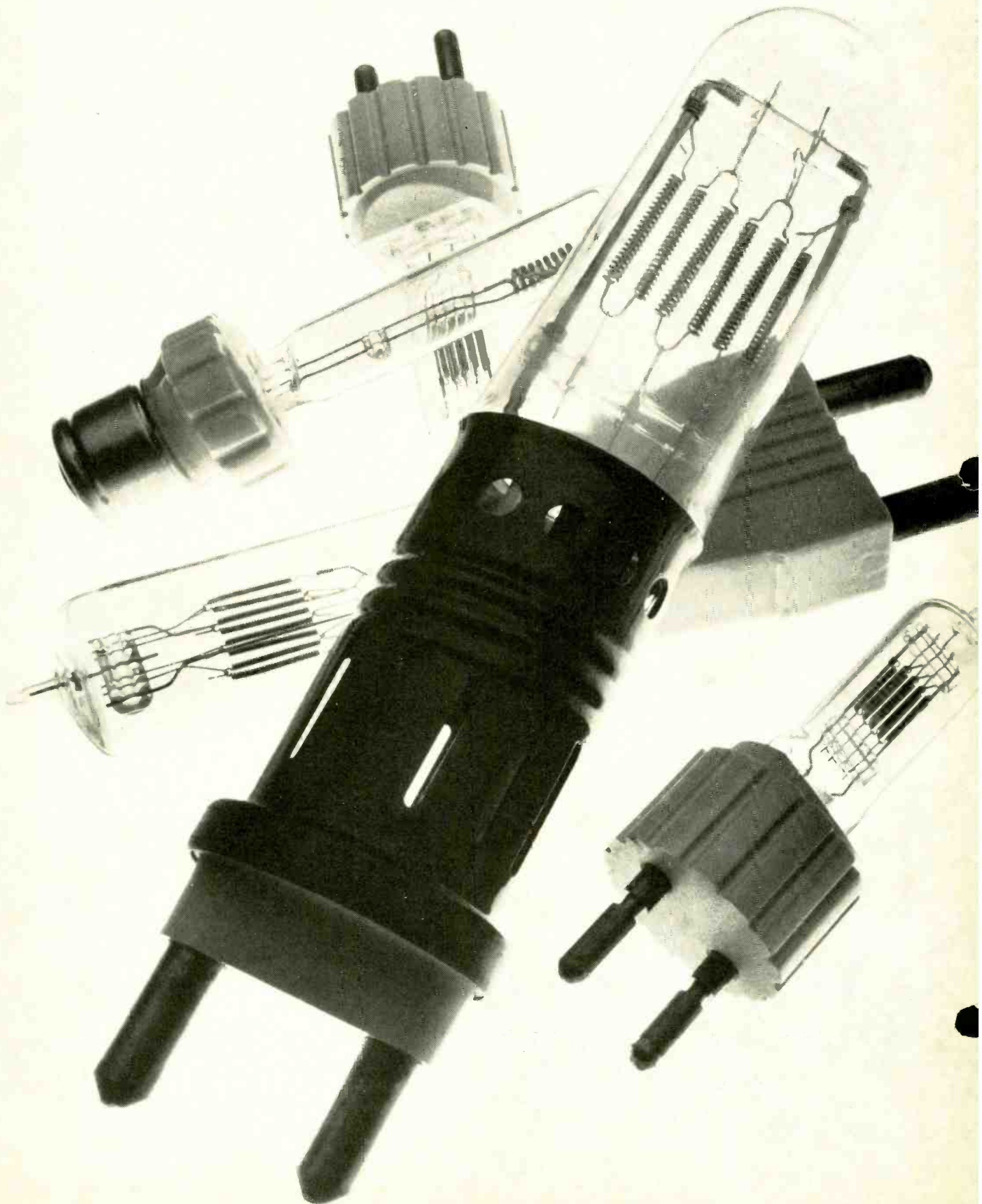
Although one might question the tolerance of the human ear to a continuous process of rapidly changing signal amplitudes, this is not a problem. Indeed, as broadcasters themselves long ago realized, the judicious use of high-quality AGC amplifiers and limiters can enhance signal quality significantly, without undesirable audible effect. Regarding the effect on image location when channel gain is changed, we are led back to the early experiments in stereo at Bell Laboratories. Here it was discovered that apparent image location is dependent primarily on the starting transient of a sound, not on what happens following that initial transient.

In a particularly interesting experiment, a signal tone was first presented to one loudspeaker and quickly panned to the other loudspeaker in a stereo pair. Although the signal ultimately resided on the other side of the room, listeners were unanimous in judging the location to be at that loudspeaker where the signal first began. The SQ logic decoder similarly benefits from such a psychoacoustic phenomenon. Since a group of performing musicians is not likely to control its precision to a degree undetectable by millisecond-precise electronic circuits, the logic decoder need only insure that signal starting transients are properly placed, while responding to the separation-gain requirements of this playback mode. The result is highly effective, and it is virtually impossible to distinguish the logic mode playback from an original four-track master during carefully controlled A-B tests.

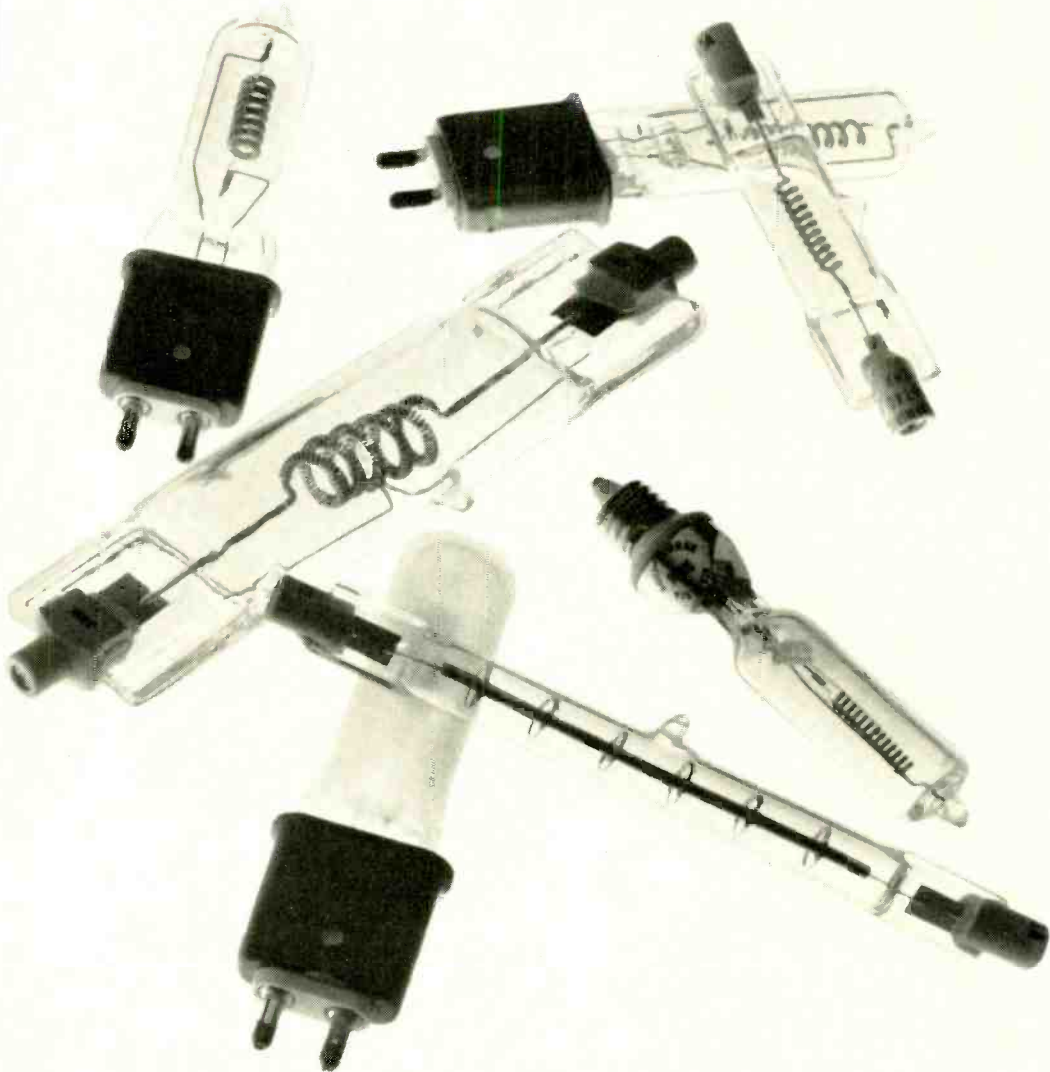
Conclusions

Quadraphonic sound is an idea whose time has finally arrived. With the adoption by Columbia Records of a completely compatible four-channel disc system, we can look forward to the availability of a large body of new recorded material. The four-channel medium offers exciting playback possibilities for our favorite repertoire of the past. It also provides our composers and producers with a new tool for creativity in the future. The broadcaster is in an exciting position, today, to participate in this new medium. **BM/E**

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GTE SYLVANIA

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Broadcasting in Quad — How I Got on the Air

By Lawrence Gahagan

This is the second in a three part series on how to get into four-channel stereo broadcasting today.

IF YOU HAVE MADE UP YOUR MIND, as I did, to give your listeners a taste of four-channel stereo, you have two general approaches to choose from: you can join with another FM station and carry two channels apiece; or you can matrix the four channels into two and broadcast them by yourself. The FCC approves both methods, and no others, at the present time.

The Two-Station Method

Unless both stations share some common location from which you can work (e.g., a transmitter site), you will need 15 kHz phase-equalized telephone lines. You cannot use a studio transmitter link between your studio and the other, and it is unlikely that you can get satisfactory quality over remote pick-up equipment, even if you overcome the legal barriers of transmitting two similar programs simultaneously.

Further, you need a mixing system for four channels and a way of splitting the station identifications so the right ones are heard on the right stations. You cannot use combined IDs for two separate facilities even when they are broadcasting essentially the same program.

You also have to decide which programs to send over which channels. If you take the front two channels and the other station takes the rear ones, the other station is likely to broadcast a very muddy program, especially to mono listeners, since rear channel material is not closely mixed and essentially of random phase.

It is better for one station to take the right chan-

nels and the other the left, even though each will be broadcasting only part of a program to two-channel listeners, and four-channel listeners would have to be alerted carefully as to how to orient their equipment.

It is clear that the two-station method is a makeshift, but until recently it was the only way to put four channels on the air and a number of pairs of stations undertook it during the last couple of years.

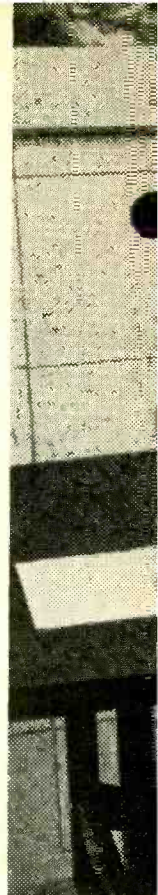
Matrixing

The matrixing method, which has been given a great deal of publicity lately, is likely to be less costly even for just a few broadcasts. Electro-Voice, Sansui and CBS have all announced matrixing systems that will encode any four-channel sources and put them into two channels. The two are broadcast, or recorded on disc or tape, exactly like standard two-channel material. The listener has the opposite matrix, the "decoder," to recover the four-channel information, which is then fed to his four power amplifiers and four speakers.

The encoder, at your end, costs \$795 from Electro-Voice (the others are roughly comparable). It eliminates the need for the four-channel mixer, the station identification splitter, and the two phone lines mentioned earlier. Decoders for the three systems are in the \$50-\$60 range, and they save the listener the cost of a second tuner. The same decoder works on matrixed records and tapes, so the listener can tape your broadcasts for later listening in four-channel mode; he can treat his friends to the new thrill at any time.

As this is written, there are many reports that universal decoders are on the way. Electro-Voice has announced a new decoder that works on all

Lawrence Gahagan is co-general manager of station KPEN (FM), Mountain View, California.





systems. Before too long we may get a standard matrixing system, which would give the FM broadcaster even more impetus to use matrixing.

Besides the encoder, all the broadcaster needs is a four-channel open-reel tape deck to feed the four-channel material to the encoder. Generally, the two-channel output of the encoder will come in as an input on your console. You can put the encoded program on the air directly, or you can tape it for broadcast at a later time. It is important to remember, though, that amplitude and phase distortion between the two encoded channels will adversely affect the decoding process. So it is vital that you maintain channel balance and minimize phase error!

Thus you won't have to rebuild your control room—you simply add the tape deck and the encoder. We bought two four-channel tape machines, one for record-playback and one for playback only. Either can be switched into the encoder; the other is then free for cueing. The playback unit also feeds the recorder for dubbing.

This doesn't allow us overlapping segues, but you can avoid that problem by careful program planning. There is much material available on discs that can be mixed with four-channel tapes in making up programs. We generally encode and record programs before putting them on the air.

The E-V encoder we used has four meters (for reading all four inputs, or the front inputs and the outputs), but you probably won't use these meters except during set-up and tryout. So the encoder can be put anywhere you like. It is a unity gain device, taking ac power, and is not critical as to operating levels.

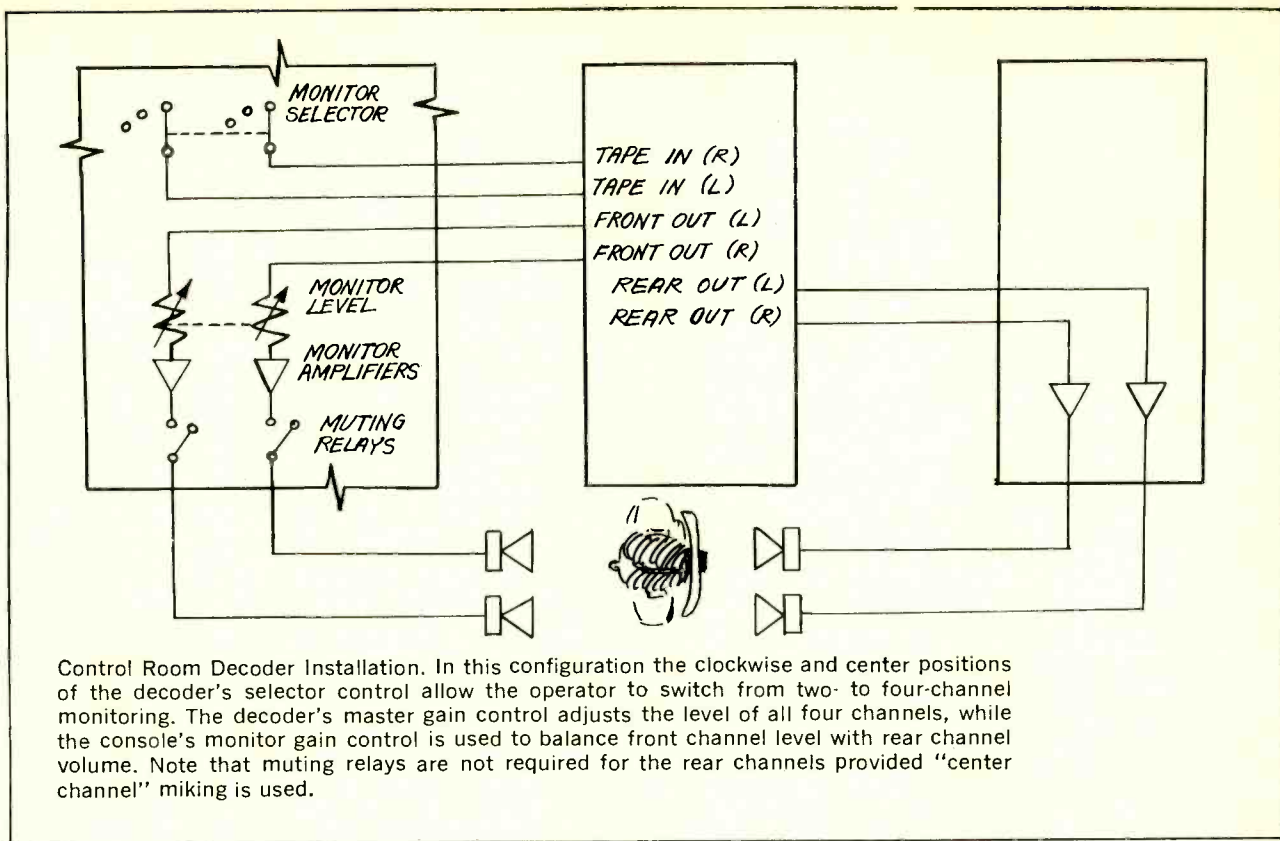
Wiring in the four-channel sources is open to all

This four-channel console was custom built for two-station four-channel broadcasts over K-101 and KRON-FM (both San Francisco). Note that off-the-air monitoring requires two separate tuners.



Control room installation shows the addition of two Teac four-channel tape machines. The unit in the foreground is equipped with four channel record amplifiers, while the rear unit is playback only.

New Development: Electro-Voice announced in late October that it would produce a four-channel matrix decoding device that will decode all presently proposed matrixing systems, including the CBS SQ, without need for switching by the listener. E-V also told FM broadcasters that satisfactory arrangement to update encoders already purchased will be made. The company said decoder units for both the consumer and I-C chips for o.e.m. set manufacturers will be available in early 1972. Significance is consumer doesn't have to wait for one system to become standard.



the pitfalls of a two-channel set up, with twice the number of wires. You *must* keep track of individual channels, making sure there is no phase reversal in balanced lines. If there is a phase reversal there will be trouble for mono, two-channel and four-channel listeners. But you probably won't know it because there are no four-channel "monitors" available, and the operation of the encoders has not been fully disclosed, with patents still on the way.

Keeping track of the channels is all the more difficult because track assignments have not been standardized and tape makers mark their machines in different ways. Every professional four-channel tape I have used has been recorded this way:

Channel 1	Left front
Channel 2	Left rear
Channel 3	Right front
Channel 4	Right rear

Amateur four-channel material has been useful to us at times, and some have used different channel assignments. We found it useful to have channel assignment switches, like the channel reversal switches on early stereo consoles.

Monitoring

Once you are set up to go on the air, the next problem is how to listen to the program. Fortunately you are likely to need few changes for control-room monitoring—you need a decoder, two more amplifiers and two more speakers. Perhaps you won't want to monitor four-channel in the control room at all, because most of your listeners will be in mono and two-channel.

However, if you do want four-channel monitoring in your control room, you must break the audio path for the decoder. We made the break *before* the monitor volume control on the console, and used the existing two-channel monitoring to listen to the *front channels*. This way, the gain control on the decoder handles all four channels simultaneously, while the original console control adjusts front-channel level for balancing front and rear. The controls on the decoder let you switch from straight-through two-channel playback to four-channel playback, and in the first position you are back to straight two-channel operation of your console.

Note that the decoder is a high impedance device so you have to combine it with console monitoring systems carefully. Most console monitoring systems are high impedance at some point, so you can add the decoder without transformers. We have not heard of anyone who had trouble with RF fields in the decoder, but RF might make the decoder unworkable in some locations. The encoder is a professional, low-impedance device with balanced inputs and outputs.

In the E-V system, mono material broadcast in equal amplitude on both encoded channels will appear in the front channels only after decoding. If you use center-channel miking for the announcer on your stereo programs, the announcer's mike will feed the front speakers only. Therefore, with the decoder installed as described here, you do not have to mute the rear speakers. Speaker wiring for the extra channels is trivially simple as no extra muting relays are needed.

Next month: A guide to current four-channel broadcasting equipment and sources of material.

TECH NOTES:

Audio DA's Do The Job

With this issue, BM/E inaugurates a new service for our engineering readers. This column will present interesting solutions to technical problems, new circuits, and other features that relate to a broadcast engineer's job. We welcome contributions from readers.

Distribution amplifiers (DA's) have been workhorses of TV for years, feeding video to monitors, VTR's transmitters, etc. The TV broadcasting industry could not have existed without DA's. But what about audio?

It used to be that speakers were driven through L-pads from a common power amplifier feeding the air signal or network to the house monitor line. Other program, monitor, and intercom material which needed distribution was resistively split to several outboard booster amplifiers. Even in TV, audio was often fed throughout the plant by a conglomeration of separate amplifiers tacked on here and there.

Then, in the 1960's, the audio DA was born. Several separate am-

plifiers with a common power supply, all mounted in the same rack panel. Good idea.

Now we've heard of a new audio DA that seems to be quite flexible and suitable for a variety of jobs. With specs like 0.25% harmonic distortion and ± 0.25 dB frequency response, both 20-20,000 Hz at +30 dBm, you can use it either on-air or in monitoring.

Made by Datatek Corp., the D-501 audio DA includes a power supply and up to nine amplifiers. For extra protection, a second power supply may be paralleled with the first—not a bad idea where the failure of a single supply could knock out all the DA's.

Each amplifier's input is fairly typical: 100 k, bridging, balanced

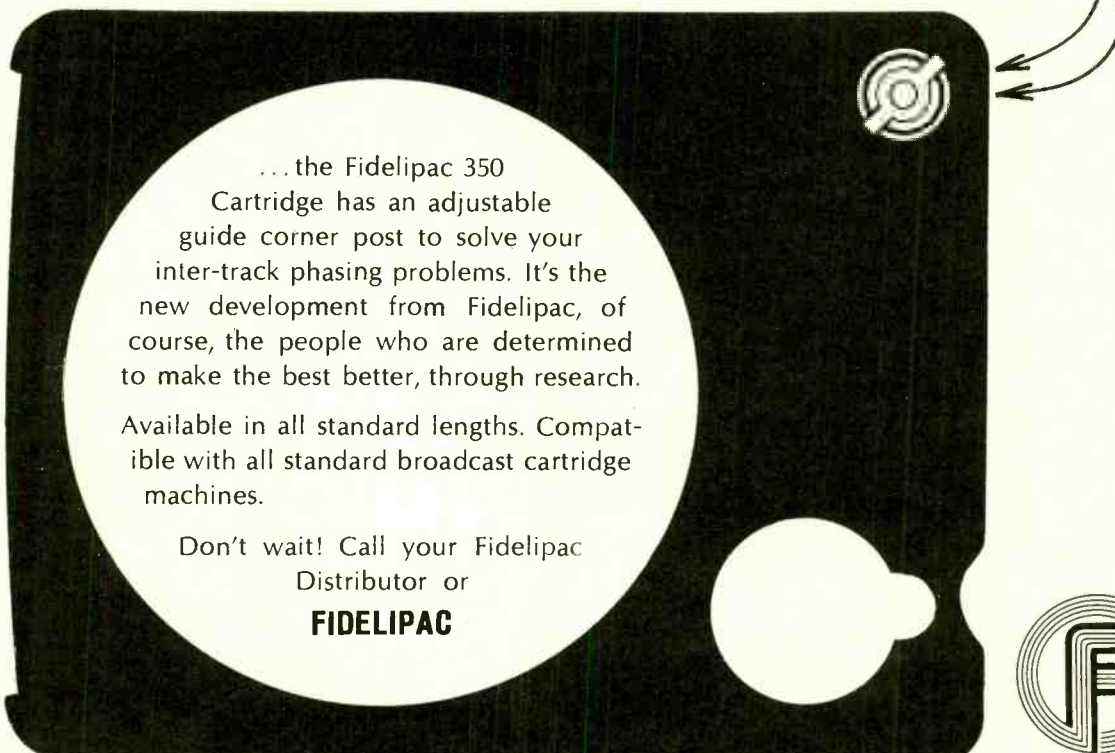
or unbalanced, up to +16 dBm before padding. Gain is 34 dB, adjustable from the front panel.

Each amplifier has six outputs which are balanced and source terminated in 600 ohms. Output capability is +30 dBm continuous duty and +22 dBm continuous duty. Isolation between outputs is 40 dB in the range of 20-20,000 Hz.

What makes the D-501 so useful is the variety of output connections to a single amplifier. For instance, you can drive up to six 600-ohm loads, putting +22 dBm continuous duty into each. Or you can drive two 600-ohm lines, and eight monitor speakers with 1 watt into each (using external speaker transformers). By paralleling outputs,

(Continued on page 41)

Fidelipac gives you phase control



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the big edge for viewer ratings and advertising dollars. When it comes to color broadcasting, nothing can touch the new CBS Laboratories Automatic Color Corrector 6000.

CBS LABORATORIES

A Division of Columbia Broadcasting System, Inc.
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Protect Against Slow-Pays: Insure Your Accounts Receivable

By Allen A. Dilworth

WHETHER BUSINESS CONDITIONS are good or static during 1972, a hard management lesson has had to be re-learned from the credit-profit squeeze since 1969: Working capital must be protected. When money gets tight, accounts receivable mount, eating into capital.

Many small firms have had liquidity problems recently. Perhaps a manufacturer is unable to collect his own receivables. If that happens, how can he pay his suppliers? My company recently paid off a \$300,000 claim to an advertising agency policyholder, when an important sponsor went bankrupt.

While most broadcasters have had problems with collection, the smaller independent radio station is often in particular trouble. Network affiliates and larger metropolitan stations are on a higher and more resourceful financial plane from a credit and collection insurance viewpoint. Many times at smaller stations the pressure to sell non-prime-time periods (such as late night) means simply getting the account regardless of that account's credit rating—or lack of.

Credit insurance

Commercial credit insurance of accounts receivable applies to manufacturing, jobbing, wholesaling, and to certain service-type businesses having industrial or commercial clients. Such insurance does not apply to retail consumer credit.

Obviously the commercial credit insurer would not stay in business long by merely protecting working capital against bad-debt losses from blue-chip companies. The bulk of premium income comes from insuring accounts which do not have high credit ratings. Fair credit ratings, or no credit ratings, are common among young, progressive companies which have not yet had time to achieve seasoned earnings records. Still, these companies are important as potential advertisers.

Commercial credit insurance is a backup, yet no substitute, for a company's own credit evaluation. Insurance cannot guarantee profit, yet it does provide control over that profit which is contemplated.

Insurance supplies a stop-loss, or money-back guarantee against abnormal credit loss. In other words, it protects against the loss on unpaid credits

that are over and above a company's normal level (deductible in insurance). Insurance is justified regardless of how good a client's account appears at time of delivery, and regardless of the business cycle.

Most businesses carry insurance on physical assets. Credit insurance on receivables is actually continuing the inventory insurance after the title passes to the purchaser of goods and/or services. Another viewpoint: Credit insurance means the station can continue to meet the payroll even if several accounts turn sour.

Management may argue that insured receivables are not important, because of faith in its own credit evaluation. Well and good, yet often the "safe" account produces an unexpected default—just as in fidelity bonding, where the "loyal and trustworthy" employee may be caught with his hand in the till.

Business failures

Some recent comments by the Credit Research Foundation are pertinent. "Historically, bad debts have risen with increases in receivables. It is a rare company whose receivables haven't gone up sharply over the past several years. In addition, the Administration tries to dampen the economy, and the extraordinarily high cost of borrowed money aggravates the ability of an increasing number of smaller companies to meet their obligations on time.

"The first warning that a customer is having trouble is difficulty in collecting money from him. Don't ignore this symptom. Follow up the account and get the story. Often in this early stage, understanding and guidance may point to the reasons . . . an insolvent debtor doesn't only owe you money, but he also owes a lot of other people money in varying amounts."

Tightness of availability and the high cost of borrowed money encourages businessmen to operate on their suppliers' working capital, if they can get by with it. When working capital is hard hit, then many a management is vulnerable to running out of money. When slow-pays become no-pays, then the abnormal, extraordinary credit loss is dangerous.

You never know what might cause slow-downs. There may be trouble inside a client management, a market disruption, or selling lethargy. There may be a general condition beyond anyone's control, such as a national crisis, crop failure, natural disaster, shift in consumer buying, or a credit-profit squeeze, as we have recently had (or been had by).

Allen A. Dilworth is Chairman of the Board of American Credit Indemnity Co., Baltimore, Md.

Let RCA Ampex[®] Mark

Alfecon II, RCA's new headwheel material, has significantly increased headwheel life.

Average head wear of RCA panels is now over 500 hours. One hundred have run over 1000 hours. Maximum, so far, is 3001.

Now our rework is available to users of Ampex Mark X headwheels.

Calculate your potential savings here.

ASSUMING YOUR AMPEX MARK X HEADWHEEL REWORKED WITH ALFECON II HAS THE SAME AVERAGE WEAR AS OURS, YOU CAN DETERMINE YOUR COSTS WITH THIS EQUATION.

$$\frac{\text{Total machine hrs per year ()}}{500 \text{ hrs. (RCA average wear.)}} \times \$990 \text{ (RCA rework cost)} = \text{(Your annual costs with RCA)}$$

Your present annual headwheel costs _____

Your annual costs with RCA reworked headwheel _____

potential savings _____

So, Ampex users, here's your chance to join RCA's 1000 hour club.

You see, RCA is in business to make the broadcaster's job easier and more profitable. Our headwheels are doing it for our customers. So we thought we'd spread a good thing around.

**rework your
X headwheels.**

Circle 135 on Reader Service Card

REGA

www.americanradiohistory.com

The independent radio station, hustling to sell that last hour of air time, may pick up marginal accounts that will pay late or not at all. That ties up working capital, and you are the loser. A good way of safeguarding your investment is commercial credit insurance.

How coverage works

In general, coverage costs a fraction of one per cent of annual sales volume. The actual amount depends on the company's management philosophy, character and scope of its accounts which are insurable, and related factors. When wisely and aggressively used, commercial credit insurance has been known to help build sales volume in a prudent way. Some policyholders have admitted that they would not know how or where to begin to appraise the financial condition of many of their clients.

Coverage is largely automatic on the basis of mercantile agency ratings. There must be experienced judgment, of course, as to the policyholder's client accounts which are insurable, and as to what extent they are insurable.

The insured and his insurer must collaborate closely as to the available coverage of credit risks to other than highly rated companies. My company provides a special endorsement to pick up the risk covering work-in-process.

Coverage is in excess of the deductible—a one-time deductible in each policy year. Coverage is often written on a catastrophic basis with a high deductible. The deductible for a company having sales of \$5M a year, for example, may be anywhere between \$3000 and \$15,000, depending upon the experience and preference of the insured.

In selecting a deductible, the insured is placing a ceiling on potential losses in much the same way as management would try to control normal expenses. Having the ceiling on credit losses provides, at the same time, a vehicle for pursuing aggressive, yet prudent, marketing of broadcast time.

Importance of collections

Business failures rose in 1970, with dollar liabilities reaching an all-time high. My company has seen an increase of 50 percent over 1970 in policyholders' filings on overdue accounts. And the size of overdue accounts is rising.

During a business slump, collections become relatively more important than sales volume. Moreover, the worry over collections comes at a time when many businesses are either hard-pressed to pay or are unwilling to make payments when due. Profit is realized when the customer pays up—not when sale and delivery are made.

So the search proceeds in 1971 for better business liquidity, which in essence is the ability of a compa-

ny to pay its own bills currently. For a long time the quality of business credits has been deteriorating. The 1969-71 credit-profit squeeze caused a lot of slow paying to worsen. To the small independent radio station, this is significant.

Through many years of economic upside the striving has been for more and ever bigger sales volume year after year. In so doing, the tendency has been to lengthen terms of payment, to be soft on credit extensions and lenient about collections.

Past emphasis has been on producing and selling. Today, the ability to do either is profoundly affected by the ability to finance a business going along. A good way to guarantee that working capital is through commercial credit insurance of accounts receivable. **BM/E**

What's Your Favorite Excuse?

The Slow-Pay Game: All you need is a company, an accounting system, and imagination. The object is to see how long cash flow can be maintained by postponing payments for reasons like these:

It's in the computer . . . we've changed our system . . . it's all made out except for the signature.

The boss is in Europe . . . would you resubmit it, must have been mislaid . . . resubmit it, the address is spelled wrong . . . we had it ready but the amount was off by 3¢ . . . we're reviewing all of our accounts . . . our controller quit . . . are you sure you sent us a bill?

Everyone will be paid after the quarterly statement goes out . . . we're paying taxes this month . . . we're taking inventory just now . . . the check-writing machine is broken . . . the CPA screwed up the books . . . there seems to be some question about the wording of the purchase order.

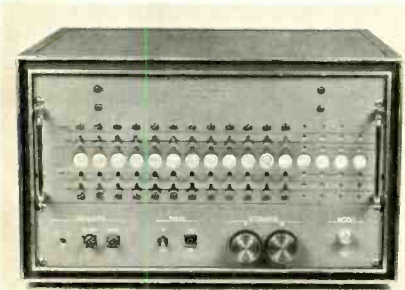
Our records show you were paid, please check your records . . . resubmit the bill, there was a staple hole on the amount . . . it is going in the mail this afternoon, tomorrow the latest . . . it can't be nine months old, we pay all our bills immediately—unless there is some hangup of course.

(Ed. note: This collection has been credited to an anonymous wit at the Noonan ad agency. It was first seen in Ad Daily Newsletter, 54 Park Ave., New York 10016. We saw it reprinted in Broadcast Services Bulletin from International Digisonics Corp., 166 E. Superior St., Chicago 60611. Digisonics' business is, of course, to "Help Stamp Out Slow Pay.")

BROADCAST EQUIPMENT

For more information,
circle boldfaced
numbers on Reader
Service Card

Multiple-frequency signal generators cover range from 50 to 300 MHz. The SX-16 series produces high-level signals for CATV or other broadcast systems. Any 16 frequencies can be had on one front panel. Level is +57 dBmV after combining, stability is crystal controlled to 0.003%. Internal modulation of 15.750 kHz



is provided; amplitude and modulation percentage are adjustable for each frequency. The SX-16 with any 12 frequency outputs, \$6100; SX-16/2 with 32 outputs, \$14,350. DIX HILLS ELECTRONICS. **275**

Economical color camera, for studio and remote closed-circuit television, uses three separate mesh vidicon pickup tubes and a precision dichroic-mirror optical system. Model CC-500 delivers an NTSC color-encoded signal, has an automatic iris control for stable color under widely varying light conditions, accommodating 125-1 changes in brightness with less than 10 percent video level change. Zoom and focus controls are on handles. Standard sync generator and encoder for standard color signal are built in. Lens is F/2.5 with 10:1 zoom. Horizontal resolution is better than 400 lines and vertical better than 300. \$12,000. AMPEX. **276**

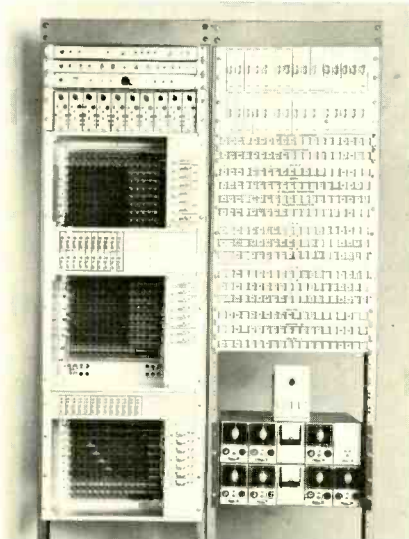
Lightweight, portable VTR uses half-inch tape in the EIA-J format, has

a rotary transformer head which eliminates slip rings and brushes. Model 6410 has a full 30 minutes of recording time, motor driven rewind, audio dub, stop action, built-in microphone, runs on batteries or



AC. Camera weighs five pounds; the recorder, 16.7 pounds. Horizontal resolution is more than 300 lines. There is instant replay through the camera. CRAIG. **277**

Audio/video routing switches provide high-speed electronic switching of multiple video and audio signals to any combination of multiple outputs. BRS-V-2000-X Series are modular in construction, allowing a wide variety of systems to be generated. Crosspoint modules are plug-in, as are input-output amplifiers. Systems can have computer compati-

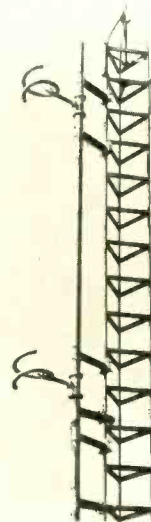


bility, use a number of control methods ranging from mechanical inter-

locking switches to BDC computer control. INTERNATIONAL NUCLEAR. **278**

Function generator covers range from 0.0001 Hz to 20 MHz. Model 7230 delivers 30v p-p square and pulse waveforms with typical rise and fall of 10 nanoseconds, and makes sine, square, triangle, ramp, pulse and sync forms. It can be swept or AC modulated over a 1000:1 frequency ratio, and can be locked to an external voltage. Dc offset is adjustable. \$795. EXACT ELECTRONICS. **279**

Circularly polarized FM antennas are highly resistant to corona and available in super power with null fill or with null fill and beam tilt. Models use from 1 to 16 elements, and are basically 1½ turn helixes one wave-



length apart. Free-space circularity patterns are within ±1 dB of perfect circularity. PHELPS DODGE. **280**

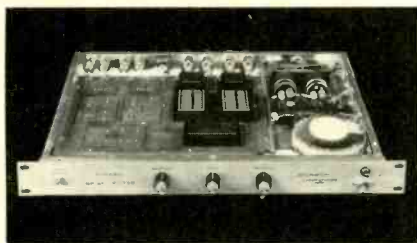
Hybrid push-pull line-line extender is designed for cable systems with 20, 25, 30 or more channels. NOVA line extender covers 40-300 MHz, has temperature compensated AGC, second order beats down 69 dB and hum modulation of -65 dB. AMECO. **282**

Crystal-controlled motor drives the Mark II and S35R cameras. It has
(Continued on page 36)

Clean up

Noise

Pollution with the Model 1000 Dynamic Noise Filter



A Signal Controlled Automatically Variable Bandpass Filter Which Reduces Noise When Playing Any:

Master Tape; Multitrack Mix; Pre-recorded Tape; Cartridge; Cassette; Record; FM Program; Video Tape Sound; with no audible effect on either music or speech

1, 2, 3, or 4 Channels Use Epoxy Plug-in Modules

Features

Bandwidth Dynamically Controlled By the Music

Noise Attenuation Up To 25 dB @ 30 cps and 22 dB @ 10 kc

Response To Musical Content Flat $\pm .2$ dB

A Transient Extends the Bandwidth to 32 kc in 1 ms

Attenuates Noise Above and Below the Audio Range

Less Than .1% Total Harmonic Distortion
Dynamic Range 100 dB

$\pm .1$ dB Insertion Gain

10 dB Unweighted Tape Noise Reduction
Output dc Coupled, ± 11 V Open Circuit

Delivers 18 dBm into 600 ohms or 16 dBm into 150 ohms

1, 2, 3 or 4 Channels Available on 1 3/4" Rack Panel

Stereo Channels Ganged in Pairs or Independently

Plug-in Epoxy Encapsulated Modules for Ease of Servicing

Active Transformer Input, 100k or 600 ohms

Highest Quality Materials and Components Guaranteed for Two Years

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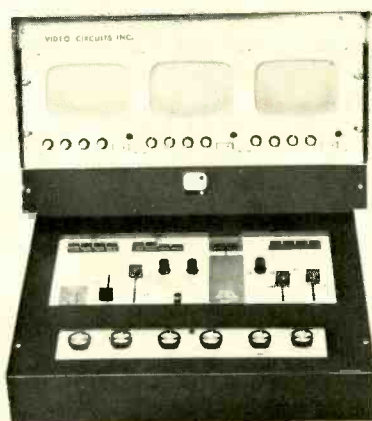
Circle 114 on Reader Service Card

sync speeds of 24 and 25 fps, forward and reverse, with an accuracy of ± 15 parts per million. Warning tone indicates out-of-sync condition. CINEMA PRODUCTS. 283

Log periodic FM antenna has a gain of 7 dB over a dipole, within 1/2 dB over the FM band. Model CLFM can be had with 75 or 50 ohm impedance, has high multipath rejection because of minimum side lobes and front-to-back ratio of 25 dB. SCALA. 284

Self-contained view-finder camera can be had with Plumbicon, silicon-diode array, or vidicon image converter. Sync can be from external signal or from a choice of internal generators. It has linear-phase, delay-line aperture correction. COHU ELECTRONICS. 285

Video console for miniature TV studios, control centers, CCTV and videotape systems, has three 5-inch monitor screens, inputs for two cam-



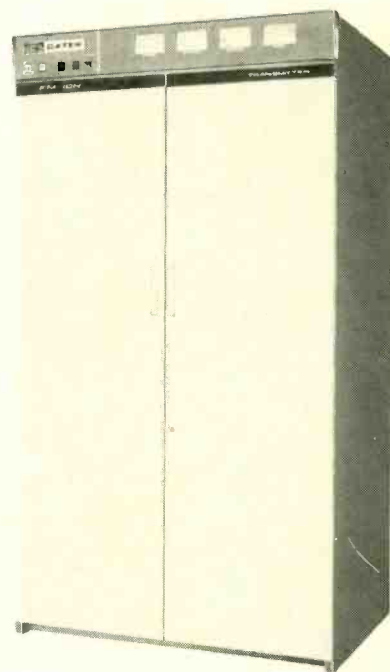
eras, 75-ohm unbalanced video input (balanced on request). \$1495. VIDEO CIRCUITS. 281

Automatic slope-and-gain control amplifier in modular form is for direct and internal plug-in use in Starline 20 or Starline 20 Push-Pull trunk stations. Model SAS-3000 samples standard video carriers, keeps output within ± 0.5 dB for input changes of -5 dB to $+3$ dB. JERROLD. 286

Crystal modification for the Auricon camera reduces weight up to 10 pounds, provides for double system filming without sync cables, will run six 400 ft rolls of film on one battery, and has a crystal-controlled motor. ALAN GORDON. 287

Eight-output directional tap for strand mounting is a hybrid coupler type, designed for high density areas. (Continued on page 37)

What FM transmitter power do you need?



Gates has the most complete line of FM transmitters in the industry. From 10 to 40,000 watts. All with a 100% solid-state exciter employing DCFM (direct carrier frequency modulation) and DAFC (digital automatic frequency control).

The TE-3 exciter is the heart of all H3 series transmitters—one tube (1kW), two tube (2, 3, 5 and 10kW), and three tube (20kW). All FCC-type accepted, ready for prompt shipment.

Tell us the power you need and ask for data on our FM antennas. Write Gates, 123 Hampshire St., Quincy, Illinois 62301, or phone (217) 222-8200 today.

HARRIS
INTERTYPE
CORPORATION

GATES
A DIVISION OF HARRIS-INTERTYPE

Circle 115 on Reader Service Card

DECEMBER, 1971—BM/E

Model XRDM can handle up to 3 amperes of ac power by pass and up to 12 amperes for short periods of time. KAISER. **288**

Matrix program boards have switching crosspoints, connected by inserting shorting pins. 1000 Series can be had in matrixes from 10 × 10 up to 100 × 100, in standard arrangements or with up to 8 levels of contacts. INFO-LITE CORP. **289**

RF amplifier is designed for off-the-air operation of FCC-approved FM and VHF-TV broadcast monitoring equipment. TBM-2500C Series has constant output for input variations of 45 dB, passband filter 290 kHz wide for rejection of unwanted signals, which are 60 dB down at 800 kHz from the operating frequency. Zero operating frequency error comes from a sum/difference mixing technique. \$485 to \$530. MCMARTIN. **290**

Low impedance magnetic telephone pickups are for use with transistorized tape recorders and amplification devices. Model 30-6000 has a suction cup for attachment wherever field is strong; Model 30-6002 slips over the ear piece of the telephone. \$2.45 and \$2.90. GC ELECTRONICS. **291**

Electronic timer will automatically turn a tape recorder or other device on and off at preset times. The Programming Timer allows the recording of radio broadcasts when no one is home. NORELCO. **292**

Single-cable bidirectional amplifier has 50-270 MHz bandwidth forward and 6-32 MHz in reverse. Super-Band Challenger Mark II, Model CVT-5AB trunk amplifier, has ASG in the forward direction. All ports have surge arrestors. AEL COMMUNICATIONS CORP. **293**

Push-button coaxial attenuators have self-wiping action which makes attenuation settings repeatable. The PB Series comes in bench or rack-mount form, can be had with 0 to 102 dB in 1 dB steps, or 0 to 82.5 dB in 0.5 dB steps. \$85. TEXSCAN. **294**

Comedy fillers for weather channels consist of pre-printed 3 X 5 cards with topical humor and one-line gags. Cable Comedy is aimed at sweetening the weather and news reports, providing some suspense to keep viewers tuned in. Much of the material is written by Bob Orben, who has written for Jack Paar, Red Skelton, and others. Subscription about \$9 a month. SHOW-BIZ COMEDY SERVICE. **295**



Can LPB offer the same or better specs in their \$475 S-2 Audio Compressor/Limiter than the people in Connecticut can? Yes! The S-2 has an instantaneous attack time constant, 10 db/second recovery time and +11 db VU peak power at the absolute limiting point on the limiter! The compressor gives .066 seconds attack time constant, 2 db/second recovery rate, 2:1 Δ db Pin/Pout compression rate plus a variable compression threshold of -40 to -10 db VU . . . for \$470.00! Just send us a refundable deposit of \$50.00 plus your purchase order and we'll ship your LPB S-2 for a free 30-day trial. We know you won't return it so we'll bill you for the remaining \$425.00. And don't forget LPB makes and distributes 5 and 8 channel consoles, turntables and all the other studio necessities you can use, all at lowest possible prices. If you're still not convinced about the LPB S-2 Audio Compressor/Limiter, we'll spring for the cost of a collect call to John Gafford at



LPB Inc.
520 Lincoln Highway, Frazer, Pa. 19355
(215) 644-1123

Circle 116 on Reader Service Card

NEW LIT

For copies of these literature offerings, circle number for appropriate items on Reader Service Card.

Data sheet on digital V-O-M describes new lightweight, 2¾ in. Model 6028, with 100% overrange, and out-

of-range and polarity indicators. TRIPLETT. 200

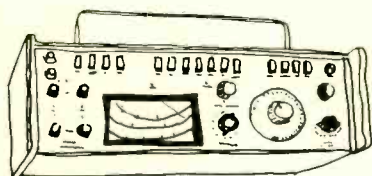
Lighting handbook for television, theatre, and professional photography has been published in a fourth, updated edition. It covers lamp data and basic lighting information for all professional lighting uses. GTE SYLVANIA. 201

Subminiature RF connectors catalog covers more than 800 ConheX models for cable, bulkhead, printed circuit, stripline and other applications. SEAELECTRO. 202

New and reconditioned test equipment catalog covers thousands of items, including standard test units from all the leading makers; also described is rental and calibration service for test equipment. TUCKER ELECTRONICS. 203

Technical bulletin, "News 48," carries comprehensive technical articles on new test units: the Videoskop III, a sweep generator and selective receiver for frequency response, gain, and group delay in the range from 10 kHz to 20 MHz; Color Gain and Delay Test Set SPAF, using the 20 T pulse modulated with the color sub-carrier; and the Sync and Color sub-carrier generator assembly, SPSF, which produces all pulses and signals needed for TV measurement. ROHDE AND SCHWARZ. 204

Harvey's has a complete tape-recorder tester that's not much larger than a lunch box.



Come to Harvey's and see a complete portable oscillator, wow-and-flutter meter and distortion meter combined into one 13-lb., lunchbox-sized package.

It's English, and we're pretty sure you'll find it more convenient and just as accurate as whatever you're now using, because the BBC is using it as

you're reading this, and they're more than happy with it. (They're a pretty demanding lot, those BBC engineers, as you probably know.)

Speaking of the BBC, Harvey's has some studio faders that the English engineers have been raving about lately.

The faders are made by Penny and Giles, and there are two kinds: The filet-mignon kind (\$76 a unit), which is a conductive-plastic fader that's smooth as pudding to operate, and also dead silent. If you spend a lot of time at the console, these Penny and Giles' are the faders for you.

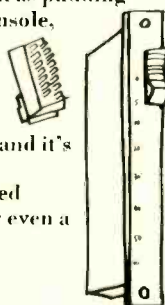
Then there's a new Penny and Giles fader that's a little smaller than a hot dog, and similarly priced (\$29.50 each). It's not the conductive-plastic design, it's a conventional wire-wound unit, but it's narrower and more compact than any other fader we know of, and it's smoother and quieter than most non-Penny-and-Giles faders.

Harvey's also has a lot of other lunchbox and sub-lunchbox-sized equipment you should know about, enough to make a letter, call or even a trip to our showrooms worth your while.

When it comes to the latest in audio or A/V equipment, Harvey's is sort of a gourmet shop.

Harvey Radio Co.

Professional A/V Division, 444 Madison Avenue, New York, N.Y. 10022.
(212) JU 2-1500 or (212) 832-8675.



NEW BOOKS—FILMS

How to Become A Radio Disc Jockey, by Hal Fisher. 224 pages. TAB Books, Blue Ridge Summit, Pa. \$7.95.

This book is aimed at a dual purpose: to be a comprehensive 25-lesson home study course for anyone who wants to do it alone with a tape recorder; and to be the handbook for the classroom teacher tackling the subject. It includes drills, exercises, illustrations on every aspect of the topic, from proper use of the voice, to developing a dynamic personality, to getting an FCC license, etc.

Technical Papers of the 1971 NAB Engineering Conference. Engineering Department, NAB. 224 Pages. TAB Books, Blue Ridge Summit, Pa. \$10.00.

A complete transcript of all the papers presented at the Conference, together with all the photos, slides, drawings.

The Invisible Resource—Use and Regulation of the Radio Spectrum. Harry J. Levin. The Johns Hopkins Press, Baltimore. \$12.00.

An analysis of the economic characteristics of the radio spectrum, and a proposal for alternative ways of using the spectrum as a market resource.

Bibliography of Rand Publications on television lists about 40 reports and memorandums on cable, television, and related topics, with an abstract of each. Copies may be obtained by writing Communications Dept., Rand Corporation, 1700 Main St., Santa Monica, Calif. 90406.

NEWS continued

he had brought in advertisers who had never before used FM, most in consumer electronics. Ken Duke, general manager of KDDD, Dumas, Texas, urged small-market broadcasters to look closely at local sports as a profitable area. He joined several others in emphasizing the importance of analyzing the station's audience, its habits and tastes, and selling the *audience* to advertisers rather than the station.

Moon Program in Color on EVR Cassette

A 25-minute special, "A Ride on the Moon Flight of Apollo 15," has been produced by CBS News and transferred from color videotape to the Columbia EVR cassette in color. The first color program to be so transferred, the commemorative account of Apollo 15's lunar exploration, used a new color electron beam recorder built by CBS Laboratories, according to R. E. Brockway, president of the CBS Electronic Video Recording Division. He said the program had been completed before the astronauts splashed down. The EVR cassette was played for the press at the conference.

Sterling Puts Movies on New York Cable

A series of eight movies never before seen on television, several of which had won international awards, was cablecast in New York during October by Sterling Manhattan, one of the two cable outfits now operating in Manhattan. Distributed by Grove Press, the films were by such "advanced" directors as Jean-Luc Goddard, Susan Sontag, Ousmane Sembene, and Allan King.

Business Briefs

Graham Magnetics, Graham, Texas, developer of the new Cobaloy high performance magnetic tape, announced the completion of facilities for the manufacture of their own line of videotapes, with commercial production slated to begin in January 1972. . . **RCA** dedicated in October a new factory on the Isle of Jersey, England, to make videotape recording equipment for European broadcasters. . . **The Optical House**, New York, showed a computer system which creates a direct link between an artist and an animation stand, eliminating the

need for long and precise programming for each operation. According to the developer, the artist merely tells the computer via a teletype machine what he wants, using common language. . . **GTE Sylvania** has appointed **MSI Television** of Salt Lake City a non-exclusive national distributor for the CSS-1 Color Slide Studio, which uses a flying spot scanner to put 35mm color slides onto TV. . . **Gates Radio** will supply three 13 kw low-band color television transmitters, Model BT-13L, for WCBS-TV, New York, and two 18 kw high-band color transmitters, Model BT-18H, for station WNET, New York, all to go in the new transmitting location for New York stations in the World Trade Center Building. At the 1350-foot level, the new location is expected to give the stations installed there improved New York area coverage. . . **Kaiser CATV** has completed a 220-mile cable system for **Amherst Cablevision of Amherst, N. Y.** . . **Cypress Communications**, Los Angeles, has announced plans to build one of the largest cable systems in the country in Columbus, Ohio, in an area with about 200,000 homes. Cypress acquired 80 percent of **Canterbury Cablevision**, which had started to install the system, and will expand its coverage. . . **A majority of economists in Washington**, says Publishers Press, believe the new Nixon economic program will be a strong stimulant for the economy. But they don't say *when* or *how much*. . . **Philco-Ford's Telesound Division** has chosen Good Communications in Philadelphia to help test-market Rentertainment, a program of renting color TV sets to cable TV subscribers. . . **TeleMation, Inc.**, has appointed Richard Kelly national accounts sales manager. . . **Comcast Corporation**, Bala Cynwyd, Penna., has bought the assets of **Westmoreland Cable Company**, New Kensington, Penna., with 171 miles of cable plant passing 22,000 homes. . . **Alfred State College**, Alfred, New York, now gives a two-year A.A.S. degree program in industrial technology with an option in broadcasting. The program is geared to train technicians for broadcasting; students take the first and second class FCC license tests. . . **Image Communications**, Chicago, has announced the opening of television production studios and training facilities, which will be headed by J. M. Crooks, as president, and Matt Spinello, as director. Both men, formerly with the Ampex Video Institute, are widely known as trainers of television production personnel. . . **Theta-Com**,

Los Angeles, announced the beginning of delivery from production of their new 12 GHz AML microwave relay equipment. . . Fred Olsen, president of **Cor-Plex International**, Chicago, and T. H. Anderson, president of **FCB Cablevision**, Irvine, California, announced agreement in principle for a merger of the two companies.

FCC Actions

Random closed circuit EBS tests have been suspended until further notice. A January 1971 test disclosed operational deficiencies, while a February 1971 erroneous transmission of an Emergency Action Notification caused considerable confusion. Further, a September 1971 test disclosed a large number of additional operational deficiencies. . . The Broadcast Bureau has affirmed its dismissal of a complaint from WAVI/WDAO (FM), Dayton, Ohio. It had been charged that WONE, Dayton, had used promotional material based on Pulse surveys which did not list WAVI/WDAO. WONE replied that the two stations were excluded from research because they were not consid-

(Continued on page 44)

IMITATED BUT UNMATCHED!



SP SERIES REPRODUCERS
SP-0001 \$625

- 8½ Inches Wide
- 450 RPM Direct Capstan Drive Motor, Electrolyzed Shaft
- Quiet, Air Damped Solenoid
- Hi-Speed Cue Option
- Monophonic or Stereophonic



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NEWS continued

ered competitive factors. The Bureau concluded that there had been no obvious abuse of the Pulse survey by WONE. . . . KCIJ, Shreveport, La., has been ordered to forfeit \$7500 for rule violations. The FCC found that KCIJ had not filed, within required time, copies of amendments to its affiliation agreement with the Mutual Broadcasting System. The Commission further found that KCIJ had issued certificates of performance which misrepresented time, frequency, and nature of network commercials it had broadcast over a period of several years. . . .

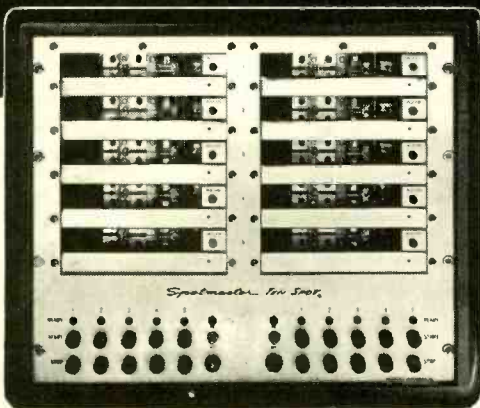
KIKK, Pasadena, Texas, has been ordered to forfeit \$5000 for operating prior to sunrise when not authorized to do so. . . . KPUB, Pueblo, Colo., has been ordered to forfeit \$700 for failing to keep a maintenance log and make field intensity readings at monitor points. . . . KNND, Cottage Grove, Ore., has been held apparently liable for \$500 forfeiture for failing to keep a maintenance log and inspect transmitting apparatus five days a week.

. . . Children's TV task force appointments were announced by the FCC. Mrs. Elizabeth J. Roberts, a

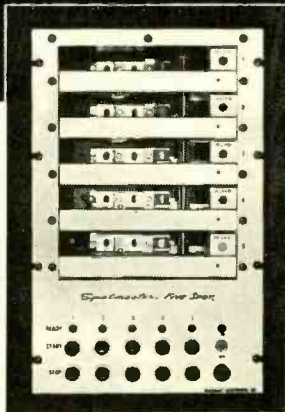
former member of the staff of the White House Conference on Children and Youth, and Dr. Alan Pearce, of the Indiana University Radio-TV Department, have been appointed by the FCC to a newly organized task force on children's television. One of Dr. Pearce's assignments will be a study of the economics of children's programming. . . . Application of CATV program exclusivity rule to nationally syndicated programs was proposed by FCC. Camellia City Telecaster (KTXL-TV) in asking for the new rule said that viewers may be deprived of the opportunity to watch many popular nationally syndicated programs in prime time because a higher priority station on the CATV system may schedule the program later in the day and, under the rules, may require the CATV system to delete any other presentations of the program the same day on another station on the system. The Commission said it found Camellia City's argument "quite persuasive," noting that in the *Second Report and Order in Docket No. 14895* (2 FCC 2d 725, 749-750) it had stated that the reason for the non-prime time exception to the program exclusivity rule for network programs was to ". . . insure that such programs are available to the CATV subscribers in maximum viewing hours." . . . Use of digital modulation in microwave radio operations will be studied in FCC inquiry. Commission fears that pulsed systems may cause destructive interference to the frequency division multiplex (FDM) systems now used in private and common carrier microwave operations.

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For further information about these and other Spotmaster cartridge tape units, call or write today. Remember, Broadcast Electronics is the No. 1 designer/producer of broadcast quality cartridge tape equipment . . . worldwide!

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New "Tele/Theatre" Shows Movies in Hotel Rooms

A new entertainment service called "Tele/Theatre," developed by Trans-World Productions, the closed-circuit television division of Columbia Pictures Industries, Inc., got its first showing at the Regency-Hyatt Hotel in Atlanta on October 6th. Current movies which have completed their first-run showings are distributed to the rooms of a hotel through special new playback equipment plus the existing hotel master antenna system, without interfering with standard TV broadcasts. The occupant of a room can "order" a movie, and the fee is added to his bill. He sees it on the TV screen in his room. Equipment for the system was built by IVC.

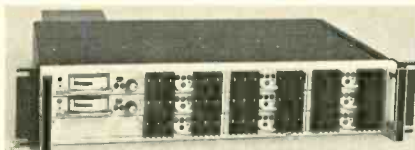
TECH NOTES continued

you can get more power into speakers. Example: Parallel all six outputs and you can drive one speaker with 12 watts.

A single pot controls amplifier gain, but if you want different levels on different output lines, you simply pad some down.

All right—that's one amplifier. This unit can be had with up to nine. Needless to say, each can handle different program material. Thus a nine-amplifier D-501 could probably handle all house distribution for a large radio station.

A couple of notes on design: Output transistors and their heat sinks are on the front panel, where they'll get maximum convection cooling, and thereby (hopefully) avoid thermal runaway. Each amplifier is a plug-in unit. When you hard-wire the back panel to a jack field or whatever, you're wiring connectors only. If an amplifier module has problems, unplug it and borrow another. Each amplifier includes its



own input fuses and regulators, so a failure of one module won't affect others in the frame.

The power supply includes a meter for voltage and current checking. Also on the front panel: Pots to adjust positive and negative regulated voltages, a pilot lamp, and a light-emitting diode (LED) which flashes on total or partial supply failure.

For more information, including a lot of diagrams showing the various output connections, circle 300 on Reader Service Card.

Stereo Mixer Kit

Making up a customized console from functional modules is standard practice today as reported elsewhere in this issue. But now you



can start with less than a module. Gately Electronics has put a stereo mixer kit on the market called PROKIT-SM-6.

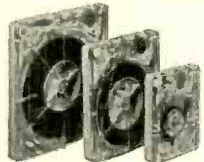
You get individual components along with ready-made p-c cards. P-c cards come with plug-in sockets to which ICs are connected. (Circuitry uses I-Cs throughout.) Six input channels are included; specs are professional. Mixer kit price is \$249. An equalizer kit and echo kit will be available shortly. For more information, circle 301.

Now It's Gateway 80

The third console to bear the name "Gateway" is an eight-channel solid-state monaural unit called the Gateway 80. Unit has 18 inputs. Cue, monitor, and program amplifiers are interchangeable p-c board modules. For more information, circle 302.

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300	20 sec. (13')		\$ 2.00
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300	70 sec. (44')		2.10
300	100 sec. (63')		2.25
300	140 sec. (88')		2.35
300	3½ min. (132')		2.50
300	5½ min. (207')		2.90
300	8½ min. (320')		3.70
300	10½ min. (394')		3.90
300	empty cart.		1.60
600	16 min. (600')		6.25
600	empty cart.		2.80
1200	31 min. (1163')		10.45

Also: DL cartridges (for Spotmaster delay machines), bulk tape, tape-tags and other accessories.

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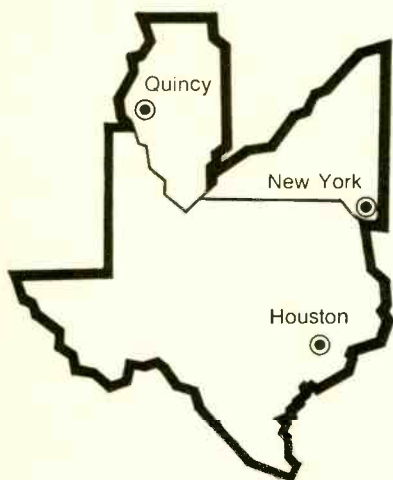
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Convention Log

Update on Automation, Cameras, Satellite and Videocassettes at 110th SMPTE Technical Conference

IT TOOK FIVE FULL DAYS to work in the many papers on new television systems at the 110th SMPTE Technical Conference. If it weren't for the pleasant environment—Montreal—the load would have been overbearing.

In the first three days topics included new component evaluation, new equipment evaluation, a close look at improvement of film and comparison of film with TV, a status report on automation, a glimpse of broadcasting by satellite, and a full description of CBC's new technical facilities for radio and TV, Place de Radio-Canada. The last two days were given over to the Videoplayer Symposium reported in *BM/E* last month, page 26.

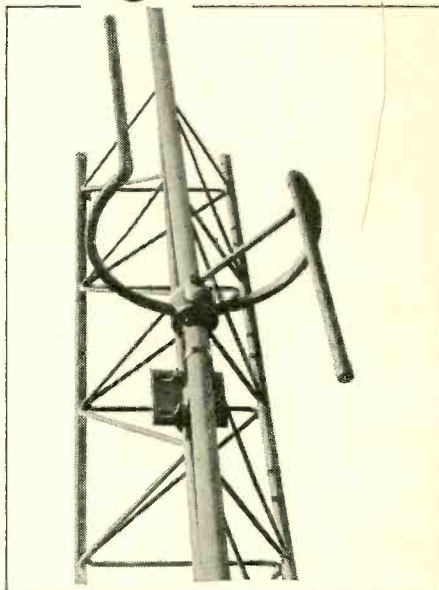
Synopses of most papers are available from SMPTE, 9 East 41st Street, New York 10017, in booklet form for \$5.00. Selected highlights of interest to broadcasters follow.

Receiver for CATV. A 20-inch color TV set built for CATV was described by A. Muma of Electrohome Ltd., Kitchener, Ontario. By using coax lead-in and double-shielding the tuner, 80 dB isolation was achieved. The problem of receiver "flag waving," which occurs when inexpensive VTRs (without equalizing pulses) are played into a CATV system, was licked by including a switch (and a capacitor) that increase the fast recovery time of the AFC circuit.

Twenty-four-channel tuning was achieved by a 12-position varactor tuner which had an A-B switch to work with either dual cable or mid- or super-band channels. From a quality point of view, Muma said he favored multi-cable over use of mid- and super-band frequencies. The receiver is a prototype—Electrohome is looking for sufficient interest on the part of cable operators before moving into production.

Mag tape advances reviewed. Lee Marks of 3-M told SMPTE attendees that 3-M's new cobalt-modified

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DECEMBER, 1971—BM/E

High Energy tapes offer higher RF output and improved signal-to-noise—4 dB from the 500 oersted tape and 7½ dB from the 900 oersted tape. The 500 oersted tape requires about 25 percent more RF drive, but this is within the capabilities of most recorders. The 900 oersted tape will require machine modification—which Marks feels will be forthcoming.

A speaker from Graham Magnetics discussed the virtues of that company's new Cobaloy particle tape. Coercive forces of 500 to 1100 oersteds can be achieved. Because a three-fold signal-level increase is possible, signal-to-noise is better, or speed can be reduced (along with thinner coatings). The soft material reduces head wear, Graham says, and Cobaloy is relatively insensitive to temperature changes. However, Cobaloy is not compatible with existing recorders. To take advantage of the new tape which is going into production, heads with narrower gaps are needed and higher record currents are required. Bias circuit changes will also be necessary.

Color rendition, cameras, film, tape, scrutinized. Many papers reported various analysis efforts. CBC

reports it has a technique for checking the colorimetric quality of TV cameras—for evaluating cameras, not day-to-day adjustment. Methol uses JCIC formula on color differences when camera is aimed at colored test papers. CBC says many cameras in everyday use produce errors beyond desirable limits, but most late model cameras, if carefully adjusted, produce acceptable quality.

A cross-step gray scale slide for telecine adjustment was described by Dann Zwick of Eastman Kodak. Seven steps of light modulation, black to white (upper portion), and white to black (lower portion), for a total of 14, are provided on the slide which uses the metal alloy, Iconel, coated on glass. The slide follows a SMPTE Television Subcommittee recommendation. The seven-step range in density is from .30 (corresponding to white) to 2.35 (for black). Densities have been selected to provide a progression of transmission values that follow a 2.5 power law—which is an approximation of the transfer characteristic of a typical color tube. This slide is a "must" for broadcasters today.

A surprising but welcome answer to projection viewing was provided

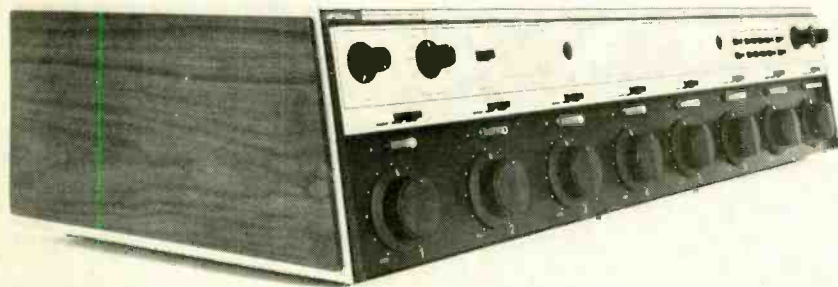
by Zwick in another paper. He said experiments show that there is no significant color balance difference between prints viewed in a standard television preview room (40 footlamberts open screen, 4 footlamberts surround, at 5400°k) and theatrical screening room (16 footlamberts screen at 3600°k, dark surround). Anything viewed in a TV room is okay for theatrical display; however the reverse is not always true.

During a color telecine panel session, the subject of responsibility for correct color was discussed and, as usual, the buck was passed to the other guy. There is a far greater awareness of the problem on the part of all—the telecine manufacturer, the television equipment operator, the lab, the film producer, the cinematographer, and the advertising agency which approves film. Automatic color correctors which take lighted scenes and shift them to white can sometimes worsen the picture—sunsets are changed to gray, white, etc.

A paper was presented by R. Theile of Munich to show the comparison of television programs produced on film and videotape. Four typical scenes were taken simultane-

(Continued on page 44)

the new mcmartin consoles



The new 8-mixer McMartin consoles feature outstanding flexibility, ease of operation and clean-cut styling. All modules are plug-in. Up to 27 inputs may be accommodated. Highest quality components, including maintainable step-type attenuators, are used.

Typical program circuit program specifications are: ±0.5 dB frequency response; distortion of 0.5%, 20 to 20,000 Hz; and signal-to-noise ratio of 74 dB for all models. Full cue, intercom and monitor facilities are standard.

Mono, stereo or dual channel models are available. The new McMartin B-800 series consoles deliver performance, operating flexibility and are priced right.

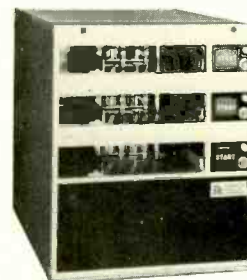
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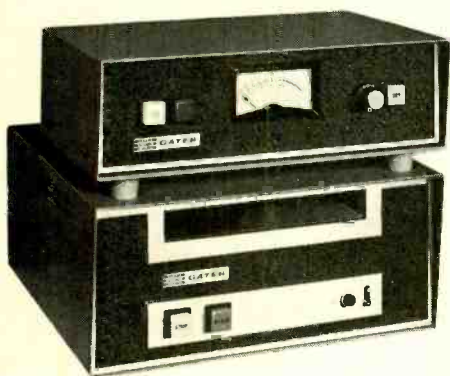
CONVENTION LOG Continued
ously by electronic and film cameras with several film options (35 neg-pos, 16 mm reversal and neg-pos, and 8 mm reversal). In all cases the quality of the videotape appeared superior—to this subjective viewer—but there were film people present who felt film was not used optimally in the tests.

Automation experiences of CBC discussed. In several related programs on automation, R. J. Buhr of Carlton University, Ottawa, Ontario, said computer-controlled systems are useful, but that a customer not familiar with computers would be in for a few rude shocks. Pitfalls include: slipped schedules, cost overruns, and failure to meet system specs. Software problems are likely to come up because of inadequate descriptions of precisely what the system is supposed to do. Biggest problem comes from idiosyncrasies that show up when the computer is time-shared. Programs can interact in strange ways.

The use of computer control in TV stations by the CBC was outlined by M. W. S. Barlow of CBC, Montreal. CBC got its initial experience in automatic switching in Quebec City using a CDL type APS410 system which gets its data from punched tape. At one time in planning expansion, CBC thought it should use large scale computers which could handle engineering and business functions. The indefinite nature of the latter, and the development of the mini-computer priced under \$10,000, led CBC to settle on a small process computer approach—which could be interfaced with a larger computer at a later time. In the meantime engineering can get data from the traffic department in the form of punched cards.

The CBC approach, therefore, is to use a mini-computer in several stations with a common software program which will work for these various stations. At Moncton, CBAFT, a Richmond Hill switcher was used. At Vancouver, CBUT, a Central Dynamics APS-610 system was used. Both systems use Nova computers with nearly identical software. The Vancouver system is the most sophisticated single-bus switcher yet installed by the CBC, having numerous extra transitions available, and control of two telecines and three VTRs simultaneously. These requirements, plus the 16-event store, almost fill up the 4096-word storage capacity of the

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basic computer.

The basic CRT display format of 16 lines each of 40 characters requires 320 16-bit words in the memory. The character generator generating the characters electronically for display on TV monitors has its own buffer storage, but does require control from the computer. The audio and video switchers, machine controls, pre-roll logic, error detection and switcher transition controls form the greater part of the stored instructions. As some two-to-three-hundred events a day may be switched, the 16-event store producing the 16-line display must be continuously updated from an external source. CBC uses punched cards, but it would be possible to enlarge the computer store to hold all 300 events by adding a further 6000 16-bit word memory.

Barlow said the cost of the basic software runs about one-third of the total cost of the system. Thus it becomes practical to computerize an existing manual switcher for less than \$30,000. The CBC software, which has been made available to any Canadian switch supplier, is designed to switch a maximum of 234 audio and video sources, up to 26 VTRs and 26 telecine islands, to provide true or duration time priority, up to ten prerolls, automatic previewing, automatic assignment confirmation, announcer pre-warning, machine instant start and stop, and external cue control. All these features are part of the Quebec City unit.

Machine assignment and log printout is not yet done automatically, Barlow said, because film and tape can't be exactly identifiable for such purposes.

In other papers, attendees learned that a random access 12-channel information retrieval system costs about \$25 to \$30 per student year. This is not too much in terms of benefits, according to author Gailitis, Ontario Institute for Studies in Education, Toronto.

A method for evaluating loudspeakers for broadcasting was outlined by C. R. Heft, CBC, Montreal. Heft prefers tone burst measurements over rectangular pulses or third octave band bursts because the latter obscure details of transient response. Subjective tests are also necessary, Heft says.

Several recent new developments which have been announced at earlier NAB conventions included a description of the Ampex third generation VTR to AVS-1, the GE program switcher, and the Marconi

Mark VIII automatic camera.

Other cameras reviewed were the EMI four-tube camera, the 2001, and the Fernseh light-weight camera, the KCP40, which uses a WRB pickup system.

A hand-held camera, developed by the production company, Editel Productions of Montreal, was described by Warren R. Smith. Smith took a three-tube studio camera which used one-inch Plumbicons (Editel said it was an Ampex unit).

The central casting and optics were retained, but a new housing was produced along with new electronics. A one-inch electronic viewfinder was added and a lens mount to accommodate a 22X132 mm zoom lens with iris servo control. This weighs 31 pounds. The electronics, except for the scan driver, was put in a backpack. Another version using a 10-1 zoom lens is now being built with all electronics except pre-amps in the back-pack. This unit will weigh 19 pounds.

The unit operates from car batteries and feeds a VR 3000 portable VTR. It has been used on moving car platforms, fishing boats, helicopters, with good results. **BM/E**

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What is a good approach to terminating hardware?

A few years ago I would have suggested the purchase of some good quality audio cable and some telephone-type terminal blocks with the advice to solder properly and that's it.

There are a number of possible approaches open to today's installer.

- 1) An all plug-together system
- 2) The crimp-on type terminal which pushes on to a mating pin on terminal blocks designed for the purpose
- 3) Barrier-separated screw-type terminal blocks
- 4) Solder-type terminals
- 5) Wire-wrap terminals

I suppose the plug-together system is becoming more popular with both station and manufacturer. The system can be easily tested on the manufacturer's floor before shipment, and quickly installed using the same cables at the site. The first costs are higher, but if you realistically include installation costs you may well save money—certainly you save time.

The crimp-on terminals which push-on to mating terminal block pins are certainly gaining in popularity. They make a nice clean no-solder connection which is highly reliable. How many times have you completed an installation on a solder-type block which looked beautiful until the inevitable changes were made? Burnt insulation and solder splashes



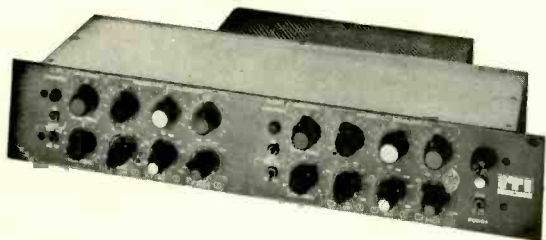
Flexible intercom system uses preset patch panels which can connect any desired calling station with any listening station.

most often result. The push-on terminals present no such problems. If you're squeamish about not using solder, the terminals can be soldered after installation if you desire. Two manufacturers of this hardware are Thomas & Betts and AMP Inc.

While we are on the subject of interconnections, don't overlook the system of interconnecting hardware developed for the telephone company and available through Graybar and Automatic Electric, etc. You probably have a number of these components already in use in your station telephone system. They are inexpensive and reliable. This system of cables and connectors works well for machine and other dc control applications.

Heat-shrinkable tubing provides an excellent means of finishing the end of an audio cable quickly and easily.

guaranteed not to rust, bust, collect dust, or bite the baby! **The** **Parametric Equalizer**



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A brief description. The Parametric Equalizer is a two channel spectrum modifier of unusual flexibility. In addition to the standard shelving-type level controls, a proprietary circuit concept permits infinite independent adjustment of equalization frequencies, "Q" or shape, and level. If you don't need two channels for broadcasting, the inter-channel crosstalk is low enough that you can use the second channel on completely different program material.

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You've probably used two-conductor shielded cable in most of your audio work over the past years. Some labor can often be saved using the multi-pair shielded cables which you should check out for your installation. If you plan shielded cable runs over 300 feet and your impedances are 600 ohms, you will find that at 1000 feet you can lose 2 dB at 20 kHz in the cable alone. For long runs better check the capacity-per-foot of the cable you plan to use.

Are audio DA's standard practice and where do I put my patching?

It is not uncommon nowadays to find 36 audio distribution amplifiers located in master control to distribute the various sources around the station. Because most of the sources come to one place, it makes sense to locate the master control jackfield at that location. You should consider buying the DA's and jackfields in one package, preassembled by the manufacturer. This will cut down on the overall work required on-site and give you another pre-tested unit.

When I come to the console, how much low level gain do I need?

You should be able to work comfortably with levels as low as -80VU (quiet talk show, boom mike) and up to -20VU (rock band) using the sensitivity pads to put mixers in their usable range.

How much dynamic range do I need at the pre-amplifier input?

There should be a minimum to 40dB at this point

without resorting to the use of the sensitivity pads.

What kind of headroom should I plan for?

When most all of the mixers are assigned to a single channel (sub or output), the next amplifier in the system should be able to handle this large signal without distortion or clipping and without any need to pull back on the mixers. A good spec is 16 dB headroom everywhere in the system.

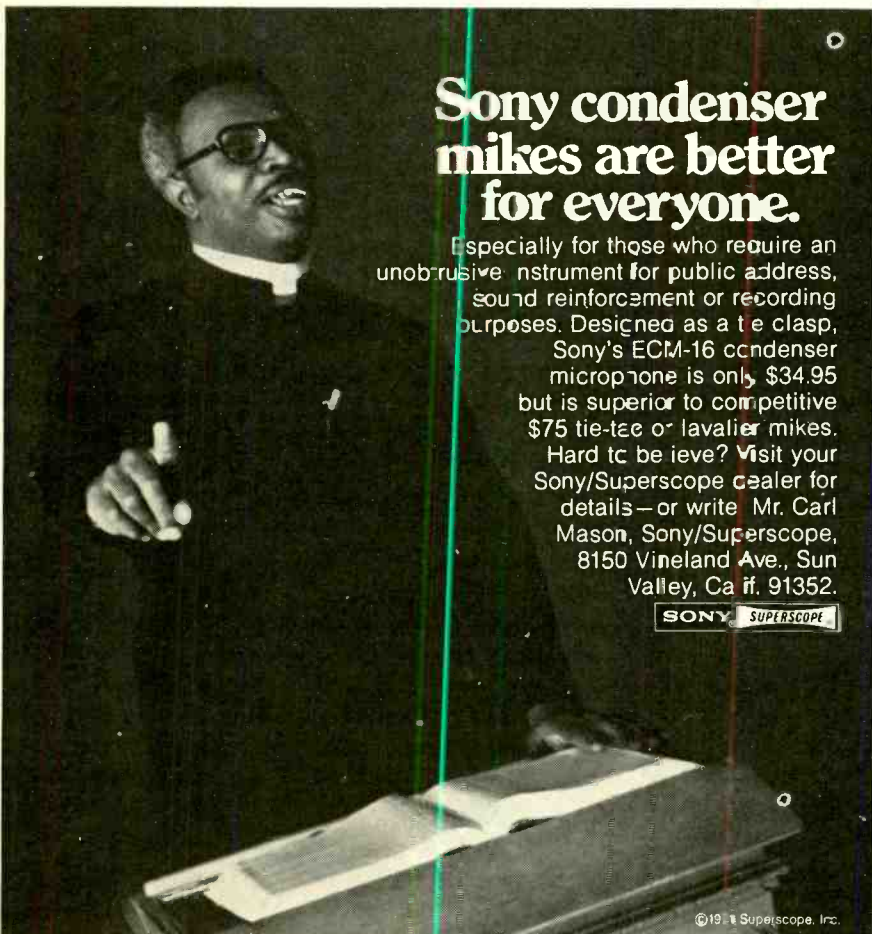
Should the console have more than one power supply? In the event of failure what happens?

You should have multiple supplies with channels split so no single supply failure can keep you off the air.

What sort of crosstalk spec is reasonable?

The only meaningful one is for a frequency of 15kHz or higher. Normally consider a signal path driven by an oscillator set at 15kHz with an output level of 10dB higher than normal operating level to produce a +18dBm console output. (All faders set as shown on the functional.) A similar signal path is now chosen through the console set up in the same manner as the first one. The input is terminated and the output is connected to a Noise and Distortion Analyzer. Ideally the noise reading obtained would be unaffected by the 15kHz signal in the other signal path. In practice there will probably be a 3 or 4 dB difference, which is reasonable. Measurements made between any two console signal paths should yield

(Continued on page 48)



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AUDIO REPORT continued

similar or better results. This is a tough test, but an off-air reel-to-reel rewind makes lousy listening in the on-air channel.

What crosstalk is reasonable between the high level into the low level position of the sensitivity switch when the mixer is being used in the microphone mode and a tape rewind signal is present on the high level position of the switch?

3-4dB is a reasonable figure.

Should I go for a system with balanced circuitry or is unbalanced good enough?

The question concerns noise and crosstalk specs. Although a system with unbalanced circuitry, put together with care, will meet perfectly satisfactory noise and crosstalk specs, when you make system changes or develop a ground problem it's a different story. Since changes in plans are the name of the game in broadcasting, you are better off with a balanced system since it lets you make quick signal take-offs or inserts anywhere in the signal path without fear of a nasty hum problem.

What about the "strip" modules with preamp, equalizer, echo send-receive etc., all in one module?

They're less costly to manufacture, but they lock you in. You are better off with a module per function in two ways. First, you can change your system easier later (for less money), and second you can track down troubles easier, swapping function modules rather than a whole strip.

As audio engineer at my station I'm stuck with intercom planning too. How about some pointers?

Intercom is a completely different animal except that standards of quality including distortion, headroom, etc., still apply. A shouted instruction, if misunderstood, can spell disaster.

Planning may be done initially using a simple X/Y plot of the system. List the "calling" stations down the left-hand side and the "listen" stations along the bottom. Mark an "X" at each desired cross-point. This will give you the basics required along with a few notes to obtain preliminary quotes. Don't forget to allow for expansion and programming changes in your thinking.

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Color television camera (MDL 270/S-Commercial Electronics, Inc.) incl. one set SEC camera tubes, filters, #2702 studio control panel, external picture and waveform monitor selection, intercom jacks and level control, tally indicator, horizontal and vertical centering, for red and blue channels, master pedestal, focus and beam, Rank-Taylor-Hobson Varotal XX, 10:1 (25mm-250mm) zoom lens, 25 ft. cable, intercom amplifier (2 channel audio) 2 head sets. List \$35,205.00. This new equipment was damaged in transit by air carrier. Cost to replace equipment in reliable operating condition is established, along with engineer report. Contact Peter McBreen & Associates, 141 W. Jackson Blvd., Chicago, Ill. 60604. Phone 312-427-1645 (Mr. Hersted).

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