A MACTIER PUBLICATION OCTOBER 1970

BM/E

BROADCAST MANAGEMENT / ENGINEERING

Get "in" gear

Want to know about the latest in sophisticated terminal equipment?

Talk to TeleMation!

Or talk to any of literally thousands of smart satisfied users of TeleMation products who know our equipment has achieved a standard of excellence in quality, flexibility and reliability that others are hard-pressed to meet.

TeleMation's TMV-551 Video Distribution Amplifier provides four completely isolated outputs from one bridging input. Built-in power supply and connector panel, IC series regulator for constant power supply voltage standard. Top color performance.

The TSG-3000 Broadcast Color Synchronizing Generator with all-digital circuitry, the highest time base stability and lowest pulse jitter performance available. Plus programmable pulse widths and *digital* genlock for *Crashlock* (next-field, operator-controlled lockup) or *Ratelock* (adds or subtracts one line per field until lockup is achieved).

For the finest in gear,
TALK TO TELEMATION.

TM

TE M ION

BROADCAST SALES

3941 East Bayshore
Palo Alto, Calif. 94303
(415) 969-3810

50 East 42nd Street
Suite 2301
New York, N.Y. 10017
(212) 687-0370

Talk to us at NAEB booth #20

BRANCH OFFICES: ALBUQUERQUE • ATLANTA • BOSTON • CHICAGO • DALLAS • DENVER • HOUSTON • INDIANAPOLIS • LAS VEGAS • LITTLE ROCK • NEW YORK NORWALK • MILWAUKEE • PALO ALTO • PASADENA • PHOENIX • SAN DIEGO • SALT LAKE CITY • ST. LOUIS • TULSA • WASHINGTON • RIO DE JANEIRO • SAO PAULO

Circle 101 on Reader Service Card

Circle 102 on Reader Service Card

OCTOBER 1970/VOLUME 6/NUMBER 10

BM/E

BROADCAST MANAGEMENT/ ENGINEERING

This month's cover: The big mouth drawn by artist Art Sudduth symbolizes an ever-present audio problem shared by radio, TV, recording, and cablecasting—control of dynamic range. Starting on page 18 you can find out what's available in the field of limiters, AGC amplifiers, and similar devices.

Mactier Publishing Corp.
820 Second Ave., New York, N.Y. 10017, 212 661-0450

Also publishers of:
BROADCAST EQUIPMENT BUYERS GUIDE
EEE
ELECTRO-PROCUREMENT

BPA

BM/E, Broadcast Management/Engineering, is published monthly by Mactier Publishing Corp. All notices pertaining to undeliverable mail or subscriptions should be addressed to 820 Second Ave., New York, N.Y. 10017.

BM/E is circulated without charge to those responsible for station operation and for specifying and authorizing the purchase of equipment used in broadcast facilities. These facilities include AM, FM, and TV broadcast stations; CATV systems; ETV stations, networks and studios; audio and video recording studios; consultants, etc. Subscription prices to others: $15.00 one year, $25.00 two years.

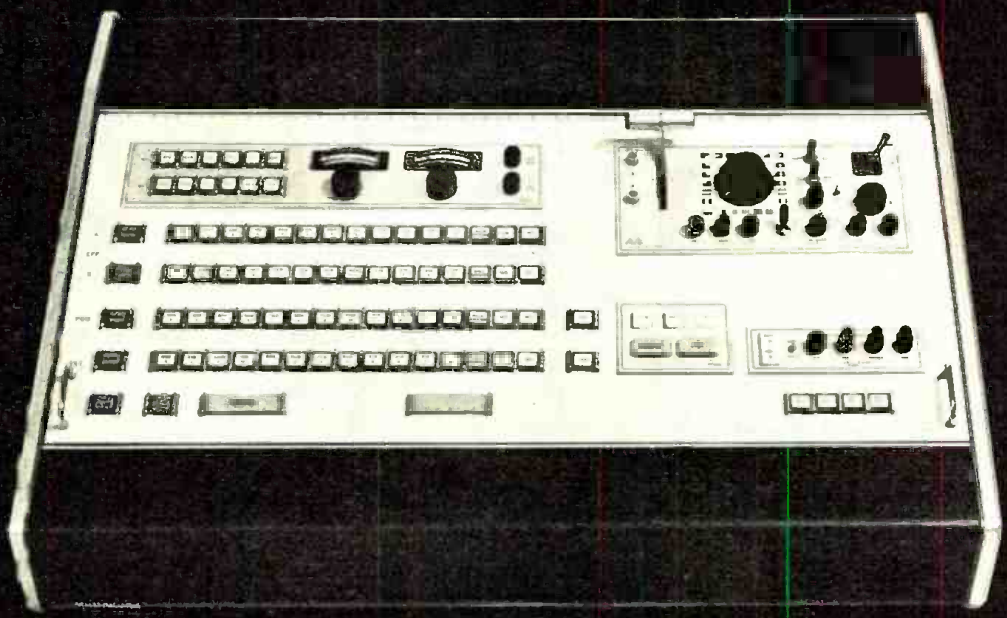
Controlled Circulation postage paid at Duluth, Minn.

THE GRASS VALLEY GROUP, INC.

MODEL 1400-10
VIDEO SWITCHING SYSTEM

FEATURES

- 15 COMP/NON-COMP INPUTS
- AUTO DISSOLVES AND FADES
- 900SE-2 SPECIAL EFFECTS (NEW)
- AUTOMATION INTERFACE
- CUTBAR (FLIP OR FLIP-FLOP)
- WIDE RANGE OF OPTIONS



BASIC PRICE $15,500

ADDITIONAL PRICE FOR ILLUSTRATED OPTIONS

PRE-ROLL SYSTEM	CHROMA KEYER	AFV SYSTEM	PGM BUS KEYER
$1000	$900	$2500	$1000

SOLD EXCLUSIVELY BY GRAVCO SALES, INC

6515 Sunset Blvd.	Station Plaza East	1312 West Northwest Highway	2626 Mockingbird Lane	1644 Tullie Circle N.E.
LOS ANGELES, CALIF.	GREAT NECK, N.Y.	ARLINGTON HEIGHTS, ILL.	DALLAS, TEXAS	ATLANTA, GEORGIA
(213) 462-6618	(516) 487 1311	(312) 394-1344	(214) 352-2475	(404) 634-0521

Circle 103 on Reader Service Card

Ampex's Instavision (see story below) claims the smallest cartridge-loading systems to date: 4.6 in. dia. 0.7 in. thick.

BROADCAST INDUSTRY NEWS

Newest video player unveiled

Early in September Ampex jumped into the crowded arena of automatic video players for education and industry, unleashing a prototype fresh from two years R&D. The Ampex answer to EVR, Selecta-Vision, Cartrivision, et al., is an automatic videotape cartridge player smaller than a portable typewriter, which uses ½-in. tape in a format compatible with the Japanese EIA Type 1 helical standard. Output is rf or video/audio to any TV receiver. In the New York demonstration, Richard J. Elkus, Jr. (general manager of Ampex educational/industrial division) played prerecorded color tapes which had good color (no smear), came up to speed nicely (no roll), but had a few dropouts, some noise and line jitter.

Elkus said Instavision is aimed at the education and business markets, but could become "a major factor in the home video player market." Equipment will be fabricated by Toamco (joint Toshiba-Ampex manufacturing project in Japan), and deliveries will start in mid-1971. Toshiba will market in Japan, Ampex in U.S. Prices: B&W player, $800; Color play/B&W record, $900; color/B&W play/record, $1000. Elkus hinted these prices might come down later, if the market opens up.

He also showed a miniature (five-lb) pistol-grip B&W camera ($400, including 4:1 zoom lens and mike) which has a 1-in. CRT viewfinder displaying camera signal during record, tape signal during playback. B&W camera and recorder are portable, rechargeable-battery operated. Recorder plugs into recharge pack/ac supply/color section for stationary operation. Blank cartridges (4.6 in.-diameter) will cost under $13, can hold 30 minutes in Type 1 format, 60 minutes in "extended play" format. In later models, playing time will be extended up to two hours. The demo tape was standard gamma ferric oxide, but Elkus said system will accommodate high-efficiency chromium-dioxide tape. Unlike other systems we've heard of, Instavision records NTSC color from camera, TV receiver, or other VTR. Fast forward and rewind are included, and Auto-Search mode. Other features: slow motion, stop action, elementary editing, second audio track. Video resolution is 300 lines B&W; SNR, 42 dB.

Elkus said Apex won't originate software, but will cooperate with other firms who want to package programs in Instavision.

FCC new math: Quantifying fairness

NBC's "Today Show" gave FCC Chairman Dean Burch an opportunity (Sept. 9) to clarify the Commission's fairness doctrine as it applies to the granting of air time to critics and counter-critics of the President's Vietnam policy.

It's too complicated to really explain, Burch admitted, in effect. While fairness time definitely is not equal time as defined for political candidates (Section 315), Burch did leave the impression some numerical quantification is almost unavoidable when one major political group or other feels itself aggrieved by a station or network.

Senator John R. Pastore, also on the program, offered Burch some advice: "Stay away from such decisions—you only open up a can of worms." But the Senator later opted for Congress having access to TV as does the President.

Fairness is related to issues, both Burch and Pastore agreed; the Senator emphasized that it was the broadcaster's job to decide on which speakers to allow to discuss the issue. Individuals can't insist on time for themselves (nor can a group) under the Fairness Rules. If the FCC doesn't like the way fairness is being handled, they should issue better guidelines, Senator Pastore advised.

For clarification of the Equal Time Rules and the Fairness Doctrine, see "Interpreting the FCC Rules and Regulations," this issue and in July and August, 1970, *BM/E*.

Upcoming Conventions

- Oct. 4-9: 108th Technical Conference and Equipment Exhibit, Society of Motion Picture and Television Engineers, New York Hilton
- Oct. 12-15: 39th Convention, Audio Engineering Society, New Yorker Hotel
- Nov. 8-11: 46th Annual Convention, National Association of Educational Broadcasters, Sheraton Park, Washington
- Nov. 10-11: 1st National Conference, National Industrial Television Association, Washington Hilton

We got our Heads together

...to help you select those which suit your needs

Whether you are involved with broadcasting, CATV or CCTV this full range of remote controlled pan and tilt heads offers complete flexibility.

type **210**

type **230 & 230 SD**

type **405**

type **407**

APPLICATIONS	CAMERA LOAD CAPACITY	DRIVE	SPEED	PRESET CAPABILITY	MANUAL CONTROL
CCTV Educational Industrial Medical & Hospital Security, Etc.	30 pounds	AC continuous	TILT 3°/sec. PAN 6°/sec.	YES	YES
For vertical & inverted mounting/preset or manual remote control of pan & tilt functions					
TYPE 230 CCTV Outdoor Security & Traffic Surveillance	120 pounds	AC continuous	TILT 4°/sec. PAN 5½°/sec.	NO	YES
For vertical & inverted mounting—completely weatherized					
TYPE 230 SD CATV Educational Industrial Medical & Hospital Security, Etc.	100 pounds	AC SERVO	TILT 4°/sec. PAN 5½°/sec.	YES	YES
For vertical & inverted mounting—completely weatherized					
CATV, CCTV Educational Industrial Medical & Hospital Security, Etc. **BROADCAST** News & Weather Presentations Interviews Panel Shows, Etc.	120 pounds	AC SERVO	TILT 40°/sec. PAN 60°/sec.	YES	YES
BROADCAST CATV & CCTV News & Weather Presentations Workshop Demonstrations Interviews & Panel Shows Commercial Video Taping Special Effects	400 pounds	AC SERVO	TILT 20°/sec. PAN 40°/sec.	YES	YES
Accommodates all leading monochrome and color cameras. Provides preset shots for all functions of zoom, focus, iris, pan, tilt & pedestal height.					

For complete details on any or all of these heads request literature and prices. Dealer and OEM inquiries invited.

POWER-OPTICS, INC.

Germantown Pike & Trooper Road—P.O. Box 266
Fairview Village, Pa. 19409—215-272-5300—Telex 846411

007

Circle 104 on Reader Service Card

INTERPRETING THE **FCC** RULES & REGULATIONS

Section 315 and the FCC "Primer"

The FCC has recently released its 1970 revised "Primer" on Section 315, entitled "Use of Broadcast Facilities by Candidates for Public Office." The purpose of this "Primer" is to inform licensees, as well as candidates for public office, of their responsibilities and rights under Section 315.

The "Primer" relates solely to obligations of broadcast licensees towards candidates for public office, under Section 315 of the Communications Act. However, it should be remembered that *the Commission has adopted rules to make the provisions of Section 315 applicable to programs originated on CATV systems.*

After examining the basic provisions of Section 315 of the Communications Act, this article will explain each of the specific provisions of Section 315—e.g., definitions of "use" or "legally qualified candidate"—both generally and in light of the 1970 Primer's pronouncements.

Section 315 in general

Section 315 of the Communications Act provides in part: "If any licensee shall permit any person who is a legally qualified candidate for any public office to use a broadcasting station. he shall afford equal opportunity to all other such candidates for that office in the use of such broadcasting stations." Of course, the licensee has no power of censorship over the material broadcast, and no obligation is imposed on any licensee to allow the use of its station by any candidate.

With its August 1970 "Primer," the FCC updated the provisions of Section 315 and provided a succinct guideline for broadcasters.

"Use" of broadcast facilities

In general any "use" of a broadcast facility by a legally qualified candidate for public office imposes an obligation on licensees to afford "equal opportunities" to all other candidates for the same office.

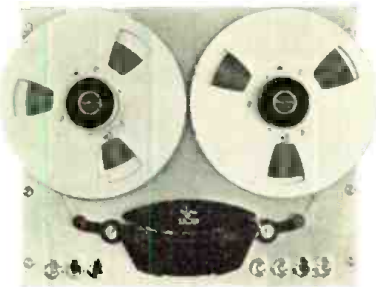
Section 315 provides that appearances by legally qualified candidates on news-type programs are not "uses" of broadcast facilities. However. as to whether a particular program is a "news-type"

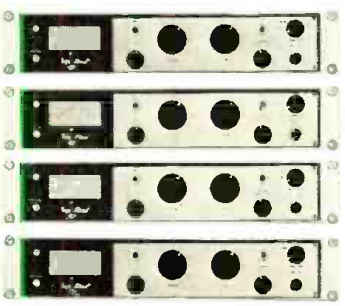
Circle 106 on Reader Service Card →

IT DOES ITS THING

Tape-Athon 900 Portable

REGARDLESS OF THE PACKAGE, THE APPLICATION, OR THE OPERATOR





Tape-Athon 900 Rack Mounting

Tape-Athon 900 Console

Tape-Athon's Model 900 Recorder/Reproducer can be expected to provide the same dependable performance in any situation — it's been engineered to take long hours and rough handling, designed to make operation easy and foolproof, and always up to NAB specs.

Available in 2, 4, or 8 track versions, the 900 is the smartest investment the studio can make. It gives you more equipment per dollar than any machine around. Write for brochure TA 250 and a quote. Then we'll do *our* thing.

Tape-Athon Corp.

502 South Isis, Inglewood, California 90307
(213) 776-6933

program, the basic question is: Does the program meet the standard of a "bona fide" news program? To answer the question, the licensee must consider: (1) the format, nature and content of the program; (2) any changes in the format, nature, content or time of scheduling of the program since its inception; (3) the instigator, producer, and person controlling the programs; (4) length of time that the program has been on the air; (5) frequency and regularity of the program.

Briefly, if a news program has been regularly scheduled in the same time slot for an extensive period of time, with little or no change in format, then authentic news coverage of a candidate for public office will generally not be deemed a "use" of a broadcast facility.

To determine your understanding of the types of "uses" of a broadcast station, test yourself on the following questions:

1. Must you give equal time to a candidate whose opponent has broadcast in some other capacity than as a candidate? Yes. For example, assume a weekly report of a congressman to his constituents is a broadcast by a legally qualified candidate for public office. As soon as the congressman becomes a candidate for re-election, his opponent must be given "equal opportunities" for time on the air.

2. Suppose a candidate appears on a variety program for a brief bow or statement. Are his opponents entitled to "equal opportunities" on the basis of this brief appearance alone? Yes. All appearances of a candidate, no matter how brief or perfunctory, other than in bona fide news programs noted above, are "uses" of a stations facilities.

3. Suppose you, as station owner, or one of your station advertisers, or a person regularly employed as a station announcer, were to make appearances on your station after having qualified as a candidate for public office. Would this be a "use"? Yes. However, consider the amplification in question 4 below.

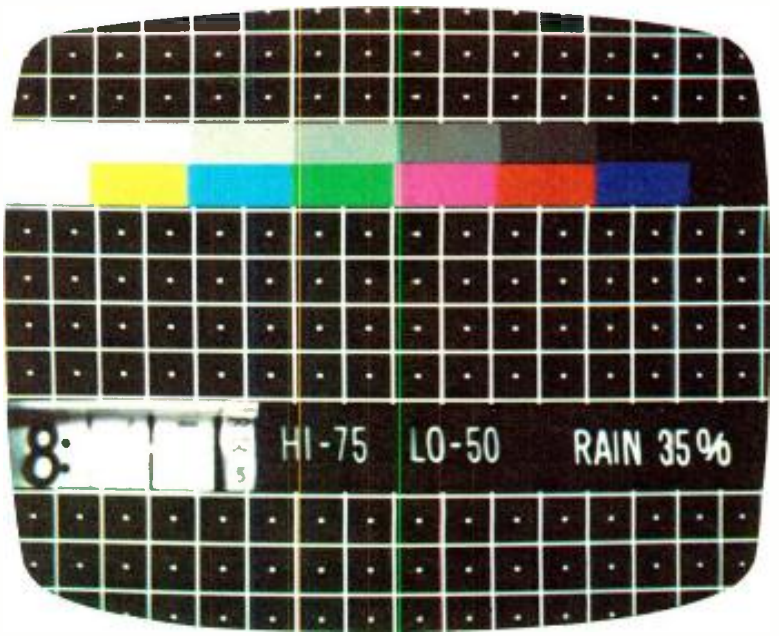
4. Suppose your television station employs an announcer who, "off camera" and unidentified, supplies the audio portion of required station IDs, PSAs and commercial announcements; however, he is not authorized to make comments or statements concerning political matters, and has no control over the format or content of any program material. Would his opponent be entitled to equal opportunities? No. The employee's appearance for the purpose of making commercial, non-commercial, and station ID announcements would not constitute a "use" *where the announcer himself was neither shown nor identified in any way.*

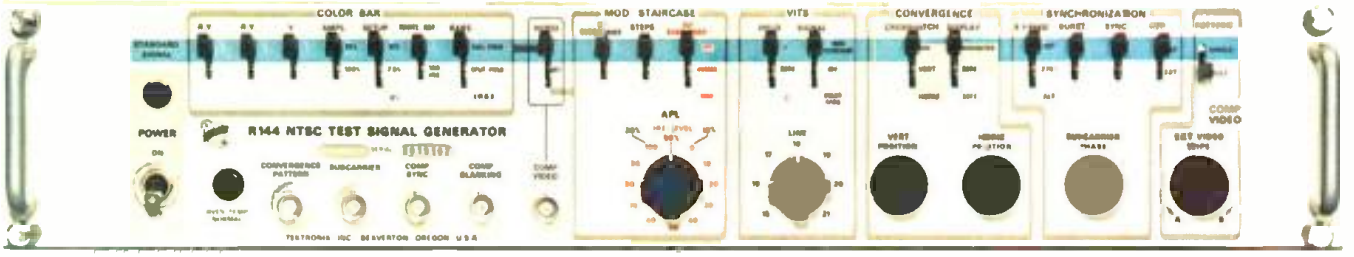
Who is a legally qualified candidate?

A *legally qualified candidate* for a particular public office *is one that meets the requirements set forth in the law of his state.* Generally, however, a candidate is legally qualified if (1) persons may vote for him in the state or district in which the election is being held; and (2) if elected, the candidate is eligible to serve in the office in question. It should be remembered, however, that a candidate *need not necessarily be on the ballot to be legally qualified.* If they are making a bona fide race for the office involved and if their names may be

Circle 108 on Reader Service Card →

New... TV Signal Generator Designed for CATV





A master sync generator for local program origination

The TEKTRONIX 144 NTSC TEST SIGNAL GENERATOR is a source of high-quality television test signals for cable and broadcast TV systems. It provided the test signals for the composite test pattern pictured above. This unique pattern is of special interest to CATV operators. It contains up to five different signals in each field: CONVERGENCE (crosshatch lines and/or dots), COLOR BARS, GRAY SCALE (color bar luminance levels only) for checking gray-scale color balance and luminance/chrominance registration, and two EXTERNAL VIDEO inputs with manual horizontal wipe. By connecting TV cameras to either or both external video inputs, local programming such as time and weather may be inserted in the convergence pattern. The signals are displayed according to an internally preset pattern. Each signal location and duration is easily programmed by the user with insulated plug-in jumpers.

COLOR BARS or MODULATED STAIRCASE are also available as full-field and/or VERTICAL INTERVAL TEST SIGNALS.

The 144 is not just a signal generator. It is also a complete EIA SYNC GENERATOR with a temperature-controlled color standard providing excellent frequency stability. Digital integrated circuits are extensively used to achieve stability, accuracy, and reliability. Outputs are subcarrier frequency, composite sync and blanking, vertical and horizontal drive, burst, composite video and the convergence pattern signal.

A choice of racknount or cabinet configurations, compact size and low power consumption (40 watts) make the 144 ideal for CATV or standard broadcast in either control room, bench testing, or field operation.

144 NTSC Test Signal Generator $2100
R144 NTSC Test Signal Generator
(includes racknounting hardware) $2100

U.S. Sales Prices FOB Beaverton, Oregon

Available in U.S. through the Tektronix lease plan

For a demonstration call your local Tektronix field engineer or write:
Tektronix, Inc.
P. O. Box 500
Beaverton, Oregon 97005

TEKTRONIX®

committed to technical excellence

written-in by voters to result in their valid election, candidates not listed on the ballot may be entitled to equal itme under Section 315.

Again, test yourself on the following questions:

1. Suppose an incumbent county clerk publicly announces his intention to run for renomination in a forthcoming primary election. He continues to broadcast sports events and otherwise speaks on radio. He has not filed his notification and declaration papers with appropriate state officials. Is a legally qualified candidate for the same office entitled to equal opportunities in response to broadcasts by the incumbent? No. Generally, a person does not become a legally qualified candidate until his notification and declaration papers have been received and accepted by the applicable state official. Since the candidate had not filed these required papers, he was not a legally qualified candidate. Again, state law is determinative.

2. If your state's Secretary has ruled that an individual has not followed the procedures required by state law for becoming a legally qualifed candidate for U.S. Senator, would you be required to afford that individual "equal opportunities"? No. However, consider Question 3.

3. An individual seeking a U.S. Senate seat requests time equal to that afforded his opponents. The individual's request is refused by the station on the grounds that he is not a bona fide candidate. The candidate advises that he has been informed by the local election board that he possesses the necessary requirements to be a *write-in candidate*. Is he entitled to equal opportunities? No. In a similiar situation, the Commission found that the individual had not complied with the rules for establishing himself as a legally qualified candidate. He had failed to submit any proof, *other than his own statements*, showing he was eligible under the applicable law for write-in candidates.[1]

If there is a question as to the candidate's legal qualifications, each licensee has the responsibility to ascertain under his state's law whether the person requesting equal time has, in fact, become a "legally qualified" candidate. In situations where the licensee is unsure, counsel should be consulted.

What are "Equal Opportunities"?

Generally, licensees may not discriminate, between candidates for a particular office, as to charges, practices, regulations, facilities or services rendered. In other words, *the licensee is not permitted to discriminate between candidates in any manner*. Of course, the licensee may adopt any policy it wishes regarding selling time, or making time available free, to all condidates. But it must be remembered, whatever policy is adopted, *the licensee must treat all candidates for the same office alike*.

A station is required to keep a public record of all requests for time by or on behalf of political candidates, together with a record of the disposition and the charges made, if any, for each broadcast.

In providing "equal opportunities," the station must consider *the desirability of the time segment allotted as well as its length*. While there is no requirement that a station afford Candidate X exactly

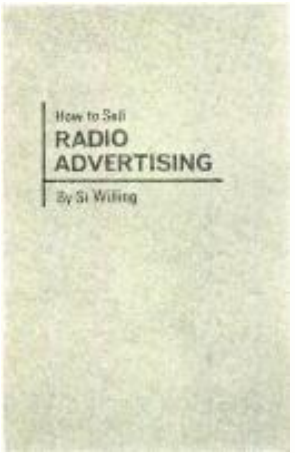
Continued on page 36

1. Letter to Raymond Harold Smith, 40 FCC 430 (1964).

Only Book on Market On Selling Radio Advertising!

BRAND NEW—A helpful guide for salesmen, sales managers and station managers interested in increasing their ad schedules.

SAVE $3.00 on this Special Prepub Offer!



HOW TO SELL RADIO ADVERTISING
By Si Willing, Owner-Manager, KMAR Winnsboro, La. and KNNN Friona, Texas

Tells how to . . .
Start . . . by knowning your product and the market
Advance . . . by overcoming objections and competition
Lead . . . by increasing your "batting average"
Excel . . . by using ideas developed by top salesmen
Surpass . . . by selling the sponsor who has everything

Here's just the thing to restore sales vitality to your station! Whether you want to train new salesmen, give older salesmen a "shot-in-the-arm," or provide your sales staff with stimulating, workable ideas—this new book is just the ticket. Here are proven, practical, ready-for-you-to-put into action ideas!

- **BRAND NEW & ORIGINAL**
- **5 BIG SALES Sections**
- **Hundreds of Sales Ideas**
- **Scores of Case Histories**
- **Money-Back Guarantee**
- **Handsome Hardbound Volume**

CONTENTS: START—How to Begin; The "time" Salesman; The Stuff that Sales Messages are Made Of; The Salesman's Marketplace; Market Study; Hiring Methods; Tools of the Trade; Sales Brochures; Rates; Sales Messages; "Time" Buyers; The "Short-Rate" and Rebate. **ADVANCE**—Budgets; "Sequestering:" The Rate Cutters; Manufacturing What You Sell; Personal Analysis; Types of People; Fear and How to Overcome It; Creativity; How to Right Mr. Wrong; Competition. **LEAD**—Mannerisms; Handshakes; Appearance; Strategy vs. Deception; How to Best A Lack of Interest; Inertia; The Emotional Bully; The False Objection; Combatting Indecision; Enthusiasm; Time and Timing; Personal Standards; Making the Best of Every Opportunity; Never Take Things for Granted. **EXCEL** Why Radio Advertising is Important; Sponsors Buy Ideas; Merchandising; The Advantages of Being a Salesman; Products and Services; Know Your Ws; Sales Techniques; Keeping a Morgue; Illustrate, Don't Demonstrate; Challenge Inherited Knowledge; Boredom, the Poison of Mankind; Turning Points; Consideration; Opinion Making; Follow-up and Follow Through; Effective Communications; Trade Organizations; Distractions; Parasites; The Extra Effort; Examples of How Not to Sell; How to Sell a Newscast. **SURPASS**—Case Histories from Leading Sales People in Various Market Situations; How to Sidestep Objections; Wait for the Opportune Moment; Converting a "No" to a "Yes;" Responsibility of a Single-Station Market; Dare to be Different; How to Satisfy the Prospective Sponsor Who Has Everything.

There's no cut-and-dried approach or magic formula for sales success; rather, sales is a day-to-day challenge. Upon this premise, the author relates his actual experience on the firing line, from Main Street merchants to Madison Ave. timebuyers.

Millions of words have been written about salesmanship, yet thousands of salesman are still groping for the right formula. But the right formula depends on the individual and the prospective advertiser. And therein lies the secret, as the author illustrates in this book by theory and, even more important, by practice. You'll accompany the author (plus other top-notch salesmen) on actual sales calls. You'll learn how all sorts of objections (maybe even a few you haven't heard!) have been successfully countered. From the dialog between salesman and prospect you'll learn the approaches and the clinchers, how to use available sales tools to the best advantage, how to create what you need (and what the advertiser needs!), how to overcome fear and timidity, and how to deal with the competition.

The author also dwells on those detrimental personal habits—mannerisms, appearance, inertia, indecision, time and timing, etc.—that turn off prospects. In Part 4 the author stresses the five points that make a successful salesman excel: merchandising initiative, special techniques, the restrictions of the tried-and-true, overcoming boredom, and effective communications (letter and phone). And in the final section there are numerous case histories, real-life sales experiences from a number of eminent broadcast salesman such as Mike Rooney (KVOZ), Neil Terrell (consultant), and Roger Davidson (WNBO). You'll learn ways to sidestep objections, how to recognize the "opportune moment", how to convert a "No" to a "Yes," and how to satisfy the prospective sponsor who has everything.

If you want to improve your selling techniques and increase your sales, this book has what you need. Beyond a doubt, you will realize an immediate improvement in your performance.

"How to Sell Radio Advertising" is published at $12.95. But, if you order now you can save $3.00. The Special Prepublication price of $9.95 prevails through November 30, 1970.

Order today at our risk for FREE Examination. SEND NO MONEY! Simply fill in and mail the handy NO-RISK coupon below to receive your own copy of this helpful volume!

Other Helpful Books On Broadcasting For Every Station!

RADIO SALES PROMOTIONS

300 Merchandise-Moving Ideas! A compendium of more than 300 creative selling ideas designed exclusively for radio stations. Here are sales tools that work! A vast supply of ready-to-use ideas for producing sales in 43 categories, from air conditioners to washing machines. Based on the premise that radio time must make a sponsor's cash register ring, here are powerful, positive ideas that will do just that . . . and add thousands of dollars of revenue to your own till in the process. Unbelievable? Try them for yourself and see . . . on our money-back guarantee. BIG 8½" x 11" size.
Order T 214 ..... only $10.00

HANDBOOK OF RADIO PUBLICITY PROMOTION

BRAND-NEW and up-to-date—geared to TODAY'S radio needs! Here's the 372-page, 250,000-word MUST book for stations wanting to attract more listeners, boost ratings, increase sales and profits. Contains just about all the sure-fire promotion and publicity ideas a radio station might ever need—over 1500 on-air promo themes; over 350 contests, stunts, station and personality promos that can be profitably used by any station. One idea alone of the hundreds offered can be worth many times the small cost of this indispensable sourcebook. Big 8½" x 11" size in handsome 3-ring binder.
Order No. 213 ..... only $29.95

PUBLISHER'S GUARANTEE

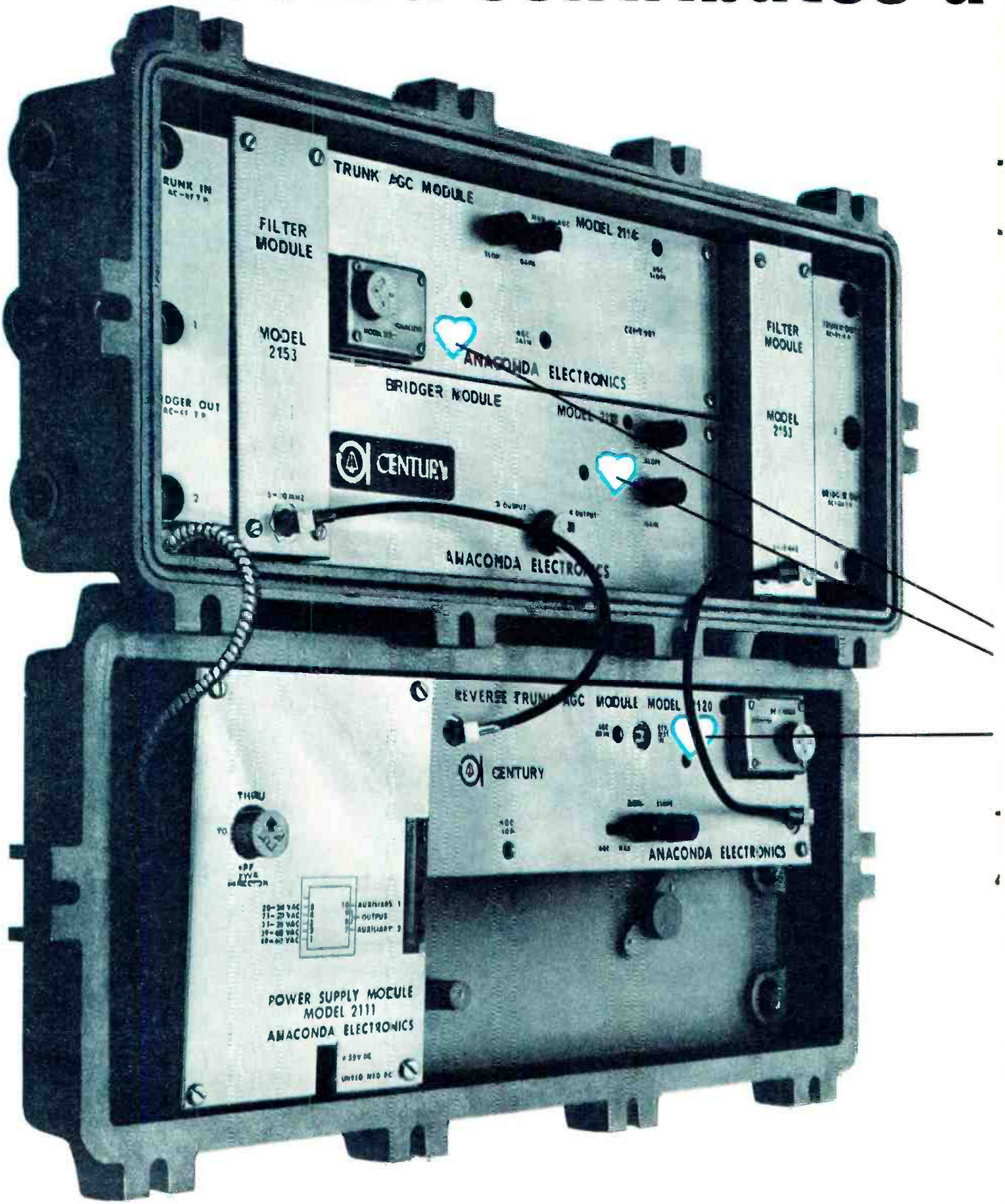
Put the information in these books to work for you for 10 days. If they don't prove to be worth several times their cost, return them and we'll cancel invoice.

NO RISK COUPON—MAIL TODAY

TAB BOOKS, Blue Ridge Summit, Pa. 17214
Please send me ..... copies of HOW TO SELL RADIO ADVERTISING at the Special Prepublication price of only $9.95 (10% additional discount on 3 or more copies.)
Also send me ☐ 214 ☐ 213
☐ I enclose $..... ☐ Please invoice on 10-day FREE trial
Name .....
Company .....
Address .....
City ..... State ..... Zip .....
SAVE POSTAGE by remitting with order. B107

Circle 109 on Reader Service Card

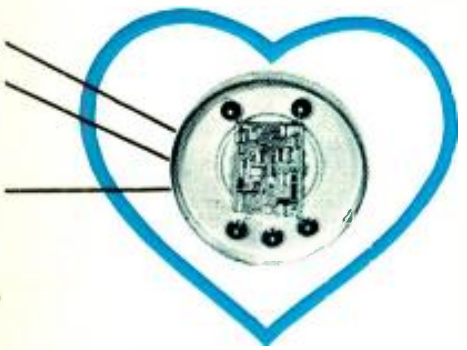
Anaconda contributes a



new technology to CATV:

MICROELECTRONICS!*

The industry's first hybrid thin-film integrated circuit, push-pull, plug-in modularized, 5-300 MHz, versatile, bidirectional, 43-channel, broadband cable communications amplifier.



"THE HEART OF THE MATTER"

*The thin-film integrated circuit (shown actual size) is the heart of the new Century Series amplifier. By eliminating discrete components and reducing lead lengths, it sets a new standard for CATV amplifier performance, reliability, and stability under all conditions.

We developed it.

We field-tested it for a year.

We designed a complete line.

We introduced it at the 1970 NCTA Convention.

Century Series

The New Technology from

ANACONDA electronics

A DIVISION OF ANACONDA WIRE AND CABLE COMPANY

305 North Muller Street, Anaheim, California 92803 • (714) 635-0150

And in Vancouver, British Columbia

Circle 110 on Reader Service Card

Add Sparkle to Your Audio

By Lamar P. Allison

Enhancing audio signals by frequency equalization is an old art that's lately been ignored in broadcast control rooms. Because of recent heavy investments in color, many TV stations haven't updated their audio facilities. These tips will show you how to produce a more pleasing audio signal in radio, TV or cablecasting.

TO ENHANCE AN AUDIO SIGNAL, you need three things:

- A good ear
- Proper monitoring facilities
- Enhancing equipment

The ear is your problem, but you probably know your own sense of hearing. The speaker/monitor system is critical, and if you're unsure of it, use good quality headphones, such as Beyer DT-48, Koss, or Permoflux. The monitoring system must be fully equalized for loudness, frequency response and room resonance.

Lamar Allison operates Audio Products, Alexandria, Va.

Enhancement equipment

Audio enhancing means boosting or cutting certain portions of the audio spectrum, and adding reverb to the signal. Since the ear's response is not the same at all frequencies, boosting can emphasize certain instruments or voices.

A common and useful arrangement is shown

Audio Consoles: Custom or Standard?

Broadcast consoles used to be off-the-shelf items to handle mikes, turntables, tape and net inputs. Pretty routine stuff, contrasted with the octopus-like monsters used in 16-track recording studios. To get that kind of versatility, you had to order a custom-built, expensive console.

Why not split the difference? That's RCA's approach in the BC-100 console series. The photo shows a standard-custom model that WWL New Orleans had assembled with a basic frame and selected modules. The console has 12 input slide attenuators, eight of which can be switched to three mike inputs. Four connect to switches to seven high-level inputs. Three output channels are used. Other features: PA bridge, AGC, cueing speaker and intercom.

There are several reasons for renewed interest in console flexibility: In radio, stereo FM and AM/FM combo/split operations can benefit from multichannel consoles. In television, videotaped commercials and programs often require special audio effects such as echo, slating, foldback, and submastering.

The RCA BC-100 can accommodate up to 20 mixer modules and four submaster modules. Input modules can be low- or high-level signals. Each mixer module consists of a vertical sealed attenuator, an op-amp booster amplifier, echo select and level control, submaster delegate switches, cue and foldback select switch. Each submaster module contains an echo-mix network, echo return and level control, attenuator, program-output selectors, and a submaster monitor gain control. Multiple output feeds permit simulcasting with breakaway capability for separate commercials.

From each submaster module there is a manually controlled bridging feed which may be used to feed a four-track tape recorder while mixing down to one or two-channel feeds to program lines or transmitters. Standard pre-hear facilities are provided by a common monitor amplifier fed from the cue position on the mixer module.

All modules are plug-ins, and similar types are directly interchangeable. Plug-in equalizers are also available for each input channel.

Heart of the console line is the Iso-Mix amplifier. It's an op amp in an analog computer-adder circuit, adapted for audio use. Iso-Mix mixes up to 30 inputs at no loss, while isolating each by more than 90 dB from all the others.

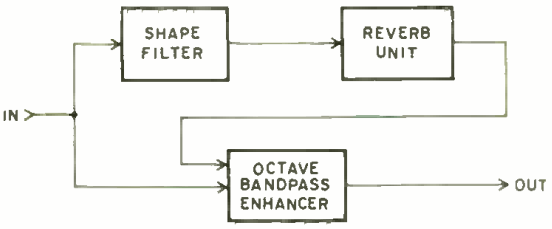


Fig. 1. A shape filter is used ahead of the reverb unit to control frequency response of the delayed audio.

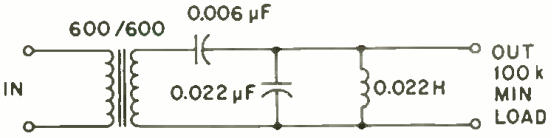


Fig. 2. Bandpass shape filter for reverb channel has a center frequency of 5300 Hz. Input is 600 ohms.

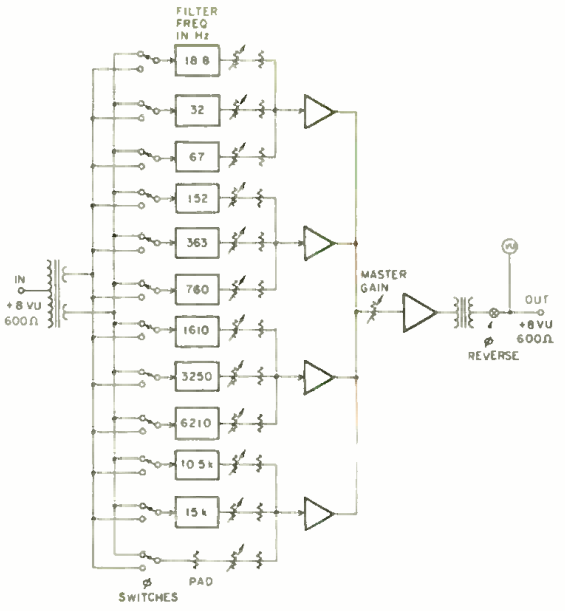


Fig. 3. In this bandpass enhancer, connect input transformer secondaries in opposite polarity to provide phase reversal.

in Fig. 1. Incoming audio is split, with one path going through a shape filter which has a center frequency of 5300 Hz, and thence to a reverberation unit. Fig. 2 illustrates the shape filter, a modified bandpass type.

For the reverb unit, I use a Fisher K10, which has a dual spring delay system with a delay time of 33 ms and a decay time of two seconds maximum at 300 Hz. Other suitable reverb units are made by Fairchild Sound Equipment Corp. and EMT (Gotham Audio).

Referring back to Fig. 1, the incoming signal is also fed to an octave bandpass enhancer. Representative commercial models are the Altec 62-A, Bruel & Kjaer 123, General Radio 1925, and Langevin 252-A. If you want to build your own, as I did, refer to Fig. 3.

The input transformer has twin secondaries which are connected to the switches so you can get 180° phase reversal at each filter input. All filters are bandpass types with approximately 18 dB per octave attenuation from the center frequencies shown. The exception is the first filter (18.8 Hz), which is a low-pass type.

An attenuator follows each filter, and every three channels are bussed into an amplifier through isolating resistors. The outputs of the four amplifiers are bussed into the master gain control and another amplifier. Past the output transformer there is a phase-reversal switch and a VU meter.

How to use it

Don't try to enhance a poor-quality program (like a telephone talk show or a remote on a bad line). Enhancing is most effective on a program with good quality which lacks sheen, brilliance, luster, body, or balance. It makes no difference whether the program is live or taped.

To begin, boost low frequencies to add body in the first and second octaves (16—64 Hz). Be careful not to boost room and wind noise in this range. If you boost the third and fourth octaves (64—256 Hz) you'll get a boomy, barrel sound. So in most cases you should leave the third through seventh octaves alone.

Next, adjust for presence and clarity. Boost from 3 to 8 dB the presence range—the eighth and ninth octaves (3072-8192 Hz). Boosting the tenth octave (8192 Hz to more than 15 kHz) adds brilliance and sparkle to music, and is useful in overcoming the deficiencies of some microphones.

Reverb

The final touch of audio richness is adding the proper amount of shaped reverb. You'll have to experiment with this, while riding the reverb pot. I feed reverb into the bandpass enhancer on the 1610-Hz input. Speech requires reverb of only about 10%-15% of program level, while music requires from 50% up. **BM/E**

Audio Processing Amplifiers: Sound Magic for the 70s

You can process audio in several ways—volume limiting, compression, expansion; loudness control; frequency or presence enhancement. And people are using these techniques in every electronic medium—AM, FM, and TV broadcasting, CATV and CCTV 'casting, disc and film recording. Here's a roundup of the various devices available, how they work, and how you can best use them.

YOUR EAR HAS A DYNAMIC RANGE of nearly 120 dB—much more than any electronic system can handle. At the other extreme, the subjective dynamic range of an AM-broadcast Top-40 single record, heard by a listener on a car radio in a noisy auto traveling at high speed on a gravel road, is perhaps as little as 5 or 10 dB.

Each medium has its own dynamic range limitation: magnetic tape, LP record, film sound track (magnetic or optical), AM, FM, TV, cablecasting, audio, and background-music SCA. One size does *not* fit all, and processing amplifiers must limit dynamic range to the extent required by the medium.

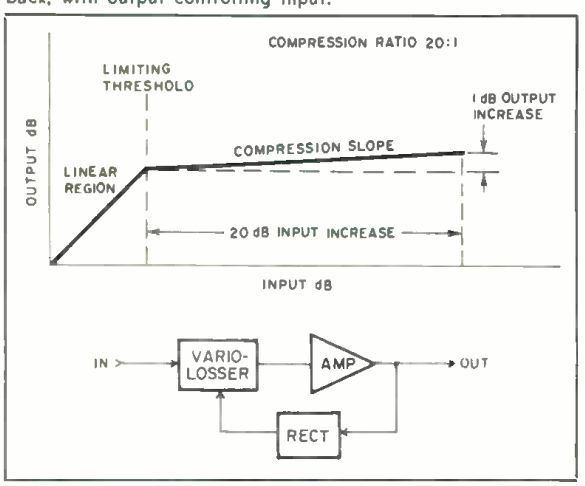
Wide dynamic range is useful and pleasant in the concert hall, or in the home via stereo FM. But wide dynamic range is quite undesirable in a background music system: The speaker volume is never loud, and all the music has to be heard at the same level. Hence the dynamic range should be as small as possible.

Since the requirements of each medium are different, various types of processing amplifiers have been developed.

Conventional limiter

In its simplest form, a conventional limiter looks like the block diagram in Fig. 1. A sample of the amplifier output is rectified and the resulting dc used to control the loss (or sometimes gain) of a variolosser element in the signal channel. As the output level increases, the control voltage works in the opposite direction, to decrease the gain of the losser stage. Most limiters work this way (backward acting). In some, input controls output (forward acting).

Fig. 1. An audio limiter prevents overmodulation by using feedback, with output controlling input.



The graph in Fig. 1 shows limiter action. Below threshold, a limiter's output is linear, or directly proportional to input. Above input, output is much reduced for input level increases. The ratio between input and output level increases is called *compression ratio* or *slope*, and is typically greater than 10:1 (often 20:1) for a conventional limiter.

A limiter is usually operated in its linear region so most program material isn't affected—only abnormal peaks are limited.

Limiter attack time is fast so that very little of the offending peak gets through to overmodulate a transmitter or overload a disc cutter, etc. Release time is another matter. Fast release is useful with speech, while slow release is better with music. Some limiters have two modes: Single release means fast recovery after every limiting action; dual release means fast recovery after fast peak, but slow release after a series of peaks. Fast limiting and release cause pumping or breathing (rapid changes in gain which sound objectionable).

Assymetrical limiter

The maximum modulation permitted in AM broadcasting is 100% on negative peaks, but there's no limit on positive peaks. The assymetrical limiter clips negative peaks or inverts signal polarity of a nonsymmetrical speech waveform to put the higher peak on the positive side.

Fig. 2 illustrates assymetrical limiting, as done in the Gates model 6543. The comparator automatically places the higher peaks on the positive side of the output.

The Collins 26U-3 limits within 2 ms; any peaks before that are hard-clipped by a circuit with 15 μs attack time. This is an advantage since fast, short peaks are merely clipped and gain isn't reduced; if it were, a hole would be punched in the program. The small amount of distortion

Audio Processing Amplifiers

Brand	Model	Compression Ratio	Attack Time	Release Time	Attenuator	Other Features	Price
Conventional Limiters							
CCA	LA-1D (306)	6.7:1	1 ms	0.2-20 s	VT		$ 475
Fairchild	670 (307)	30:1-2:1	0.2-0.4 ms	0.3-25 s	VT	Limits L+R or L−R only	1795
RCA	BA-43/46 (308)	40:1	200 μs	0.4-3.0 s	MOSFET VVR		629
Assymetrical Limiters (for AM use)							
Amalgamated Wireless	BIG-1 (309)	50:1	<50 μs	0.5, 1, 2 s		AGC and Gain platform	1200
CBS Labs	Volumax 4000 (310)	Infinite, 7:1	<1 μs and/ or <2 ms	0.15 s	Diode	Auto peak phasing	725
Collins	26U-3 (311)	10:1	15 μs clip 2 ms lim	0.1-0.2 s	IC	Peak clipper	765
Gates	6543 (312)	30:1	< 10 μs	3-7 s	Var. Xstr.		675
Frequency-Sensitive Limiters (for FM, TV, recording use)							
CBS Labs	FM Volumax 410 (mono) (314) 411 (stereo) (315) Recording Volumax 420 (mono) (318) 421 (stereo) (319		<1 μs and/ or <2 ms	0.01 s (HF) 0.14 s (LF)	Diode	50, 75-μs curves	725 1445
			Same as above		Diode	Matches disc recording limits	725 1445
Collins	26U-3 (320)	10:1	15 μs clip 2 ms lim	0.1-0.2 s	IC	Peak clipper	765
Fairchild	Conax 602 (321)	—	Instantaneous		VT	HF Peak clipper, stereo only	
Gates	6631 (322)	>50:1	40 μs	0.2-10 s	Diff. amp.	HF Peak clipper	730
RCA	BA-47 (323)	—	1 μs	1 μs	Zeners	HF Peak clipper only	
Dual-Band Limiter							
Altec Lansing	9473A (324)	20:1, 12:1, 4:1	10 μs	0.4 s (HF) 3.6 s (LF)	MOSFET VVR	Dual band, f_c = 250 Hz	510
Compressors, Level Controllers							
Altec Lansing	1591A (325)	10:1, 5:1	30 ms	0.5, 1.5 s		Mike, line inputs	252
CBS Labs	Audimax 4440 (m) (327) 4450 (s) (328)	10:1	12 ms	Gated	Diode	Gated gain stabilization	725 1295
CCA	AGC-1D (329)	7:1	25 ms	5-12 s	VT		450
Collins	26J-3 (330)	15:1	5 ms	7-11 ms	IC	Gain platform	725
DuKane	2A8C (331)	10:1, 5:1	30 μs	0.5-3 s		Noise gate	
Limiter-Compressors (Rack mount)							
Electrodyne	CA-700 (332)	30:1, 2:1	50 μs	0.1-5 s		De-esser	575
Philips Broadcast	5752 (333) 5753 (334)	20:1 5:1, 3:1, 2:1	1 ms lim 0.2 ms comp	0.1-3.2 s	PDM	Noise gate	650
Spectra Sonics	Complimiter 610 (335)	100:1 1.1:1	0.1-2.0 μs lim 0.1-1.2 μs comp	90 ns 50 ms-10 s	FET/VVR		585
Teletronix	LA-3A (336)	50:1, 3:1	250 μs −0.5 ms	0.5-5 s	EL/LDR	HF contour adjust	375
Universal Audio	1176LN (337)	20:1, 12:1, 8:1, 4:1	<20 μs to 800 μs	0.05-1.1 s	FET/VVR		489
Limiter-Compressors (Mike channel)							
Automated Processes	525 (338)	20:1, 2:1	15 μs	0.1, 0.5, 2.0, 2.5 s		De-esser, ceiling control	325
Electrodyne	CA-702 (339)	30:1, 2:1	50 μs	0.1-5 s		De-esser	350
Fairchild	663 (340)	2:1	3 ms	0.3-7 s	Lamp/LDR	De-esser available	
Fairchild	692AGC (341)	2:1	3 ms	0.3-7 s	Lamp/LDR	Remote control	
Gately	1800 (342)	20:1	10 μs	0.1-5 s	EL/LDR	Rack-mount accessory	299
Melcor	CL-20 (343)	20:1-1.2:1	10 μs	0.1-2.5 s	FET/VVR		248
Expander-Limiter-Compressors							
EMT (Gotham)	156 (344)	1:1.5-1:2.5 exp	Program dependent	1.5-7.5 s exp	PDM	Stereo only	2990
		>100:1 lim	100 μs lim	0.25-2.5 s lim			
		1.5:1-4:1 comp	1-4 ms comp	0.5-3.5 s comp			
ESECO	Limpander LE-350B (345)	1:2 exp 50:1 lim	150 μs lim	75 ms lim	VT		525
Gates	6629 (346)	1:2.5 exp	7.5-35 s exp	4-10 s exp	Diff. amp.	Attack/ recovery timing control	695 (M) 1430 (S)
		30:1 comp	100 μs-30 ms comp	12-53 s comp			
RCA	BA-43/45 (347)	1:2 exp 40:1 comp	4 s exp 15 μs comp	6 s exp 3 s comp	EL/LDR		620
Loudness Controllers							
CBS Labs	710 (mono) (348) 711 (stereo) (349)	Loudness dependent	100 ms	2.5 s	LDR		860 1720
Presence Equalizers							
CBS Labs	450 (350)		25 ms	1 s	LDR		715
Fairchild	Dynalizer 673 (351)		See text				

Note: Boldface numbers in parentheses which follow model number in second column are for Reader Service Card

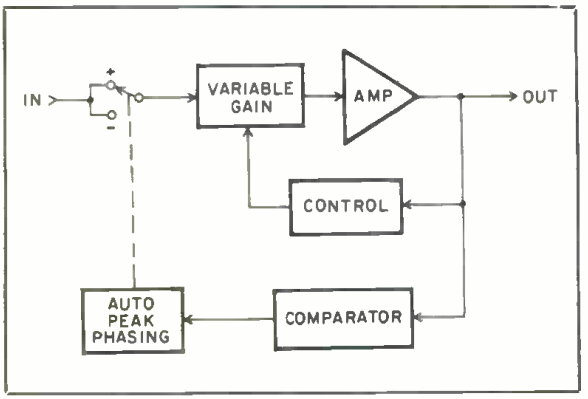


Fig. 2. Gates M-6543 limiter is used in AM, allows higher positive than negative modulation.

caused by hard clipping is a tradeoff for keeping the level unchanged for short-duration pulses or peaks.

Frequency-sensitive limiter

Wherever a pre-emphasis curve is used—in FM and TV broadcasting, and tape, disc and film recording—you're faced with a level-control dilemma: If you limit before pre-emphasis but set post-limiting gain on midrange audio, high frequencies will overmodulate or overload. On the other hand, if you limit after pre-emphasis, high frequencies will cause limiting and push midrange audio down.

The first solution to this problem is the method used in the Fairchild Conax and CBS Labs FM Volumax and Recording Volumax. High-frequency response is dynamically controlled by high-frequency signal level. For low-level signals, response is nearly flat. But as high-frequency signal level rises, high-frequency rolloff comes into action. At the 100% modulation level, the frequency response is the inverse of the pre-emphasis curve.

RCA's approach in the BA-47 is to pre-emphasize the audio and hard clip all peaks which would cause overmodulation. Any distortion caused by peak clipping is pushed down by the following de-emphasis.

Collins goes one step further with the 26U-3 limiter. Fig. 3 is a simplified block diagram of that model. As you can see, there is switchable pre- and de-emphasis (the limiter can be used for AM also), variable gain reduction (using a MOSFET as a voltage-variable resistor) and hard clipping. In operation the unit acts as a conventional variable-gain up to a preset level; at that point, any further peaks are hard clipped.

The Gates model 6631 FM limiter also uses variable gain up to a certain level, and hard clipping beyond that. In addition, the Gates model allows you to switch-select the lowest frequency at which clipping occurs on the pre-emphasis curve: 10, 6, 4, 2, 1, or 0.4 kHz.

Dual-band limiter

To minimize dynamic range distortion, limiter release time should be short. But to minimize harmonic distortion, release time should be long. Most limiters use a compromise time around 0.4—0.8 second. That value is short enough to cause distortion to low frequencies.

Another related problem is single-instrument domination, where a solo horn reduces level of all other program material.

Altec-Lansing's solution to both problems is to split the incoming signal into two channels by frequency, with 250 Hz as the crossover. Two separate limiters are then used, with short release in the high-frequency channel, and long release in the low. Harmonic distortion is thus held to 1% for all frequencies down to 32 Hz.

Compressor

Also called an AGC amplifier, the compressor is very much like a limiter; input signal-level variations are minimized at the output. There are several differences however, and Fig. 4 illustrates the first: The compression ratio of a compressor (say, 3:1) is typically smaller than that of a limiter (say, 10:1 or more). Attack time is longer (milliseconds rather than microseconds). Finally, a compressor is normally operated in the middle of its compression curve, hence its name; it compresses the entire dynamic range. This action is not what a limiter does, which is to limit only the peaks.

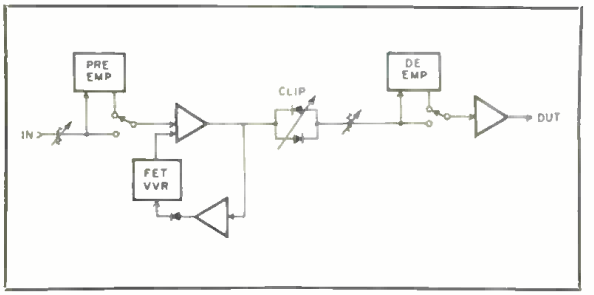
A recent development in compressors is the gain platform, used in the CBS Labs Audimax and the Collins 26J-3 compressor. An ordinary compressor brings up the background noise during a pause in speech or music (pumping). The gain platform is produced by an inhibiting circuit which holds the gain constant during a short pause, allowing it to change for longer periods of relative silence.

Limiter-compressors

A compromise device, the limiter-compressor usually has a variable compression curve (or slope) so the user can select the amount of compression or limiting he wants in a particular application. The Electrodyne models have four switch-selected compression slopes, and a de-esser with three positions which lets you use various amounts of high-frequency rolloff to eliminate objectionable "s" and "t" sounds. The feature is chiefly useful in recording.

Spectra Sonics' Complimiter 610 has separate

Fig. 3. For FM use, Collins 26U-3 limiter has switchable pre- and de-emphasis compensation.



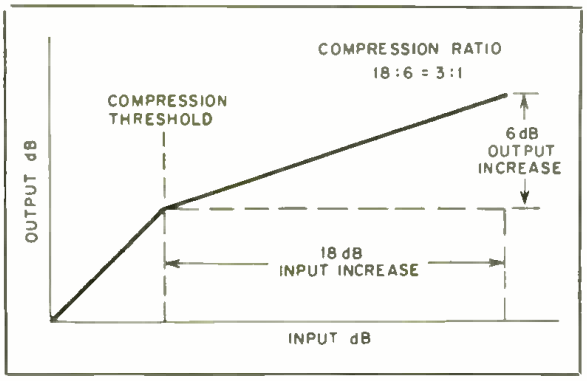


Fig. 4. Typical compressor or AGC amplifier is operated in middle of its gradual compression slope.

and simultaneous limiting and compression action, using the best time constants for each. The Teletronix LA-3A is apparently the only forward-acting compression or limiting device on the market. The control-voltage sample is taken off the secondary or the input transformer before the photoresistor used as a variolosser. Thus gain correction is done ahead of any signal amplification.

In the Philips Broadcast models, a noise gate attenuates the input 10 dB whenever the signal falls below a threshold level for more than 250 ms. When the signal reappears, the noise gate removes the attenuation within 1 ms.

All the devices we've discussed so far mount in 19-inch racks, have power supplies, VU meters, and work with input and output levels around zero VU. That's fine for a limiter hung across the console output or ahead of a transmitter or cutterhead driver. But recording studios like AGC action in each mike channel, and the miniature types built to satisfy that demand are about 1½ in. wide, require an outboard power supply, and accept slightly lower inputs (down to –30 VU or so). Most have edge-mounted VU meters.

Expander-limiter-compressor

A further refinement in dynamic range compression is the addition of expansion. Fig. 5 illustrates the actions of such a device, the EMT 156. The forward-acting expansion section processes low-level signals to distinguish them from background noise. The backward-acting compression section processes high-level signals and compresses the long- and short-term dynamic range. The limiting section (also backward-acting) limits only short-term peaks which exceed a predetermined level. In the manual mode, attack and release times may be user-set to the values shown in the table. In the automatic mode, however, these times are determined by program content. For example, in the compression section the program's peak-to-average loudness ratio controls the release time. Thus the program's original dynamic range determines the amount of compression applied.

The ESECO and Gates devices operate somewhat similar to the EMT, but with expansion and limiting only. The RCA model is a expander-compressor.

Loudness controller

All of the preceding devices control what a VU meter indicates—volume level, or the electrical power in a circuit. Limiters prevent electrical overload. But beginning around 1962, the FCC and others noted that some radio-TV commercials sounded louder than surrounding program material. Loudness is not the same as volume level. Loudness is what you hear; volume level, what you measure. Three techniques determine loudness:

- Shelf equalization, or rolling off lows and boosting midrange audio.
- Volume compression and limiting.
- Echo or reverb, which seems to fill holes between peak sounds.

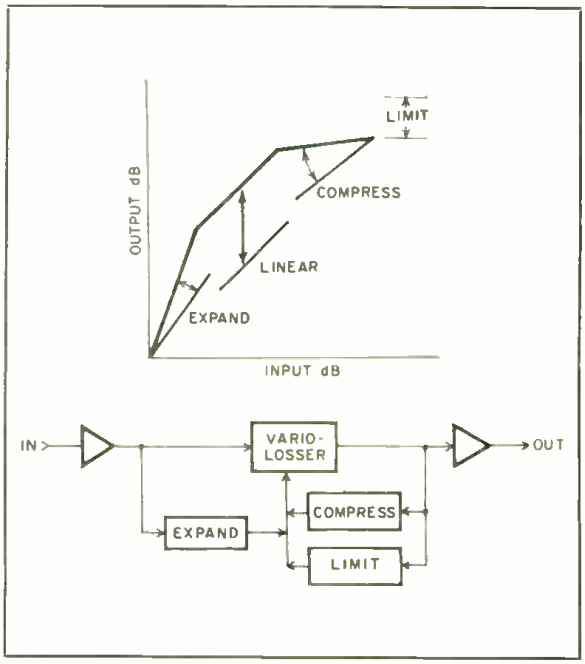
When program material is processed with all three techniques, it sounds much louder, even though a VU meter and an oscilloscope indicate the same before and after.

Both CBS Labs and RCA have developed automatic loudness controllers. (RCA's version, however, is not on the market.) Their operation is basically similar, and is illustrated by Fig. 6.

The human ear is more sensitive to midrange audio than to lows and highs. Therefore the loudness controller curve in Fig. 6 is an approximation of the average ear's sensitivity. That curve (with minor variations) was developed separately and empirically by RCA and CBS, by testing the hearing of groups of people.

In each device, a sample of the output signal is split into frequency bands. As shown in Fig. 6, RCA uses eight, while CBS Labs uses five. The response of each band is different, and the over-

Fig. 5. Triple-action EMT 156 limits peaks, expands low-level, compresses medium-level signals.



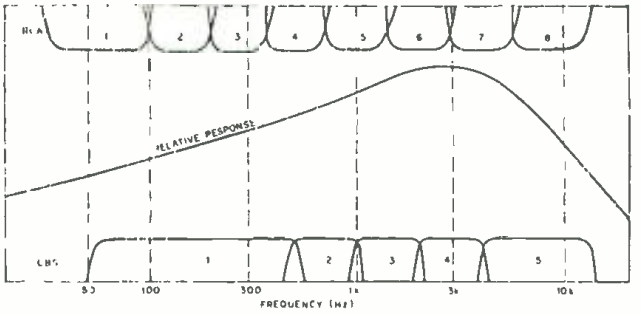


Fig. 6. Similar RCA and CBS bandpass approaches to loudness control result in overall response shown.

all response of all the filters produces the curve shown.

Following the filters, the various frequency-band signals are summed and fed through a time-constant network. The output is a dc control voltage which is fed to a variolosser network at the input of the loudness controller.

The time-constant network is necessary because repetitive sound pulses have a cumulative effect on hearing which enhances their loudness.

For example, CBS Labs presented listeners with two pulses of 50 and 900 ms duration. The 50 ms pulse had to be reproduced at a sound pressure level 6.3 dB greater than that of the 900 ms pulse to be judged equally loud. Hence the shorter a pulse, the less its loudness. But repetitive pulses sound about the same as a continuous tone.

In practice, the loudness controller is a peak-limiting device which does not increase low-level passages, yet which doesn't permit increase beyond a predetermined level. This is necessary because the loudness controller must be the last link in the chain before the transmitter; any other level-controlling devices after it would defeat its purpose.

The loudness controller is a linear amplifier up to threshold. Then it limits heavily for the next 6 dB of input. Following that, it's linear again. Thus very short sounds of high level are allowed to pass, for emphasis.

Presence equalizer

In speech, consonants in the range of 2000—4000 Hz supply most information, while vowels (125—500 Hz or so) supply most of the power. In male speech, consonants are typically measured 20 dB below vowel level. In a wide-range high-fidelity system, this is no problem.

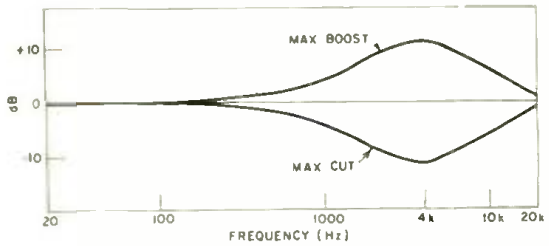
But with tape recordings, incorrect bias or head alignment, or dirt/oxide buildup, can all cause consonant loss. Telephone talk shows, helicopter traffic reports, and poorly equalized remote lines can also cause consonant loss.

Presence equalizers were developed to correct such degraded speech. Fig. 7 shows the action of CBS Labs Model 450. The device works like this: First a speech/music discriminator recognizes speech by its staccato nature. (If music is present, the presence equalizer is disabled.) An analyzer circuit determines level in the 2000—4000 Hz range, comparing it with a reference. If there is

insufficient presence, the equalizer boosts midrange audio (to a maximum of 10 dB at 3400 Hz). If there is too much presence, the equalizer cuts midrange audio (again to a maximum of 10 dB at 3400 Hz). The result is more intelligible speech.

Fairchild's Dynalizer 673 works differently, boosting highs (maximum 10 dB) and lows (maximum 14 dB). In effect it cuts midrange audio. It is useful on music faded behind a narrator, where it keeps the music sounding bright.

Fig. 7. Presence equalization by CBS Labs Model 450 can brighten sonically dull speech material.



Other devices

While music waveforms are usually symmetrical, speech is heavily assymetrical. Improper miking can worsen this nonsymmetry. Kahn's Symmetra-Peak processes audio and provides symmetrical output. The advantage is that you can then modulate more heavily.

Another ingenious equipment is Kahn's Voice-Line 67, which includes transmitting and receiving units for use at both ends of a business-grade telco line with 300—3000 Hz response. The transmitter takes audio in the 100—300 Hz range and inserts it into a notch at 2000 Hz. At the receiver the audio is put back where it belongs. The loss of 300 Hz chunk at 2000 Hz is small, but low-freq enhancement improves voice quality. **BM/E**

The gain-control stage

Achille's Heel of a limiter (or similar device) is the variable-gain stage, which must rapidly attenuate (or not attenuate) the signal with the minimum distortion possible. That's a difficult task, and three approaches have been used:

- **Variable-gain amplifier**

VT: The variable-mu vacuum tube was the heart of the earliest limiters. But tubes wear out, and have serious problems with dc thump—a sudden shift in control voltage which causes an undesirable change in audio level.

IC, diff amp: An IC or differential amplifier is the modern variable-gain stage, often using a FET/VVR in the feedback loop to control gain. There's no hum and little thump.

- **Shunt variolosser**

(A device used as a variable resistance across the signal circuit)

LDR: The resistance of a light-dependent resistor (or photoresistor) varies with the amount of light applied to it. In a Lamp/LDR the light source is usually a neon lamp, which has thermal lag, causing delay and overshoot in limiting. The light source in an EL/LDR is an electroluminescent panel which has faster action.

BT: The bipolar transistor is very nonlinear as a variable resistance, and is seldom used.

UJT: The unijunction transistor is fairly linear, but only over a narrow range which won't accommodate the wide signal swing needed in a limiter.

JFET/VVR: A junction FET used as a voltage-variable resistance can accommodate a wide signal swing, but is noisy, nonlinear, and has nonsymmetrical distortion.

MOSFET/VVR: Because the MOSFET has an insulated gate, it is less noisy than the JFET. Using the substrate as a separate terminal also helps. Bias is applied between gate and substrate, while the drain and source are connected as the variable resistance across the signal circuit, achieving very good dc isolation.

- **Pulse duration modulation**

This is the newest method of gain control, and is somewhat like SCR operation. An electronic switch is opened and closed rapidly (250 kHz or so) across the signal circuit, allowing either signal or no signal to pass. After the switch, a filter removes the switching frequency and distortion. The output is a replica of the input, but at reduced amplitude.

By the way, zeners and other diodes are often used as peak clippers, but that action doesn't constitute gain control. And hard clipping causes distortion.

What about stereo limiting?

Unless otherwise noted, all limiters and similar devices in the table are mono—that is, single channel. Stereo limiters are available, but usually you must buy two mono units and pair them. How do you run them?

- If each limiter works independently, each channel will be held at its maximum modulation level, but the L/R balance will be destroyed.
- If an L+R mix is used to control limiting for both channels, L+R balance will be preserved, but a random overall shifting of output levels will be produced.
- Cross-coupling the dc control signals between the L and R limiters seems best. The limiters must be identical models and must track one another. The unit with the most gain reduction will control both. L + R balance will be preserved, and there will be few random shifts in output level.
- And then, there's quad stereo. . . .

Stereo Tape Recording: Problems and Solutions

By Leon A. Wortman

Synchronous multi-channel recording has its own vagaries which aren't found in mono work. Here are a few tips on getting the most out of professional equipment—

In phase or out of phase?
Like every other piece of stereo equipment, a tape machine should be checked for L/R phase. An out-of-phase condition not only sounds bad in stereo, but it's terrible in mono, and the majority of stereo FM listeners are still using mono receivers. A quick phase check: Terminate playback outputs with resistive loads and VU meters. On most professional machines, these are inbuilt; on some you may have to add outboard components. Put a single-tone recorded tape on the transport and start playback. Now parallel the outputs and watch the VU meters. If the reading increases, L and R are in phase; if it decreases, L and R are out of phase.

Why is reproduce head adjustment necessary?
A reproduce head operates by maintaining each gap in intimate contact with the tape, collecting the recorded flux as the tape passes. If intimate contact is lost or irregular, the head doesn't pick up all the recorded frequencies. A makeshift solution, which isn't recommended, is to use a frequency equalizer to compensate for head-contact losses. That solution doesn't work, for several reasons:

- A tape transport with faulty head-tape contact or alignment is usually unstable; response varies with time.
- The range and shape of the equalizer response usually can't compensate for system losses.
- Head and amplifier noise may remain constant, but signal losses caused by loss of intimate contact or incorrect gap orientation make the signal-to-noise ratio worse.

How do you check the height of a reproduce head?
In a full-track mono transport, head height is not very critical, and incorrect height worsens the SNR only slightly. In a stereo or multi-track system, usable track width (which determines SNR) is already small, and a small height misadjustment can be serious. Such misalignment is first noted when high-frequency response falls off. Other results: incorrect level setting, frequency response, and equalizer adjustment. You can't align head height with a full-track test tape. Always use a test tape with a track configuration matching the head stack used on your transport.

Why is proper azimuth alignment necessary?
If the reproduce head isn't precisely perpendicular to the direction of tape travel, high-frequency losses will result. Play a test tape through the azimuth-adjustment portion and vary the azimuth adjustment of the reproduce head while watching the VU meter at the playback output. The high-frequency tone on the tape will vary in output level as you adjust the head azimuth. Adjust for a peak in playback level.

What is zenith adjustment and why is it required?
All tape guides, including the front faces of all heads, must be parallel to the reel axes, or perpendicular to the top plate of the transport. If this zenith alignment is incorrect, tape can "bow" with the same result as azimuth misalignment, namely loss of high frequencies. Here's a simple way to check zenith:

- Paint the face of the head with a dye. You can use a wax pencil.
- Play a tape until the dye (or wax) has worn off the head face.
- Observe the wear pattern of the dye. If zenith adjustment is correct, right and left edges of the wear pattern will be parallel. If they form a V shape, zenith is incorrect.

What causes wandering tape?
If the edge of the tape changes position, the tape will "bow" and high-frequency losses will increase. If the tape guides are too wide, tape will wander. If the guides or heads have a slot worn in them, the tape will wander in and out of the slot. This will most certainly happen if heads are readjusted after having been allowed to wear-in at an incorrect zenith attitude.

Why is head cleaning necessary?
Increased head-to-tape spacing, or less than intimate contact, causes losses in high-frequency response. Very small spacings cause large losses; the slope is not 6 dB/octave, but exponential, increasing with frequency. The loss in decibels is 55 times the spacing in inches, divided by the recorded wavelength. Dirt and tape oxide build up on heads through normal tape use, keeping the tape away from the head, and eventually cause

Leon Wortman is with Ampex Corp., Redwood City, Calif.

serious loss of high frequencies.

How can incorrect holdback tension cause poor frequency response?

In a professional tape transport, the tape is held in intimate contact with the heads by wrapping it around the heads in a parabolic curve. The pressure which forces the tape against the head is the pulling force of the takeup reel and the holdback tension on the feed reel. If holdback tension isn't set properly for the size of reel used, the tape won't be held tightly against the head. Short-wavelength (high-frequency) signals are recorded on the surface of the tape and don't penetrate very much. Hence if holdback tension is too slack, high-frequency losses occur. Low-frequency (long-wavelength) signals penetrate the tape sufficiently so that this isn't a problem.

Why is proper tape-to-reel winding necessary?

Everyone takes the tape reel for granted, not realizing the effect an improper reel has on the recorder's performance. The prime function of a reel is to protect the tape during storage or shipment. A reel isn't designed to hold or control tape pack. In fact, the reel flanges should never contact the tape. The tape pack derives its sole support from the contact of the first layer of tape on the hub. Thus it's very critical to start tape winding properly and uniformly on the hub. All professional tapes are handled and transported during manufacturing on flangeless hubs, and a properly controlled tension pattern will hold as much as 9200 feet of tape on a flangeless hub.

Should any special precautions be taken with commercial test tapes?

Absolutely. A test tape is something like a precisely calibrated steel rule, for it's made under laboratory conditions to provide an accurate reference with which to calibrate professional recorder/reproducers. Mechanical or magnetic damage will destroy this accuracy. The shorter wavelengths (higher frequencies) are most easily damaged. Mechanical deformation will damage the tape edges, causing uneven tracking and a

Continued on page 41

The Four-Channel Scene: A Survey

- **Broadcasters: FM-only operations will lead the way.**
- **Manufacturers: Mild interest, quiet research.**
- **Retailers: Wary, doubtful, but ready to leap on the bandwagon if one comes along.**
- **Needed: Tape and disc hard- and software.**

WORKING ON AN MBA at Pace College, New York City, William T. Davies, Jr. surveyed portions of the audio and broadcast fields in June, 1970 about four-channel stereo. These are excerpts from his thesis, "Four-Channel Stereo FM Broadcasting: Prospects for Profitability."

Davies surveyed members of five groups: transmitting equipment manufacturers, receiving equipment manufacturers, FM stations, retailers, and consumers. Most interesting is the response he got from FM broadcasters.

Questionnaires went to 260 member stations of NAFMB (about ⅛ of the commercial FM stations in the US). Response was 173 stations (67% of those queried). Davies comments that membership in NAFMB implies greater-than-typical interest and activity in FM broadcasting, and therefore nonmember quad activity will probably trail that of NAFMB members.

Key question in the survey: Is your station likely to convert to quad once equipment and programs become available? Davies suggested it would cost $10,000 to convert two channels to four. Sixteen percent of the stations thought they'd be leaders in converting to four channels; 53% thought their involvement would be influenced by the industry itself; and 29.5% said their conversion was unlikely.

Program formats

Davies found a tie between present and future stereo. All stations anticipating leadership in converting to quad are already broadcasting stereo. Referring to the entire sample, about 83% (143 stations) are now broadcasting in stereo. In contrast to NAFMB membership, only about 35% of all US commercial FM stations currently broadcast stereo, according to Quentin Proctor of the FCC.

Power and antenna

To determine if low power would be a deterrent to four-channel conversion, Davies arranged answers to the key question by station power/height class. About 1/6 of both low-power As and high power Bs and Cs expected to be four-channel leaders. Interestingly, about 80% of the reporting Class A stations are currently broadcasting in stereo. He found no correlation between antenna polarization and the likelihood of conversion.

Davies also found that SCA operation affects a station's viewpoint toward quad. Of the anticipated surround-stereo leaders, 75% don't handle SCA. For the sample as a whole, 40% transmit SCA. This compares with 35%, which is the portion of US FM stations Quentin Proctor says are transmitting SCA.

Crossownership of TV and/or AM may also affect readiness to convert to quad, Davies found. He asked stations if they were FM only, or sister operations with AM and/or TV; their responses he sorted by interest in quad. FM-only operations constitute the largest number of those firms anticipating four-channel leadership. Of the FM stations reporting unlikely quad conversion, the majority have AM sisters. Davies concluded that multiple owners tend to promote TV first, AM second, and FM third. But FM-only operations have no competition within the corporation and thus can promote FM aggressively.

Station comments

Some broadcasters felt that public acceptance of four channels would be necessary before stations would find it practical to convert, and this might take as long as 10 or 20 years. It was mentioned that quad would cause degradation of the FM signal, just as two-channel stereo has done, compared to mono.

Several broadcasters cited only a limited number of potential four-channel listeners, despite the medium's technical triumph. Others conceded no such triumph. One respondent mentioned the fully researched and orderly introduction of two-channel stereo once the broadcast system had been approved, as contrasted with current quad activities, which he considered premature and exploitative. Another mentioned that four-channel is being promoted by manufacturers needing a gimmick to sell additional equipment.

Transmitting equipment

Of the 33 broadcast equipment firms queried by Davies, 13 (39%) responded. Two are presently researching quad, two more contemplate

Continued on page 42

Our new krypton-halogen replacement for the PS52 fits the same fixture, lasts twice as long and maintains constant color temperature for life.

That's some replacement.

New DSF 1500-watt krypton-halogen studio lamp.

PS52 1500-watt incandescent studio lamp.

When you replace a PS52 studio lamp you can replace it with something better.

The something better is Sylvania's DSF krypton-halogen lamp, which fits the same fixture as the PS52.

Its average rated life is 250 hours. More than twice the life of the PS52.

And that's useful life, because the DSF is as bright at the end of its life as it was at the beginning. There's no darkening with age as in the PS52.

And its 3200° K color temperature is there right from the beginning. And it's still there 250 hours later. Constant.

The DSF has low-noise construction. There are no loose parts to resonate when used with SCR dimmers.

With all these advantages, the DSF is more than a replacement.

It's a major improvement.

Sylvania Electric Products Inc., 100 Endicott St., Danvers, Massachusetts 01923

SYLVANIA
GENERAL TELEPHONE & ELECTRONICS

Multiplex Sound for TV: Bilingual or Stereo

The clever Japanese have quietly introduced a second audio channel in their television system, making possible stereo or bilingual TV broadcasting. The system is compatible and seems useful.

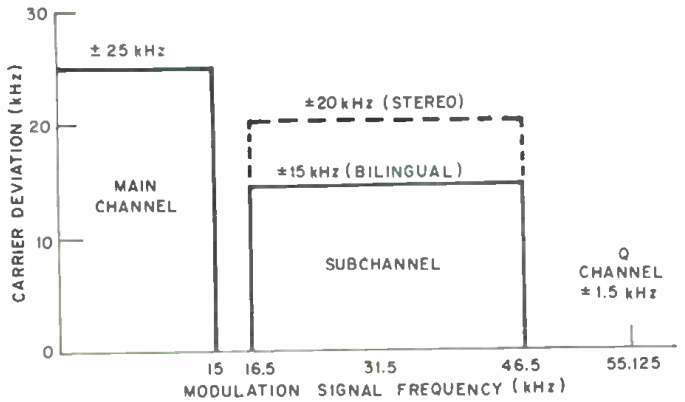


Fig. 1 The various signals presented to the modulator stage of the TV aural transmitter at NHK Tokyo.

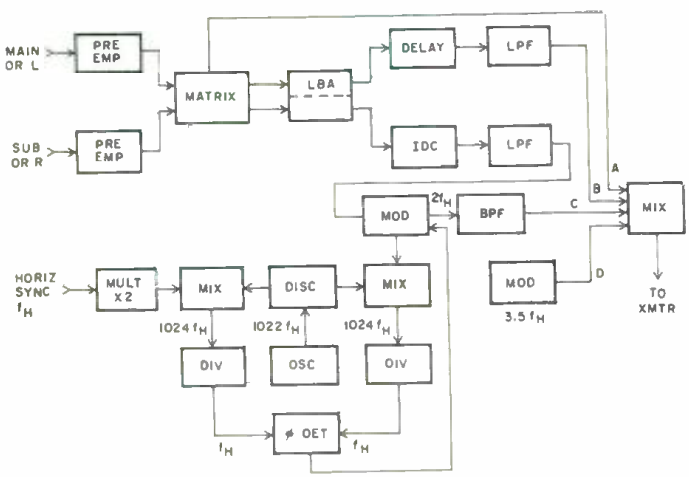


Fig. 2. Stereo or bilingual signals are formed in this generator. See the text for explanation.

When Expo 70 opened recently in Tokyo, foreign visitors found they could switch hotel TV sets to either Japanese or English language audio. (See news item, page 10, *BM/E*, May, 1970). Today the No. 1 channel of NHK (Japan Broadcasting Co.) carries many bilingual broadcasts, enhancing Tokyo's cosmopolitan aura. TV stereocasts are featured occasionally and recently Toshiba introduced two color-TV sets capable of picking up the stereo and bilingual broadcasts.

How it works

You'll recall that Japan uses US television standards of 525 lines and NTSC color. Thus their sound channel is identical, with 100% modulation defined as deviation of ±25 kHz. Fig. 1 shows the spectrum of a two-channel TV sound broadcast. In the monaural mode, only the main carrier is deviated. For simultaneous bilingual broadcasting, a second audio program modulates an FM subcarrier whose frequency is twice the horizontal scanning frequency, (15,750 Hz for B&W, 15,734.264 Hz for color).

For stereo sound, L and R are summed and fed to the main channel, providing compatible audio for mono viewers. L–R information is fed to the subchannel. There's no need for a pilot signal, as horizontal sync performs that service.

Subchannel injection (deviation of the main carrier caused by the 31.5 kHz subcarrier) is ±20 kHz for stereo, but backed off to ±15 kHz for separate programming, for a better crosstalk figure. Subcarrier deviation is ±10 kHz with audio response of 15 kHz.

You'll notice a Q channel in Fig. 1. That's a control signal with ±1.5 kHz injection at a frequency of 3.5 times the horizontal sync frequency. The Q signal is used to switch the receiver circuits between mono, stereo, and separate modes. When the Q channel is unmodulated, the receiver operates in the mono mode. When the Q channel is modulated with AM at 922.5 Hz, the receiver operates in the different or bilingual mode. And when the Q channel is modulated with AM at 982.5 Hz, the receiver operates in the stereo mode.

Continued on page 44

ELECTRONIC SOUND:

Can your station make it?

Maybe your station can use something unusual—why stick with the sounds we've all heard for years?

YOU SAY YOU'VE MODERNIZED your studio and updated your programming; your promotion is styled to the Seventies and now you want to know what's next?

Electronic sounds—for your station IDs, news intro's, anywhere you might need something unusual. The sound behind NBC's peacock may have been the first regular use of the Moog Synthesizer. But since then electronic sounds have begun to work their way into more and more radio and TV programming formats.

Where do the sounds come from? The most publicized electronic sound instrument is the Moog, of course. But there are other synthesizers around—a Swiss model, the Bukkula, the Arp, the Putney, and the Electro Comp, to name a few. Also there are instruments like Innovex's Condor brand modulators, which modulate sounds fed into them—such as an electric guitar output modulated to sound like a sitar or harpsichord.

Many production studios have begun to include one or an other of these pieces of equipment in their catalog of available services. Sound City (Van Nuys, Calif.), for example, has recently invested $10,000 in a Moog system which it uses to simulate musical instruments, to create sound effects and "electronic" music and to process existing sounds.

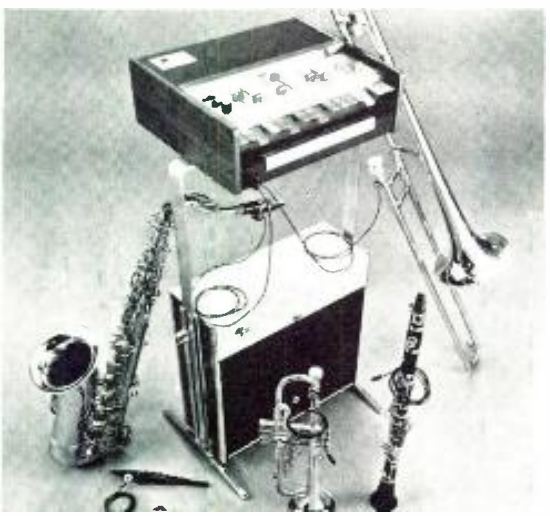
Sound City, equipped with an Ampex MM-1000 master recorder, has been capable of producing four-channel recordings for more than two years, charges $35 an hour for its Moog—which typically provides a few tracks of organ-like backup.

Seattle West Recording uses the Innovex sound modulators—especially for country western

Continued on page 44

For more information on these synthesizers or modulators, circle on the Reader Service Card the numbers in parenthesis after the company: Arp Synthesizer **(301)**; Putney **(302)**; Electro Comp **(303)**; Moog **(304)**; Innovex **(305)**. And read "The Electronic Musical Instrumental Manual," by Alan Douglas—a Tab Book, Blue Ridge Summit, Pa. 17214.

The Moog Synthesizer, named after its developer, Robert Moog, generates raw sound which it then modulates into different tones by control of vibrato, volume, attack and decay rate. Voltage-controlled instruments (oscillators, filters and amplifiers) produce and process the signals which can come out as "Electronic" music or as simulations of conventional instruments. The Beatles have used a Moog, "Switched-on Bach" featured it, and many sound studios have made it part of their equipment. Sound City Recording Studio (Van Nuys, California) programs its Moog synthesizer to simulate conventional musical instruments, as well as to produce "electronic" sound and to process signals fed into it—such as cleaning up a distorted bass guitar track. Shown above is a musician at Sound City playing what may sound like an organ, a guitar or whatever else he has programmed the Moog to synthesize.



The Condor RSM (reed sound modulator) sells for around $550, the GSM (guitar sound modulator) for around $700. The instrument, according to Innovex, "takes the cultured signal from the reed instrument, extracts frequency and amplitude information, then redefines and converts it to an all-harmonic series wave form." Plug in a microphone and, so they say, you can scat sing tuba. Or do your station ID in English horn.

CATV Terms for Broadcast Managers and Engineers

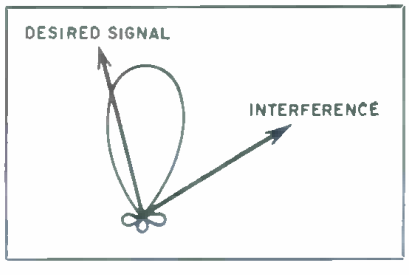
By Larry F. Roeshot

WHEN BROADCASTING PERSONNEL get involved with cable television they often discover unfamiliar terms, many of which are unique to the CATV industry. The transition is simplified once the terminology is understood. Techniques are somewhat different. For example, the broadcast engineer may be familiar with rf circuits at high power. However, the relatively low-power, broadband CATV distribution equipment introduces some special problems. Individuals with recently obtained FCC licenses have a similiar limitation. FCC examinations require little understanding of how a cable system operates.

The purpose of this series is to describe some of the more common CATV terms in not-too-technical language. While these encyclopedia descriptions are not intended to be a complete course in cable television, they should provide a broadened understanding of CATV for broadcast engineers and technically oriented managers.

Active: Any circuit or system component that requires power for operation. The most common active CATV system component is an amplifier, cable-powered from a 30 or 60 Vac source. The definition also includes nonamplifying devices such as diode switches, oscillators, varactor-tuned filters, etc. A cable system also employs a number of nonactive or passive circuits and components such as filters, combiners (often erroneously called mixers), splitters, directional couplers and taps.

Antenna Array: A stack or combination of antennas to obtain a desired pickup or rejection pattern. The Yagi is the most popular single-channel antenna. Stacking is usually limited to four antennas in modern systems. Use is often made of the sharp nulling characteristic (direction of minimum signal) of CATV antennas. The null is pointed toward the source of interference with some sacrifice in signal pickup. However, maximum signal-to-noise ratio can be obtained by this method.



Larry Roeshot is president of Spectra Inc., CATV consultants in State College, Penna., and is technical director of the National Cable Television Center at Pennsylvania State University in University Park.

Antenna Preamplifier: A low-noise amplifier usually located near the antenna terminals on the mast. The loss from the antenna lead-in adds to the noise figure of the system. By eliminating the cable loss using a preamplifier, the overall noise figure is improved. This improvement is determined by the following expression.

$$F_0 = F_1 + \frac{F_2 - 1}{G_1}$$

F_0 = Overall NF

F_1 = NF of preamplifier

F_2 = NF of receiver + cable attenuation

G_1 = Preamplifier gain

Coaxial cable is usually used for downleads in CATV systems. It has more than twice the loss of ordinary 300-ohm twin lead. At uhf the large loss makes the use of preamplifiers even more important. Single-channel preamplifiers contain an input filter before the first transistor stage, to reduce interference from other signals. Most modern preamplifiers use FETs to further reduce the distortion otherwise generated in the preamplifier.

When all-band, log-periodic antennas are used, input filters are less effective, and FETs cannot be used over such a wide frequency range. Bipolar multichannel preamplifiers are available but give greater distortion. Thus multiple-channel preamplifiers are effective only when there is no excessively strong signal at the input. Traps can be used to reduce the level of a strong signal, but the insertion loss of a trap at other desired frequencies can be prohibitive. A different antenna configuration is usually the preferred solution.

Attenuators: Circuits used to reduce the signal level. Cable TV systems use rf attenuators as audio attenuators are used in broadcasting. Rf attenuators used in CATV provide uniform response up to about 300 MHz. Because of the difficulty in maintaining flat response over a wide frequency band, continuously variable attenuators are limited to a 6-dB range. Signal distribution equipment makes use of fixed plug-in attenuators to maintain signal levels within prescribed limits throughout the system. Minor changes in the average signal level are corrected by the system AGC amplifier.

AFC (automatic frequency control): Slight correction to the converter oscillator frequency, usually accomplished with varactors. CATV converters occasionally use crystal oscillators, but never oven-controlled. When you consider that 12 or more channels are converted, oscillator control becomes a significant circuit and cost factor.

Continued on page 40

Can a tough, little, low-priced microphone make the big time?

(A success story.)

A good little microphone, the E-V 635A. But just how good? After all, it was intended to replace the "workhorse" Model 635... a dynamic microphone that had earned its title under fire in studios and on remotes all around the world.

So when we introduced the 635A we put it to a critical test. A major recording studio was loaned a dozen 635A's and asked to test them. The engineers weren't told the price, but they got the idea that it was somewhere near $300.00.

They were so delighted with the sound that they cut several big band recordings with nothing but 635A's. "Best $300.00 microphone we've got." Then we told them the price. They were shocked. They couldn't believe their ears.

Meanwhile, 635A's were beginning to appear in force on music and variety shows on every TV network. Mostly hand held. Something to do with ruggedness and good balance... but mostly because of the sound. Especially during ultra-close miking.

The rest is history. Radio and TV newsmen quickly adopted the 635A as their new "workhorse". After all, news only happens once, and the 635A was their best insurance against bad sound.

To most professional sound engineers, the E-V 635A is already an old friend, although it's only been around since 1965.

At the price, they can afford to use it almost everywhere. And they do. (We told you it was a success story.)

ELECTRO-VOICE, INC., Dept. 1001EM
614 Cecil Street, Buchanan, Michigan 49107

MODEL 635A Omnidirectional dynamic. Response 80—13,000 Hz. Output—55db. Balanced low impedance. Includes Model 310A stand clamp and lavalier neck cord. Fawn beige Micromatte finish.
$88.00 list, less normal trade discounts

high fidelity systems and speakers • tuners, amplifiers, receivers • public address loudspeakers • microphones • phono cartridges and styli • aerospace and defense electronics

Electro-Voice®
a GULTON subsidiary

Circle 112 on Reader Service Card

LEARNING TO OPERATE A CONVENTIONAL COLOR VIDEO CAMERA TAKES THREE MONTHS. LEARNING TO OPERATE OURS TAKES THREE MINUTES.

The reason for this astounding discrepancy lies largely in the differing number of operating controls to be mastered. The conventional color video camera has thirty or more. Ours—the new Sony DXC-5000—has just three.

What's missing is all the controls associated with the endless setup procedures and readjustments called for by changes in light levels and color temperature. For the DXC-5000 has completely automatic gain control and color temperature compensation. Even apart from these automatic features, the DXC-5000 is a marvel of simplicity. Thus it uses two tubes instead of four to produce a high-quality picture: one tube for luminance the other to generate all three color signals, red, green, and blue. And because the camera has relatively few parts, it's reasonably priced, extremely compact, and weighs a mere 29 pounds.

And what *are* the DXC-5000's three controls? Vertical registration, horizontal registration, and electronic focusing. As many controls it so happens, as it takes minutes to learn to operate the camera.

We suggest you take the full three-minute course at your Sony color video camera dealer.

SONY®

...the better one

SONY CORPORATION OF AMERICA
47-47 Van Dam St., Long Island City, New York 11101

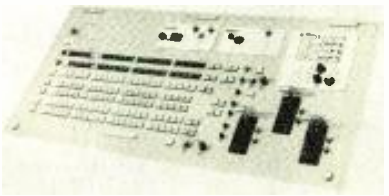
Circle 113 on Reader Service Card

Samplings

Confuzz, a conductive, silver-impregnated nylon tape, eliminates static electricity buildup on moving or rotating surfaces such as magnetic tape; acts as grounding path, with light physical contact; comes in six widths, 0.125 to 2 in.; operating temp −65° to +300°F. TECHNICAL WIRE PRODUCTS. **369**

CATV return loss bridge, model 63F, has 40 dB directivity over range 10-1000 MHz, inbuilt reference termination, uses F-type connectors, costs $140. Precision 75-ohm calibration termination costs $40. WILTRON. **370**

V-I production switcher



Circle 366 on Reader Service Card

Model 24-10 vertical interval production switcher accepts comp or non-comp signals on any input, automatically adding sync to non-comp signals; inbuilt automatic synchronous-non-synchonous detection with mix-effects lockout; easily adjustable delays. Shown here is first production model, sold for $22,640 to KBTV (Denver). Custom features include 24 input, seven output capacity; special effects; chroma-keyer. VISUAL ELECTRONICS.

BROADCAST EQUIPMENT

TV program origination system is small remote portable by car or station wagon. Includes two B&W cameras, switcher-monitor, audio and sync facilities, carrying trunks, lighting. AV SYSTEMS. **371**

Color helical VTR has both insert and assemble editing, using vertical interval switching. Uses capstan servo for precise timing, two audio tracks, four motors, fast lockup. Video bandwidth 5 MHz, video S/N 44 dB, horizontal resolution 400 lines, 1-in. tape. IVC-870 color costs $8000; B&W cost $7500. IVC. **372**

Helical VTR uses Japan Type 1 format for half-inch machines. Model PVR 707 has pushbutton control of all transport modes, will operate in both vertical and horizontal positions, by local or remote control. Has inbuilt two-input switcher, optional electronic editing, auto. video/audio level control. AUDIOTRONICS. **373**

For more information circle product's boldfaced number on the Reader Service Card.

Continued on page 34

Digital freq counter

Model 616 measures freq up to 225 MHz, with direct digital readout; range extends to 1.3 or 3.3 GHz with optional converter modules; also can measure time intervals to one μs; well-designed for cable systems checking operations under new FCC standards (see *CM/E* supplement, page 6); $1975. TELECTRIC.

Circle 367 on Reader Service Card

Quad sound panner

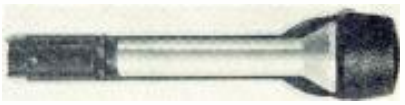
Circle 368 on Reader Service Card

Model 480 "joystick" four-channel stereo panner moves phantom location of sound source in 360° range with infinite (stepless) resolution; position of stick indicates audio "source" location; splits signal into four separate outputs via multiple-finger contacts wiping on conductive plastic panning elements; tracking acc ± 0.5 dB (5° of indicated position); insertion loss 1 dB max. Two channel stereo applications include sequewaying between stereo programs, between dry and reverb or other sound combinations (two input, four output use); $190. AUTOMATED PROCESSES.

Audio equipment

Mono console has eight mix channels, 22 inputs, 10-W monitor amp, cue and audition facilities. Type QRK-8 console: $1695. QRK. **286**

Microphone is dynamic, shock-isolated for hand-held use. RE50 has freq resp of 80-13,000 Hz, output –55 dB, has integral windscreen and



blast filter. With stand adapter, cost is $120. ELECTRO-VOICE. **287**

Stereo preamp has an S/N ratio of 125 dB on phono input, freq resp of +0, –1 dB from 5 Hz to 100 kHz, uses straightline volume, balance, tone controls. Model 33 drives both high- and low-Z headphones from front-panel jack, with separate headphone level control. Six back-panel ac receptacles. $395. MARANTZ. **288**

Microphone has ball head and cardioid pickup with 25-dB front-back rejection ratio and inbuilt on-off switch. Model 850s dynamic-designed for close-talking work, with freq. resp 40-15,000 Hz, output –50 dB. ASTATIC. **289**

Tape gear

Automatic repeating cassette works with any audio cassette player, uses Mirocron lubricated tape. AUTOMATED LEARNING. **297**

Stereo recorder/reproducer handles both reel-to-reel and cassette material. Model 330 includes deck, electronics, detachable five-in. speakers, two F-25 cardioid dynamic mikes, stereo patch cord for dubbing from

cassette to reel or vice versa. Price $339. SONY SUPERSCOPE. **298**

Audio cassette recorder/reproducer uses Dolby noise-reduction system. Model V-2 has automatic stop which frees all pushbuttons to normal at

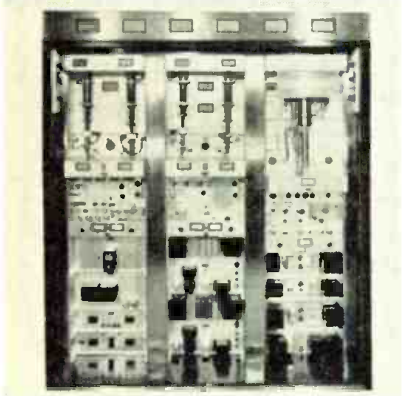
end of tape. VIVITAR. **299**

Broadcast cartridge tape machine, Cuemaster series 750, has synchronous drive with capstan speed trim; instant start and stop; automatic cart loading; NAB equalization; plug-in PC boards; remote control. Available in mono or stereo. Made in Australia by Consolidated Electronics; imported by TELEVISION EQUIPMENT ASSOCIATES. **300**

Rf equipment

Solid-state uhf translator has 10-W peak output power, can tune any channel from 14 to 83. Low power drain makes it choice for use with thermoelectric generators at remote locations. RODELCO. **360**

Uhf TV transmitter, type 250-A, has been type accepted by FCC for NTSC color on channels 14 through



83. Can be used at low-power station or as driver for 2, 5, and 10 kW transmitters. TELDEX. **361**

MATV amplifier covers all vhf and uhf channels. Model 4330 has switch-selected input allowing choice of single channel or separate vhf and uhf inputs. Resp ±1.5 dB through all 82 channels. FM trap included. Price $120. JERROLD. **362**

AM BC transmitters have low distortion. BTA-10L rated at 10 kW, BTA-5L at 5 kW. Both use Ampliphase transformerless modulation system, capable of 100% modulation at 30 Hz with less than 2% HD. Both use solid-state exciters. BTA-10L uses six tubes, costs $22,995; BTA-5L uses four tubes, costs $21,000. RCA. **363**

Dummy load line, Termaline types, are 3⅛ in. water-cooled, include models rated at 15, 25, 50 kW continuous dissipation. All exhibit low VSWR of 1.1:1. Model 8742, 15 kW, costs $1400; model 8762, 50 kW, costs $2600; both are vhf. BIRD. **364**

FCC Rules and Regulations

Continued from page 12

the same time of day on exactly the same day of the week as Candidate Z, *the time segments offered must be comparable as to desirability.*

Limitations on use of facilities by candidates

Broadcasters may not delete what they believe is libelous material from a broadcast under Section 315. Nor may broadcasters require a candidate to submit an advance script of his program *for the puropses of censorship.* For the purpose of planning broadcast continuity, however, a broadcaster may require submission of the candidate's script in advance. Therefore, if a candidate secures time he need not use it to talk about a subject directly relating to his candidacy. *The candidate may use the time as he deems best.*

Moreover, if a legally qualified candidate broadcasts libelous or slanderous remarks, the station generally cannot be held liable.

What rates may be charged?

Section 315 provides that charges made for the use of a station by a candidate *shall not exceed the charges made for comparable use of that station for other purposes.*

Therefore, a political candidate may be entitled to receive regular discounts that would ordinarily be allowed to advertisers other than candidates for public office, and the like. Similarly, a station with both "national" and "local" rates may not charge a candidate for local office the rates published on its "national" rate card.

Consider this situation: A licensee makes "packages" of ROS (run-of-schedule) spot announcements available to commercial advertisers at a reduced rate. The ROS spots are carried at the convenience and discretion of the broadcaster and are subject to preemption by fixed-position commercials. The broadcaster refuses to sell ROS spots to political candidates. His reason is that if one

candidate, by luck, has ROS spots scheduled in prime time, his opponents could demand that their ROS spots also be broadcast during prime time. The result would be that some candidates would obtain fixed rates spots at ROS spot prices. However, under Section 315, is the broadcaster justified in refusing to sell ROS spots to candidates? No. Since ROS spots are available to commercial advertisers, *the broadcaster must make ROS spots available to political candidates on the same basis.* However, if one candidate purchases ROS spots, the licensee does not have to sell the candidates' opponents fixed position spots, for the same time periods, at ROS spot rates. If ROS spots are chosen by the other candidates, the licensee is required to act in good faith and scrupulously follow normal procedures in the allotment of time for these commercial announcements. In sum, once a broadcaster decides to sell spot announcements to political candidates, he must make *all* spot "packages" and rates available to commercial advertisers available to political candidates; this includes "ROS packages," "package discount rates" and the like.

Finally, suppose you decided to increase your advertising rates by 25% on December 1. If some legally qualified candidates had purchased time before the rate change, for use in the month of December, would you be allowed to charge the increased rate for time purchased by legally qualified candidates *after* December 1? No. The rate charged an opposing candidate must be the rate charged his political opponent.

Conclusion

Each broadcaster should obtain a copy of the Commission's latest 1970 "Section 315 Primer" and study it carefully. Section 315 continues to be one of the most troublesome areas for broadcasters. With its recent applicability to CATV, similar problem areas are likely to arise for CATV program-origination. Whenever doubtful situations arise, your counsel should be consulted. **BM/E**

This section, providing broad interpretation of FCC rules and policies, does not substitute for competent legal counsel. Legal advice on any given problem is predicated on the particular facts of each case. Therefore, when specific problems arise, you would be well advised to consult your own legal counsel.

SALE OF THE MONTH

Be an ad agency — not just a broadcaster

Robert I. Kimel
WWSR Radio
St. Albans, Vermont

The Challenge: In a small market such as ours (city population 8500) few businesses can afford advertising agencies. As a result most stores "are sold" advertising instead of "buying" it. Ad budgets tends to fluctuate tremendously month to month. Many local merchants question the value of ad expenditures and prefer to operate without a budget—simply buying what sounds good and refusing what doesn't appeal on that particular day. What we needed was a way to bolster these hesistant merchants' interest in advertising on our radio.

The Solution: We decided to "become" an ad agency. We have prepared forms and already have held lengthy meetings with some merchants. A jewelry store owner met with us for eight hours, for example. We reviewed his past year's sales and anticipated the coming year's sales; we did the same with his past and future ad budget and with many merchandising phases of his operation. We proposed a budget with a base schedule plus added expenditures in heavy months. Now, his advertising pattern follows his sales: If he does 6.7% of his year's business in January, that's the percentage of his ad budget he spends for that month. We also worked out an image for each advertiser, and we feature that business image in all commercial copy. Station staff have met with store clerks to give information on selling to customers and to point out that increased store sales can eventually mean increased pay checks for them.

Our presentation offers an overall plan for the merchants—(1) planned advertising in all media, (2) a distinctive individual approach to be used in ad copy, and (3) backup at the place of business by informed clerks with adequate merchandise advertised at the right time. The result: We have more than 200 52-week advertisers on our books—an excellent base for station billings. It also assures us that we will get good results for our advertisers, since their expenditures are well planned and backed up.

We need your help—

And so does everyone who's in the business of selling local market radio and TV ads. Send us your sales tips and we'll run as many as we can in our Sale of the Month. It's that simple. You'll get ten dollars and a handsome certificate. Everyone else will get a good sales idea.

NEW LIT

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

Professional video products, the full line from Ampex in 24 pages. **200**

Model 100 professional tape recorder and reproducer in Tape-Athon four-pager. **201**

Complete CCTV test signal generator, Signal Source 204 and others, in spec-sheet packet from Visual Information. **202**

CCTV use in underground pipe inspection, in Cohu four-pager. **203**

Lamp catalog with Sylvania line of incandescent, fluorescent, tungsten-halogen and mercury lamps. **204**

Communication components from ADC, 13 pages of plugs, patch cords, etc., 400 stocked and almost 3000 available. **205**

Slide 'n Switch brochure from Sealectro describing random-access circuit selector guaranteed for 250,000 operations per contact at 250 mA switching and 2 A static. **206**

Measurements in communications spectrum, audio to microwave, covered in quarterly periodical named "WILTRON Technical Review," available free to qualified engineers in microwave, audio/video and telephone fields. **207**

An Alphabetical Guide to Motion Picture, Television, and Videotape Production, by Eli L. Levitan. A book like this hasn't been available for years. It does for motion pictures, television, and videotape, what the NAB Engineering Handbook does for broadcasting. An encyclopedia of industry practice, technical terms, and trade jargon, this book contains historical notes ("The first photographs taken from above ground level were . . . in 1858 from the swaying gondola of a captive balloon . . .") and explanations of such technical processes as videotape recording and film camera troubleshooting. There are many interesting and pertinent pictures and diagrams. There are reference tables and charts (22 pages on camera filters alone!) and explanatory diagrams (three on holography). A useful reference for anyone in film or videotape work. Hard cover; 797 pages including subject guide to entries; 1970. Price $24.50. McGraw-Hill Book Co., 330 West 42 St., New York, N.Y. 10036.

CATV terms

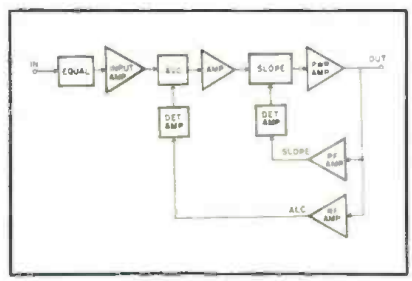
Continued from page 30

AGC (automatic gain control): Automatic control of amplifier gain so that the output signal level is virtually constant for varying input signal levels. Seasonal and daily temperature variations cause changes in the attenuation characteristics of coaxial cable. Typical cable attenuation increases 10% for a 60°F temperature rise. Cable systems normally use an AGC amplifier at every third location, or 60 dB of cable attenuation.

Early CATV systems used a composite signal AGC system. In this type of system a quasi-peak detector is used to measure the average sync-tip level for all TV signals in the band. This system is similar to conventional TV receiver AGC.

Another AGC method controls gain in proportion to the temperature measured at each amplifier location. Thermistors are mounted on the amplifier case. This method assumes that temperatures are relatively uniform throughout the system. Amplifiers in direct sunlight may overcompensate for cable located in cooler shaded areas. Amplifier gain changes resulting from aging or low voltages are not corrected by thermal AGC systems.

The most popular AGC systems in use today have one or two pilot carriers. The signals are inserted at the headend, usually at 73.5 and 220 MHz. Narrow-band circuits in each AGC amplifier measure the level of each pilot signal, and correct amplifier gain at both ends of the band. This change in amplifier slope has given rise to the term automatic slope control. A simplified block diagram of an amplifier using automatic level control (lo frequency) and automatic slope control (hi frequency) is shown below.



CONTINUED NEXT MONTH

Tape problems

Continued from page 25

constantly changing relative azimuth of the recorded test tone. If the tape pack contacts the reel flange, the tape edge may be damaged. Physical distortion is aggravated by high temperatures and by temperature and humidity cycling. Follow these precautions to safeguard a test tape:

- Run it through a transport in the play mode only (never fast forward or rewind) and don't stop it—let it play all the way out. That way you won't stretch the tape, and you'll get an even wind on the hub. When it plays out, reverse feed and takeup reels and rewind the tape by putting the transport into the play mode.
- Store the tape in a cool, dry place away from magnetic fields (loudspeakers, meters, motors and microphones).
- Before using the tape on a transport, clean and demagnetize all heads and tape guides. Dirty or magnetized heads or guides will ruin a test tape.

Does a test tape wear out?

Definitely. A test tape has both useful life and shelf life. If carefully handled and played 50 times, such a tape will have a loss of 0.5 to 2 dB at a half-mil wavelength (15 kHz at 7.5 in/s). For 100 plays, the loss may be as high as 3.5 dB. The loss rapidly approaches 5 dB beyond 100 plays. Unknown to many is the shelf life of a test tape. Even when a tape is carefully stored, the short wavelengths fall off after a time. Thus test tapes must be periodically replaced.

Can a single test tape be used to calibrate a tape machine at several speeds?

Not with accuracy. It is sometimes assumed that, since the NAB equalization curve is identical for both 19- and 38-cm/s tape speeds (7.5 and 15 in/s), an adjustment at one or the other speed is adequate for both. On the contrary, accurate response measurements require the use of separate tapes for each speed. **BM/E**

Four-channel Survey

Continued from page 26

such research and eight are doing neither. Three companies felt they would become leaders in quad production, and four said the industry would ultimately determine whether or not they made quad; three said quad wasn't for them. Four outfits reported receiving a few queries from stations about quad equipment. Davies concluded that since there's no FCC-approved quad stereo FM systems yet, it's too early to crystal-ball the transmitting gear market.

Receiving equipment

The survey included 45 manufacturing members of IHF; 32 firms (51%) responded. Nearly half are either conducting or contemplating research in quad. Most respondents estimated the consumer cost of a four-channel receiving adaptor for present FM stereo tuners at $50—$100. If a present stereo tuner were redesigned and modified on the assembly line for quad, what would the additional consumer cost be? Most answers were less than $50. When the same question was asked about a stereo receiver, the answers clustered largely in the range of 40%—59% additional cost. Most firms thought the industry would determine whether they included quad in their line, but five companies (which are currently doing quad research) anticipated a quad boom. Some 75% of the companies had received either a few or no inquiries about quad from customers. Yet a majority of the sample firms feel the future holds at least moderate consumer interest in four channel.

Manufacturers' comments concerned software: Quad tapes are here, need some refinement, but can stimulate public acceptance of the medium, while FM systems are still experimental. Another thought the only way to sell quad is for recording companies to produce material which both the public and FM stations can play. This will provide the low-cost programming which stations must have to survive.

Davies found some tie-in with quad tape gear which he interpreted as indicating spillover into FM receiving equipment. This would account for the optimism of the majority of the hi-fi firms surveyed.

Davies also surveyed "16 manufacturers of radio and stereo equipment of lesser price and quality than high fidelity . . . whose products are adequate for the general consumer." Only one company responded; it had total lack of interest in quad.

Retailers

Davies sampled 113 retail members of IHF, getting 54 replies. The personal reaction by nearly

40% of the respondents was either neutral, or that quad wasn't worth the expense. But more than 25% noted at least some audio improvement. More than ⅓ of those responding hadn't heard quad. Approximately 4/5 of the retailers replying, who were geographically well dispersed around the nation, had received inquiries from customers about quad.

Cost aside, 50% foresaw extensive objections to four speakers in a room, and another 40% expected moderate objection. The objections were on both technical and decorative grounds. 52% foresaw little eventual interest in quad; 46% saw moderate or strong interest. More than half the sample felt $25—$50 a consumer-acceptable retail price for a quad adaptor. A $50 increment in tuner price, and a 30%-50% increase in receiver price, were picked as appropriate for quad conversion.

The large majority of the comments, however, objected to the total overall cost of conversion to four, chiefly the speakers and power amplifiers. To those who required or admired quad, price seemed no factor.

Since more than half the retail members of IHF didn't respond, and more than half of those who did foresaw little future demand for quad, Davies infers that the hi-fi industry isn't ready to embark on quad promotion. However, he feels that if software and hardware are produced for consumers and FM stations, retailers could be expected to get into sales promotion quickly.

Conclusions

Davies says: "The consumer with conventional stereo cannot be expected to acquire an additional stereo amplifier and two additional loudspeakers exclusively for initially limited four-channel programs on FM radio. A substantial amount of interest in four-channel tapes and/or records and the associated required equipment will also need to be generated before four-channel stereo FM can likely become profitable." He reasons that quad would be an added expense for an FM station, and it wouldn't inherently increase revenue or profit. Only when four channels are promoted and listeners are convinced to listen to the new sound, will the station be able to increase revenue, by increasing rates. At that point, other stations may also convert to quad, to avoid losing listeners to the leader or pioneer.

Davies pointed out that extensive promotion of quad on FM is impossible until the FCC adopts an official system. This may take years, but Davies sees the interim bringing benefits: Development, perfection, and successful introduction of four-channel tape and disc systems; providing software for FM stations, and getting two more amplifiers and speakers into homes. With both the chicken and the egg on the scene, FM stations could then cash in on four channels. **BM/E**

Multiplex Sound

Continued from page 28

Transmitter adaptor

In Fig. 2 you see a simplified diagram of the circuit used to transmit two-channel TV sound. Frequency control begins with a crystal oscillator operating at 1022 times the horizontal frequency. Incoming horizontal sync is compared with a divided-down version of the oscillator signal, and the modulator is part of a feedback loop which keeps it at exactly two times f_H.

In the mono mode, only line B (in the figure) is activated into the mixer. For stereo, line B carries the L+R signal, and line C the L–R signal, while line D provides Q. For different or bilingual operation, the same lines are activated, but with different programs (the matrix is disabled).

Video compensation

When the video signal amplitude modulates the visual carrier, a small amount of phase modulation occurs. In the conventional intercarrier receiver, this residual PM is detected along with the FM sound, causing the familiar sync buzz.

In the two-channel sound system, sync buzz degrades the subchannel too much. The remedy devised by Toshiba is negative phase modulation ahead of the modulated stage, thereby cancelling most of the buzz. **BM/E**

Electronic Sound

Continued from page 29

radio promos. Marketed under the name Condor, two modulators are available which go to work on the sound from a conventional musical instrument. The Condor RSM (reed sound modulator) processes the sound from woodwind and brass instruments, picking it up from the mouthpieces. Output includes added voices below and above that of the instrument, vibrato and simulation of other instruments including bassoon and cello. Many voices can be mixed at once—or a cancel bar can cut out as many as you want in an instant. The result is not the "electronic" sound put out by Moog's device, but it creates electronic enhancement and transformation of non-electronic sound.

The Condor GSM (guitar sound modulator) operates much like the RSM, picking up the six strings individually at the bridge and processing each signal separately. The result can be a blend of sax, oboe, sitar and other instrumental sounds at the flick of so many switches. Condor models rent for $20 to $40 a day and can be brought into a station's own studios—although adaptors are needed for mouthpiece pick-ups. Musicians can usually "play" the Innovex instruments after a twenty-minute warm up, developing more imaginative uses for them quickly. It shouldn't take broadcasting stations any longer to think up their own ideas for electronic sound. **BM/E**

BM/E CLASSIFIED MARKETPLACE

CLASSIFIED ADVERTISING RATES

DISPLAY CLASSIFIED ADVERTISING: $22.50 per inch 1x; $22.00 per inch 3x; $21.00 per inch 6x; $20.00 per inch 12x. ALL OTHER CLASSIFIED ADVERTISING 25¢ per word; minimum $3.00. BLIND BOX NUMBER: No extra charge. Replies sent to address below will be forwarded to you. PAYABLE IN ADVANCE; send check with order. CLOSING DATE: 5th of 2nd month preceding issue date.

BM/E, Monterey and Pinola Avenues, Blue Ridge Summit, Pa. 17214 Phone 717/794-2191

HELP WANTED

CIRCUIT/PRODUCT DESIGN ENGINEERS

The engineers we seek will include their talents in Video, Audio and Computer related circuitry designing products for the Television Broadcasting Equipment market. Send resume to the personnel manager. Vital Industries, Inc., 3614 S.W. Archer Road, Gainesville, Florida 32601.

SENIOR TELEVISION ENGINEER—Must have strong maintenance background with the latest solid state broadcast color television equipment. Send resume to Ronald Lask, Chief Broadcasting Engineer, Television Section, University of Illinois, Medical Center, P.O. Box 6998, Chicago, Ill. 60680.

POSITIONS WANTED

Currently employed 1st phone needs job near law school. BS. Political Science. 4 yrs. exp. in medium market TV. Engineering thru editorial composition. Box 1070-1, Blue Ridge Summit, Pa. 17214.

Struggling dj not a pro, but trying. Seeking announcing position in southeast. Doug Gallihier, 3907 Angol Place, Jacksonville, Fla. 32210. Phone 904-771-7386.

Announcer, disc jockey, control board operator-male-22, single. Damon Joe Formen, 2458 No. Platt, Wichita, Kans. 67214. Tel. Area Code 316-265-8846.

Can investigate, film, write and edit news. Will work anywhere. 8 yrs. photography. 2 yrs. news experience. Gerard Klein, 74 St. Munn, East Orange, N.J.

Earnestly seeking progressive rock. 3rd. endorsed. Box 92, Maize (who could imagine) Ks. 67101.

EQUIPMENT FOR SALE

GE 50 kw Transmitter BT-50-A1 complete with associated equipment including cabling, 3 ea. 280 ft. and 2 ea. 160 ft. guyed towers, transmitter shack, etc. To be offered for sale by public bid. Available late 1970 for disassembly and removal from location near Sacramento. Arrangements to inspect the facility, currently operating, and to request copies of the Bid form, contact immediately B. N. Brown, Sacramento Municipal Utility District, P.O. Box 15830, Sacramento, California, 95813. (916) 452-3211, ext. 576.

EQUIPMENT FOR SALE (con't)

SCULLY TAPE RECORDERS: Mono., 2, 4, 8, 12, & 16 track models plus 270 automatic players. Some models in stock now. W.A.L. custom audio control consoles & console modules. Solid state 120 Watt power Amps. We buy and rebuild Scully lathes. WIEGAND AUDIO LABORATORIES, INC. 3402 Windsor Road, Wall, N.J. 07719. Phone 201/681-6443.

GE color film island complete with Eastman multiplexer and Spindler-Sauppe dual side projector, excellent condition, used less than 100 hours, has not been in service for last 9 months. Contact Howard Zuckerman, National Teleproductions, 5261 No. Tacoma Ave., Indianapolis, 317-257-1581.

Jack Panels and patch cords, Audio and Video, new and used. Precision video coax cable and connectors (Belden 8281). Write for catalog. Gulf Electro-Sales, Inc., 6325 Beverly Hill, Houston, Texas 77027. Phone 713-781-3066.

AMERICA'S LARGEST STOCK AND CONSIGNMENT LISTING of new and used broadcast and recording equipment. We trade-sell and buy. THE MAZE CORPORATION, P.O. Box 6636. Birmingham, Ala. 35210.

GENERAL Electric Vidicon camera-slide chain. CONRAC AV12E. New G.P.L. 350 camera. Sync generator, process Amp, Marconi-Ampex 3500 Vidicon camera, zoom lens, Ampex 660B. Capt. Bill, WIMS RADIO-Michigan City, Ind.

TR-22 Videotape machine-RCA. Low band, color, air bearings, good condition. Includes three headwheel panels. Contact Chief Engineer, WTIC TV, Pittsburgh, Pa. 15214. Phone (414) 321-8700.

Color videotape recorders for sales. Four IVC Model 860. Almost new, excellent condition. Cost, $7,800 each. Make a reasonable offer. Phone 904-354-2806.

CAPSTAN IDLERS for AMPEX 300, 350, 440 Series, self aligning with replaceable ball bearings. $22.50 net. VIF INTERNATIONAL, Box 1555, Mtn. View, Ca. 94040.

RCA TK-30 and TK-31 image orthicon cameras; RCA TR-2 and TR-5 videotape recorders, plus many incidentals. Television Facilities, Inc., Box 396, Montgomeryville, Pa. 18936. Tel. 215-855-0970.

RCA headwheel panels-unused RCA highband and low-band headwheel panels priced to sell. Contact WHDH-TV, 50 Morrissey Blvd., Boston, Mass. 02125. Ph. (617) 288-5000.

The complete and reliable source for new and used broadcast equipment. Request our free listings. Broadcast Equipment and Supply Co., Box 3141, Bristol, Tennessee 37620.

Any type tower erection finance. Bill Angle—Tel. 919-752-3040. Box 55, Greenville, N.C. 27834.

WANT TO BUY

Television transmitters wanted: We need used high and low band television transmitters, any power. Must be in excellent condition. Contact Bruno Schwebel, Telesistema Mexicano, S.A; Av. Chapultepec 18, Mexico, 1, D.F., Phone: Mexico City 5-18-56-74.

BUSINESS OPPORTUNITIES

FIELD SALES REPRESENTATIVES—If you are making regular calls on customers in all areas of television broadcasting, and are interested in selling a complete, well established line of video patchfields and accessories, please write or call: MR. JESS F. LANCASTER, Marketing Manager, Broadcast Products, COOKE ENGINEERING CO., 900 Slaters Ln., Alexandria, Va. 22314 703-548-3889.

PROGRAM SERVICES

TAPES FOR AUTOMATION

THE **CnB** STUDIOS

Specializing in Custom Services

3415 BERESFORD AVENUE
BELMONT, CALIFORNIA 94002
415 / 592-6149

PROGRAM SERVICES (con't)

Deejay Manual—A collection of one-liner comedy pieces for sparkling DJ's $3.00. Write for free "Broadcast Comedy" catalog. Show-Biz Comedy Service (Dept. R) 1735 East 26 Street, Brooklyn, N.Y. 11229.

D.J. one liners! Write for free samples, and also receive details on: California Aircheck Tapes, Voice Drop-ins, D.J. Source Guide, and much more! Command Productions, Box 26348-A, San Francisco 94126.

DEEJAYS! 11,000 classified gag lines, $10.00. Unconditionally guaranteed! Comedy catalog free. Edmund Orrin, Boyer Road, Mariposa, Calif. 95338.

MISCELLANEOUS FOR SALE

DECALS, TRADEMARKS & LETTERING made for sales aids. All kinds since 1944. Write for idea catalog. Mathews Co., 827 S. Harvey, Oak Park, Ill. 60304.

CONSULTANTS

JANSKY & BAILEY
BROADCAST-TELEVISION DEPARTMENT
Atlantic Research Corporation
A Division of
The Susquehanna Corporation
1812 K Street N.W.
Washington, D.C. 20006
Member AFCCE (202) 296-6400

TECHNICAL SERVICES

VIDEO TAPE RECORDER AUDIO HEAD ASSEMBLY SERVICE

Precision relapping of all heads and supporting posts, includes cleaning and testing. AMPEX VTR audio assembly . . . $75.00 complete. Brand new shelf stock replacement heads of our manufacture available when relapping not advisable. LIPPS, Inc., 1630 Euclid St., Santa Monica, Calif. 90404 (213) EX 3-0449.

INSTRUCTIONS

Are you interested in a professional announcing career in radio? Then enter America's most unique and practical Broadcasting School . . . The SCHOOL OF BROADCASTING TRAINING in Artesia, New Mexico. Three months training on two commercial radio stations . . . KSVP AM and KSVP FM Stereo gives you three months actual commercial broadcasting experience that really counts when you apply for your first full time radio job. Third class radio-telephone license with Broadcast endorsement included . . . needed at many radio stations for employment as a disc jockey. Room and Board available and placement assistance after graduation. Class is limited to 12 only. BONDED! Approved by the New Mexico State Board of Educational Classes begin January 2, 1971 and June 2, 1971 and Sept. 2, 1971. Also six weeks course for First Class FCC license theory and laboratory training beginning September 2, 1970. Enroll Now! Write . . . Dave Button, Manager . . . School of Broadcast Training, 317 West Quay, Artesia, New Mexico. 88210 Telephone 505-746-2751 for reservations!

AMERICAN INSTITUTE OF RADIO offers the nation's finest quality course for your first class License in three to four weeks. Individual instruction. Classes start every Monday. Tuition $300.00.
A. I. R. in FLORIDA Koger Building—Boulevard Center—3986 Beach Boulevard. PO Box 16652, Jacksonville, Florida.
A. I. R. in TENNESSEE 2622 Old Lebanon Road, Nashville, Tennessee 37214. 615-889-0469.

"1970 Tests Answers" for FCC First Class License, Plus Command's "Self-Study Ability Test." Proven! $5.00. Command Productions, Box 26348-A, San Francisco 94126.

INSTRUCTIONS (con't)

USE BM/E's CLASSIFIED MARKETPLACE TO REACH OVER 26,000 BROADCASTERS!

Please run the ad below in BM/E's CLASSIFIED MARKETPLACE in your next:

☐ 12 issues ☐ 6 issues

☐ 3 issues ☐ 1 issue

in a space of ..... inches .....
words under the Classification of:

.....

☐ Check enclosed

Name .....

Station or Co. .....

Address .....

City ..... State .....

BM/E, Classified Advertising Department, Blue Ridge Summit, Pa. 17214. 717/794-2191.

BM/E ADVERTISERS' INDEX

ADVERTISING SALES OFFICES

NORTHEAST
820 Second Avenue
New York, New York 10017
212-661-0450
H. R. Shanton Granger

SOUTHEAST
Ken Fairleigh Associates
P.O. Box 3956
Charlotte, North Carolina 28203
704-366-1434
Kenneth F. Fairleigh

MIDWEST
612 North Michigan Avenue
Chicago, Illinois 60611
312-642-3774
Thomas F. X. Carter

MACTIER PUBLISHING CORP.
820 Second Avenue
New York 10017 212-661-0450

Sally Ann Morley
Sales Administrator

WEST COAST
1245 East Walnut Street
Pasadena, California 91106
213-795-1528
213-684-0590 (Los Angeles)
Lawrence C. Papp
Burt Underwood

Thompson & Healey Inc.
1111 Hearst Building
San Francisco, California 94103
415-362-8547
William J. Healey

JAPAN
Nippon Keisoku Inc.
P.O. Box 410
Central Tokyo, Japan
Yoshi Yamamoto

FROM THE EDITOR

Stereo for Everyone

In the realm of technological advances, we think the FCC should be permissive rather than restrictive. What is the harm in allowing any broadcaster—AM, FM, or TV—to program compatible stereo at will?

Leonard Kahn has demonstrated a compatible AM stereo system which has been on the air in Mexico since May 2. (See page 8 of our June issue.) It doesn't degrade the signal received by mono listeners, and anyone with two receivers can get instant stereo by tuning them slightly off-channel in opposite directions.

In many parts of this country, you can't get listenable FM stereo. Why must listeners on farms and in autos be condemned to mono? Furthermore, lots of people already have stereo amplifiers, tape recorders, and phonographs. All they'd have to shell out for AM stereo would be the small cost of a new AM tuner.

The argument that AM is inherently low-fi doesn't hold water. Nearly all transmitters are capable of 12,000-Hz response, and WLW Cincinnati has even used a private microwave STL with a custom-built rig to achieve system response to 21,000 Hz! The bottleneck in AM fidelity is the conventional cheap receiver with narrow i-f bandpass and consequent 5000-Hz audio response. H. H. Scott has recently introduced three AM-FM chassis with 9000-Hz AM frequency response. Thus an AM stereo tuner could have good audio.

In a similar vein, Toshiba and NHK have developed a TV stereo system which is on the air in Tokyo. (See page 28 of this issue.) If you heard a recent Metromedia special called "Midsummer Rock," you have an idea of what TV stereo is like. The program was a color-TV, stereo-FM simulcast, and was very entertaining. The Toshiba system is compatible and, if permitted in the U.S., would make no receivers obsolete. New receivers, or adaptors for old ones, could be built to utilize the two-channel audio.

In 1958, both RCA and Philco separately proposed AM stereo. In the early 1960s, GE proposed TV stereo. The FCC rejected all those proposals, and it's our impression they did so to give FM stereo a break. While that may have been a laudable effort ten years ago, we don't think FM needs that kind of a break anymore.

Actually, FM stations could still be one jump ahead of their sister media, with four-channel stereo. (See page 26 of this issue.) A compatible quad FM system was demonstrated by Jim Gabbert and Lou Dorren at last May's NAFMB Convention. (See page 38 of our May issue.) Both mono and two-channel listeners get all the program material, some of which is already available in the form of four-channel tapes. More will probably be forthcoming shortly, as at least three quad disc systems have been demonstrated.

Along similar lines, several packaged video playback systems are outfitted for stereo sound.

We think manufacturers and stations should ask the FCC to revise its rules to permit transmission of compatible two-channel stereo on AM and TV, and compatible four-channel stereo on FM.

Thomas R. Haskett, Associate Editor

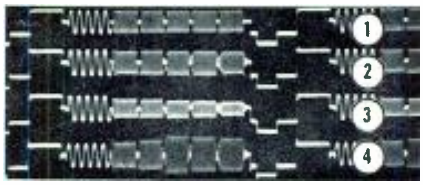
PRODUCT INDEX

A quick reference to products mentioned editorially or in advertisements. Page number is listed first (light face type) followed by reader service number (bold face.)

Proof that DYNA-TUNE can cure many of your head-end headaches.

Now you can have high-fidelity off-the-air color from your head-end. Utilizing completely new filtering and signal-restoration concepts, the DYNA-TUNE provides superior adjacent-channel color performance in either microwave-fed or demod-mod systems. These important developments allow the DYNA-TUNE to actually improve the color signals in many critical areas over that produced by the broadcast RF transmission system.

You can also forget the problems inherent in outdated tube-type tuners . . . the DYNA-TUNE uses a field-effect front end and the latest in integrated circuits to provide performance and reliability previously unattainable in this type of equipment. A completely new approach to off-the-air color . . . for only $1310 (fixed-tuned model $1385).

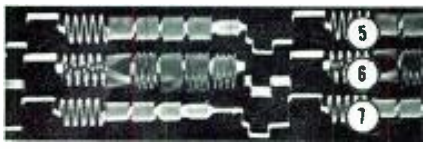


COMPARATIVE TESTS

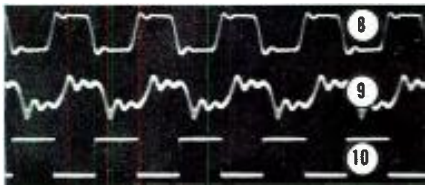
The unique color compensation function of the DYNA-TUNE is evident in waveforms 1 through 4. The test set-up for these waveforms consisted of an off-the-shelf DYNA-MOD modulator supplying a modulated 4.2-MHz multiburst signal to the DYNA-TUNE. Waveform 1 is the output of the multiburst generator. Waveforms 2 through 4 are the demodulated outputs of the DYNA-TUNE with (*2*) proper compensation, (*3*) no compensation (note the inherent roll-off in the higher frequencies) and (*4*) overcompensation, such as might be desirable to compensate for remodulation. All waveform photographs were taken with the tuner oscillator set for maximum aural rejection.

Waveforms 5 through 7 show the results of a conventional CATV demodulator tuned for the best overall picture (note the roll-off in the color region). Waveform 6 was taken with the demodulator tuned for the best 4.2-MHz response (note overall distortion, including degradation of sync pedestal) and waveform 7 was taken with the demodulator tuned for best overall sync. Remodulation of this output would result in even further degradation.

Another significant indication of the superior overall frequency-response characteristics of the DYNA-TUNE can be seen in waveforms 8 through 10. In this test set-up, the multiburst signal was replaced with a 500-kHz squarewave. Waveform 8 was taken at the output of the DYNA-MOD/DYNA-TUNE combination and waveform 9 was taken at the output of a conventional CATV demodulator driven by the same DYNA-MOD. Waveform 10 is the squarewave source. (Note the overall improvement in ringing and overshoot in waveform 8.) No external envelope-delay correction equipment or filters were used when performing any of the above tests.



Circle 130 on Reader Service Card



Mail the coupon today for complete information on this important product . . . better yet—place your order today for *fast* delivery.

DYNAIR

DYNAIR Electronics, Inc.

6360 Federal Blvd., San Diego, Calif. ZIP 92114 • Phone (714) 582-9211

Please send me complete information on the RX-4B DYNA-TUNE Demodulator.

Name_____

Title_____

Company_____

Address_____

City_____

State_____ Zip_____

Gauss: engineered precision where it counts

Gauss research and development has created two technological masterpieces. The 1620 Recorder/Reproducer with 5 heads, features an ingeniously designed capstan and guidance assembly that completely eliminates transport plate warpage and attendant guidance problems. This rugged dual-capstan transport puts greater strength and accuracy right up front where the action is, reducing scrape flutter and maintaining tape accuracies at all speeds. Gauss' 1630 is a reproduce-only transport incorporating all identical design advances of the 1620. Both transports can be mounted in any position on any surface, function equally well in a bi-directional mode and offer constant tape tension regardless of size, position or location of reels. We can safely say the new Gauss 1600 Series heralds a new era in the broadcasting and tape recording/duplicating state of the art. But hearing is believing. Another precision product . . . by Gauss.

by Gauss

Gauss Electrophysics
An MCA Tech. Division
11822 W. Olympic Blvd.
Los Angeles, California 90064
(213) 478-0261

Circle 131 on Reader Service Card