FCC Promises Stereo Decision

by Kathleen Imbemba

Washington DC ... FCC Chairman Charles Ferris appears to have committed the Commission to a definite decision on AM stereo “within the first quarter of 1980.” Both broadcasters and broadcast equipment manufacturers have responded enthusiastically to the FCC announcement, voiced during the recent House FCC oversight hearings, and anticipate that the Commission’s decision will favor AM stereo in general and one of the five contending systems in particular.

Although Harris, Belar, Magnavox, Motorola, and Kahn-Hazeltine have each been tested in over-the-air experiments, and the results of these tests submitted to the FCC August 3, 1979, the first of the five AM systems to be developed, Kahn-Hazeltine, claims to be the most thoroughly tested. The Kahn System has been evaluated for 30,000 on-air-hours by 11 radio stations, and has been soundly endorsed by stations affiliated with Meredith, Lin, Westinghouse and RKO. Meredith Broadcasting has been especially specific in its support of the Kahn-Hazeltine ISB system, asserting that, “It is apparent that the only AM stereo system capable of long-distance skywave reception, good fringe area stereo image, insensitivity to co-channel and adjacent channel interference and perfect compatibility with present AM mono receivers is the Kahn-Hazeltine system.”

Frequency vs. Phase Separation

Leonard Kahn, developer of the Kahn-Hazeltine ISB system believes that one reason his system is best is because it is also the simplest. Kahn is quick to point out that what is most distinctive about his system is its utilization of frequency instead of phase separation, a method that Kahn patented quite early in his work with AM stereo systems. Because the Kahn-Hazeltine system is a frequency separation system, it is indeed tolerant of narrowband directional antenna arrays, a compatibility factor verified by a number of actual installations at stations with sharp arrays. All the other systems which have been presented to the FCC for consideration, because they are phase separation systems, might well create great difficulties when required to operate with sharp arrays, many of which are used in this country, Canada and Mexico. Certainly the problem of directional antennas would be a serious impediment to the acceptance of any of the phase separation systems in Canada.

Phase Sensitivity in AM Systems

Kahn claims that the Kahn-Hazeltine system, with its frequency separation system, is immune to the phase sensitivity of the Magnavox and the other three phase separation systems; this sensitivity is the primary cause of stereo platform motion (swaying) during skywave groundwave interference periods. This swaying was such a problem for the phase separation systems that both Magnavox and Motorola specifically called attention to it during the NRBA Conventions of 1977 and 1978. While Magnavox reported that the swaying was experienced by all the systems tested by NAMSCR -Magnavox, Belar and Motorola- additional tests done in 1978 indicated that, again, Motorola and Harris also were affected by platform motion during interference periods. On-the-air tests have proven that only the Kahn-Hazeltine system, with its frequency separation system, is considerably less affected by skywave groundwave interference, the Kahn-Hazeltine system is completely free of motion caused by common phase perturbations and is only sensitive to sharp selective fades.

Sensitivity to Antenna Characteristics

Another distinctive feature of the phase separation system is their

(Continued on page 8)
How to Start Right

Ossining NY ... As a rule the recording industry has, throughout periodic fluctuations of the national economy, been a reasonably stable and viable economic concern. The quality and quantity of facilities and personnel has notably increased, to the point that a once fly-by-night business has transformed itself into a respected and organized multimillion dollar industry. All too often, however, when one mentions the recording industry, an image of flashing lights, twirling dials and loud music from rock’n’roll stars appears in one’s mind. While it is true that a recent proliferation of high technology studios has erupted around the country, these studios represent only one portion of the industry whose ultimate goal is to communicate with the public as a whole. The 46-Track interlocked-automated-overdubbed-re-re-mixed-post-edited-delated-flanged-phased-EQ’d-auto-mastered records that are produced today are of the highest quality in the history of the music industry. However, without the ancillary industry support required to bring the product to the public, supermixers and their artists would be twirling only their thumbs instead of the dials.

What’s Production

This support industry, generally unseen and certainly unglamorous, is more multifaceted than the studio recording process; it can assume a number of guises depending upon the final outcome of the product. In general, the word which best describes the fundamentals of full entertainment synergy is PRODUCTION. This term may upset some persons who feel it much too general. But let’s see what exactly is included in my amorphous definition of PRODUCTION.

1. Commercial Production: TV, Radio, Film, Video Tape, Synch
2. Audio Visual: Advertising, Sales Presentations, Film Strips, Cassettes, Museum Guide Tapes
3. TV: Recording, Remix, Syncing, Recording, Documentary
4. Duplication: Audio Cassette, 8-Track, Reel to Reel, Video Cassette, Quad, 1” Audio Dubbing
5. Transformers: Film to Tape, Disc to Tape, Tape to Mag, Live Mag (full coat to stripe), Optical Sound
6. Live Sound: Sound Effects (SFX), Remote Voice Overs, Remote Audio/Visual for Film or TV

While this list represents only a cursory look at the possibilities contained within the term PRODUCTION, one becomes aware of the scope of knowledge and experience necessary to elicit a finished product from the heaps of ideas that any one project may generate.

Here’s How

Let’s take an example, albeit simple. The super 46-Track studio has just finished the final stereo mixes on its album of SUPERSTAR. The tape goes to the mastering house for disc mastering, then off to be pressed in multiples of Gold or Platinum. However, since the record company’s aim is sales, they want to advertise the album on the radio. Well, they can’t very well play the whole album on the air everyday; they want to advertise it, so they decide to make a few 30 to 60 second commercials (spots) to sell the album. Where do they get the commercials? They have to make them. One way to do this is to segment the album into several small sections with some of the songs on the album, add an announcer who talks about the album and artist and jam as much as possible into a 60 second slot.

Although it sounds simple this form of production uses many studio hours. The particular segments of music must be chosen, edited down to 10 or 15 seconds and mixed into another song musically; voice overs must be inserted but not over the actual singing voices, and the whole commercial must be no longer than 60 seconds for radio or 58 seconds for TV.

One thing you may notice here is that no part of the final commercial produced has any element with more than two tracks, (stereo) of information and that’s only original music mix. The announcer feed is mono and anything else that might go into the commercial would certainly have no more than two tracks. The type of facility required for a production of this sort is definitely not an automated, full blown, bells and whistle recording studio, especially since the studio proper would only be used for sound effects or by the announcer. There are other types of rooms which are well suited to a production mix of this nature and require a drastically reduced capital expenditure to build and operate.

Commercials for any product, even other than records, generally have no original sound element greater than stereo. We must remember that the majority of air advertising and broadcast is still done in mono and that stereo information, by and large, is lost unless transmitted by a high quality FM station. No one facility is ideally suited for all types of recording work, and similarly, all production studios are not the best for all types of production. Some are geared specifically to the commercial market; these are perhaps the simplest for a modest 8 or 16 track studio to consider building.

Another Way

We should all admit that we are taken in by the excitement of live studio sessions, whether it’s the Bee Gees doing 46-Track, or the local rock band doing 8-Track demos in a small town recording facility. But let’s look at an example of a studio with which I am personally acquainted. Mike started his room in a small suburb of NYC, not known at all as a recording locale. He built an 8-Track studio but, anticipating expansion in the future, he made sure that his studio was capable of handling a fairly large band. The key is...
But What About Reverberation?

by Bill Allen
MICMIX Audio Products, Inc.

Dallas TX ... Most broadcasters would give their right monitor an extra point in the ratings. Points mean listeners, listeners mean advertisers, advertisers mean income, and income means a happy station owner. The key ingredient in this recipe for success is the listener. Stations must provide their audience with an attractive format, entertaining on-the-air personalities, and a clean, healthy, wholesome signal. Most attention is focused on the format and the personalities, but broadcast signal quality is of great importance as well. Signal processing and enhancement plays a major role in the ratings game.

The Beginning

During the broadcast boom of the 40's and 50's, signal processing was relatively simple and uncomplicated. Reverberation was basically the only processing utilized. The live acoustic chamber became popular during this era, and broadcasters were so conscious of its importance that stations which could not afford to build one made do with whatever was available. In some instances, a stairwell or restroom was used as a live chamber. As one can imagine, many stories have been told about these "live" chambers. Still, the point is that reverb was so important that "Yankee ingenuity" was used by many broadcasters to create this important audio effect. As signal processing began to mature, reverberation and its use in-line has often been lost in the shuffle of equalization, compression, limiting, and the other "tricks of the trade." Recently, however, more and more stations are returning to the use of reverb in the signal chain to increase station loudness or to enhance the signal quality.

Simply speaking, good reverberation not only adds warmth and character to the audio signal, it also increases the average loudness and makes the signal seem stronger. At an AES symposium on broadcasting, an ABC representative attributed a major part of one of their station's market dominance to its loudness which was greatly due to the "use of reverb after limiting." He also stated, "Reverb before limiting will change with level which is annoying to the listener. With reverb after limiting, it tends to keep the level even, filling in the holes so that the apparent loudness stays up." At the same symposium, a CBS representative stated, "A fact of life we have to recognize is that, given a two stations with the same format, maybe even

(Continued on page 8)
PRE AMPLIFICADOR DE TORNAMESA
LOGITEK BPA-100

Anunciado el fin de los problemas de sencibilidad y Hum en las tornamesas con este pre amplificador.

Mono Modelo BPA-100 .................................. $175.00
Estereo BPA-100 ........................................... $240.00

Distributor Exclusivo Para Mexico
Y Sur America

Para mayor informacion favor de comunicarse a:
Guarantee Radio Supply Corp
1314 Iurbide Street
Laredo TX 78040

Logitek
Telefonos: 512-723-9422 y 723-6913

FULL COMPASS SYSTEMS

Circle 151 on Action gram.

Reader's Forum

Get something to say about BEE? Any comments on articles? Send them in to the Reader's Forum (BEE, Box 1238, Arlington VA 22210) for a reply.

More on the Golden Ear

Gentlemen:

Thank you for the opportunity to respond to John Price's reply (Forum, 12/79 BEE) to my questions regarding his recommendation for the use of a full track alignment tape for setting cartridge machine head alignment.

Mr. Price is correct. A full track alignment tape insures accurate phase integrity across the entire width of the test tape. However, the NAB Cartridge Tape Standards Committee recognized a potential problem area in the use of full track cartridge test tapes. The fringing errors generated when full track tapes are used in stereo machines may lead the user into believing that the low frequency output of the machine is greater than it actually is due to recorded flux entering the head gap from outside the gap area.

The Standards Committee states that when full track tapes are used, fringing compensation must be provided by the test tape manufacturer. FIDELIPAC has determined fringing errors vary from machine to machine and this data cannot be reliably provided for all circumstances. Therefore, we have evolved a unique method of producing a test tape which has phase integrity and yet meets the precise requirement of the standard by being discrete mono or discrete stereo. All test tapes are recorded full track using an oversize single gap head which records material off the top and bottom edge of the test tape. Then, the necessary guard bands are erased, using a full track erase head whose program tracks have been milled out.

Test tapes manufactured in this fashion provide the user with an accurate track location with which to adjust the height of the head, thus eliminating the possibility of cue tone-cross talk due to incorrect head height adjustment.

Arthur Constantine
Sales Manager
Fidelpac Inc
Mt Laurel NJ 08057

Free on VTRs

Gentlemen:

Clint Free's article in the December 1979 issue of BEE, "TR60 Horizontal Phase Control", is interesting but not necessary. We've been editing with RCA TR-4, TR-50, and TR-60 VTR's for ten years. We make edits without horizontal lurches and without adjusting the horizontal phase prior to each.

I might add that edits are made manually as well as under the control of an RCA TEP and a CMX 340.

The VTR must be in SL servo and "fixed" TW mode. Prior to recording, set the "TW Position" on the Headwheel Modulator for correct TW position. (Refer to RCA IB's.) The first edit should be from black to color bars, etc., without making any adjustments. A horizontal shift may be noticed. All of the following edits will follow the horizontal phase of the first edit. If any drift should be noticed during the course of a very long editing session it can be compensated for by adjusting the...

(Continued on page 10)

Year End Clearance Sale

Technics:
SP 10 Mk II turntable ........................................ $675
SP 25 turntable ............................................. $299
SL 1200 Mk II turntable ................................... $270
RS 1500US recorder ....................................... $1170
ST 9030 tuner ................................................ $345
SB 6060 linear phase speaker ............................ $240
SB 7070 linear phase speaker ............................ $310
SE CO1 micro amp, 40 w/chan ........................ $259
SU 8011 stereo amp, 25 w/chan ....................... $139
RS M68 cass deck w/auto reverse ...................... $400

JVC:
KD 2 portable cass deck .................................... $249
K2 8 cass deck w/comp bias & eq set ................. $595
Otari MX 5050B recorder ................................ $1745
dbx 500 Boom Box ........................................ $189

Call or Write
608-271-1100
Full Compass Systems
6729 Seybold Road
Madison WI 53719
TWX: 910-286-2745

Announcing . . . New From Kahn
The NON-SYMMETRA-MOD
Modulation Enhancement System

This new technique allows you to convert symmetrical audio waves to asymmetrical waves providing full +125% positive peak modulation with excellent quality. Avoids the annoying distortion of conventional devices. And, of course, it is suitable for AM stereo.

Call or write for more information
KAHN COMMUNICATIONS, INC.
839 Stewart Avenue
Garden City, NY 11530
516-222-2221

Circle 152 on Action gram.
and 16 track studios which are cropping up all over the country in non-metropolitan centers. It is difficult to expect to be booked solid by all rock ‘n’ roll bands in a new studio without the population to support it. Offering the comparatively mundane, yet badly needed services of quality audio production to a town or city which will be able to take advantage of those services is as much as an advantage to the studio owner/operator as it is to the industry as a whole.

Initially, the investment required is far below that of a music studio. One needs only the few 1/4” or 1/2” machines deemed necessary, a small console of some sort, minimal peripheral gear and a studio which can accommodate perhaps four or five persons comfortably, either seated or standing. Any existing 8 or 16 track rural or demo studio should be able to tool up for production work with a minimum of trouble: it already owns most of the needed equipment. The first obvious benefit of a facility like this is the reduced amount of real estate needed to set up a room. When there are no announcers working in the room, one is not losing substantial income by having dead space: one can be in a larger multitrack room when the musicians go home and all that is left is to mix.

Secondly, because the equipment is far less sophisticated, there is a marked savings in the amount of maintenance required on a daily basis. Someone should always be on call to fix those panics, but redundant equipment in a stocked production room guarantees that a down machine does not mean studio downtime. One day, someone figured out the

(Continued on page 12)
Transient Surge Protection

by David C. Burns
Allied Broadcast Equipment

Richmond IN ... Transients and surges induced by lighting, heavy electrical equipment, generator switching, power line faults, etc., can damage electrical and electronic circuits in broadcast equipment, computers, monitors, and any facility using circuitry sensitive to power-line disturbances. Even fluorescent lighting tubes can be damaged by high-voltage surges encountered in many power systems.

Volt-Guard is a voltage-sensitive device that protects against such transients. Installed in parallel with the line, it is inactive until it senses an over-voltage at which time it provides a low-resistance shunt across the line (crowbar action). It reacts in fifty nano seconds (fifty billionth's of a second). Volt-Guard's parallel installation requires it to bear no load.

Some Examples

On a 120 volt AC line, Volt-Guard begins to function at ±170 V, begins its clipping action at ±200 V, and crowbars at ±225 V, establishing a protective envelope of 450 V peak-to-peak.

Figures 1, 2, and 3 show the action of the Volt-Guard for various transients and surges.

Figure 1 shows a repetitive voltage wave form of approximately 3400 volts peak-to-peak. The voltage wave form is produced by a step-up transformer, simulating in amplitude possible transients that can occur on AC lines. Actual transients are much faster and usually damped; but the first few cycles of a transient can be very high in amplitude.

With the application of Volt-Guard (figure 1B), the 3400 volt peak-to-peak wave form has been contained at ±225 V or ±2450 V peak-to-peak, as displayed on the scope face.

Figure 2 shows a simulated repetitive wave form of approximately 390 V peak-to-peak with superimposed noise. With the application of Volt-Guard (figure 2B), the wave form has been smoothed and filtered. Volt-Guard filters noise and attenuates higher order harmonics.

Figure 3 shows a positive DC voltage of approximately 3200 volts peak-to-peak with positive and negative-going spikes of 1300 volts peak, respectively simulating in amplitude possible transients that can occur on AC lines as large DC surges with repetitive spikes. With the application of Volt-Guard (figure 3B), the positive DC voltage has been contained at a positive 225 volts, with no large repetitive spikes. The protective envelope will handle DC surges as well as AC transients or combination thereof.

Another feature of Volt-Guard is its zero cross-over switching capabilities. This allows a circuit to be completed only at the instant when the voltage crosses the base-line.

Volt-Guard is available for protection of 120 V, 208 V, 240 V, 480 V, and 550 V AC lines. Configurations include single or three-phase, Delta or Wye.
NEW TURNTABLE PREAMP

"Equipment that's Alliedependable"

A device of this caliber doesn't come about by luck or chance. The Audio-Metrics turntable preamplifier is a product of intense research and thoughtful, careful design. And these are not empty phrases - we set out to make the best.

A true commitment to superior performance demanded a survey of existing equipment coupled with a re-evaluation of the preconceptions concerning phono preamplifier design. Our research told us both what a preamp should and should not do.

WHAT IT DOES

NOISE - A combination of discrete and integrated circuit components in the input gain stage and low noise resistors, hold noise to near theoretical limits.

TRANSIENT RESPONSE - The realization of the importance of dynamic distortion figures is so recent that a rating standard is yet to be agreed upon. Yet, audiophiles attest to the significance of these factors for accurate reproduction. Uniformly high speed circuit design with response up to the mHz range, insures this unit's capability to reproduce even the fastest music peaks. Therefore, slew induced distortion and transient intermodulation are virtually non-existent.

INPUT OVERLOAD - With second stage equalization, the first stage gain block effectively buffers the cartridge from loading changes and provides broadband high input overload protection.

AUDIO TRANSFORMERS - The challenge was to eliminate the transformers and their inherent audio distortion, and still maintain RF protection and balanced outputs. The technical answer to the problem involves the use of state of the art integrated circuits, ground plane circuit boards and input and output RF suppression. The practical side of the story is simpler and more important. Tests in ultra high RF environments have proven the unit to be RF interference proof.

WHAT IT DOESN'T DO

EQUALIZATION - The Audio-Metrics preamp rigidly adheres to the RIAA curve. It does not allow for the user adjustment of high and low frequency response. Broadcasters uniformly told us that the preamp was not the place for tone compensation.

SWITCHES AND RELAYS - No special auxiliary turntable start/stop switching or other accessories are included in the Audio-Metrics preamp. It seems obviously inappropriate to expect every user to pay for special features applicable to only a few special situations.

SPECIFICATIONS:

INPUT - 47k Ohms Parallel 180 pf.
MAXIMUM INPUT - 350mV Any Frequency
MAXIMUM GAIN - 5mv at 1kHz = +5dBm Single Ended Out
= +10dBm Balanced Out
MAXIMUM OUTPUT - +27 dBm Single Ended Into 600 Ohms
= +27 dBm Balanced Into 600 Ohms
OUTPUT IMPEDANCE - 100 Ohms Single Ended
- 200 Ohms Balanced
FREQUENCY RESPONSE - +5.25dB RIAA (using new curve, specifying low end roll off)
THD - .05% + 18dBm Into 600 Ohms
IM DISTORTION - .04% + 18dBm Into 600 Ohms SMPTE
SIGNAL TO NOISE - 80dB Relative 5mv at 1kHz
Input Terminated 620 Ohms
Measured: Unweighted - Broadband
- 90dB Relative 12mv at 1kHz
Input Shorted
Measured: A Weighted
CHANNEL SEPARATION - 90dB
CONNECTORS - Input - Phono Jacks
- Output - Barrier Strip

The pre-amp input loading is 180 P.F. Because correct cartridge loading is important, you should check your individual cartridge specifications for recommended loading. Conventional shielded tone arm cables present a load of about 27 PF/FT. If you must reduce your cartridge load, consider shorter cable runs or low capacity cable. No attempt should be made to adjust loading by removing the pre-amp input capacitor, as this would defeat RF rejection.

635 SOUTH E STREET - P. O. BOX 786
RICHMOND, INDIANA 47374

Ordering Call 1-800-428-6954 In Indiana Call 1-800-382-6907
INFORMATION CALL 317-962-8596 CHICAGO SALES 312-784-2257
Notes on Chroma Noise

Knoxville TN ... Chroma noise is probably the most prevalent unrepairable problem I have found, with the older machines exhibiting more symptoms than new ones. The symptoms can easily be observed on a vectorscope. If the color bar dot spread is in excess of ten degrees, a velocity error correction but with velocity error, the yellow bar is more accurate. A five degree dot spread of the yellow bar is good and achievable with most RCA and Ampex machines.

Time base correctors compare off tape horizontal sync and color burst correctable deficiency most likely exists. The yellow bar, which with standard bars is on the left side of the screen, should be used for the measurement. Any velocity errors will cause blue and red to be exaggerated; in machines without

Reverberation

playing the same records and with equal strength, the (loudest) station ... is going to come out with the highest rating." While compression and limiting are used to increase the effective modulation level by reducing the dynamic range, reverber extends the "length" of a signal, thus increasing average modulation level. Reverber creates an aural illusion: the signal sounds louder because it is fuller, warmer, and the small amounts of dead air between words and songs are occupied by some sound. Too much reverber would be annoying to the listener, so discretion must be used to mix in just enough to fill in the holes.

The Ear Hears

A key point to remember is that the ear is a very sophisticated listening device. One's mind does not immediately perceive all of what the ear hears; a great many things remain

appreciably poorer performance with actual antennas rather than with "dummy loads." Although the Harris system claims that ... the VICP signal can be transmitted by limited bandwidth antenna systems with no degradation of channel separation ... , the Harris system offers a 15dB separation figure limited to 400 to 5,000Hz in their new specifications. Belar reported that separation measured as low as 14 or 15dB at 150Hz and 19dB at 1,500Hz under actual tests at WR, even though dummy load measurements during NAMSRC achieved over 25dB through the range of 10 to 5,000Hz.

On the other hand, most stations using the Kahn-Hazeltine system were able to obtain on-the-air separation figures closely approximating laboratory figures in excess of 20dB from 100 to 5,000Hz.

Receiver Tracking and Phase Ripple

Kahn also claims that his system is immune to separation loss due to phase tracking errors and phase ripples, while all phase separation systems inevitably lose stereo separation because of the phase errors caused by poor receiver tracking. The tracking of the RF is a major problem with its local oscillator has always been a problem; however, the problem would be severely aggravated if it became necessary to track the circuits in phase as well as the amplitude. Although errors in phase tracking would not destroy all separation, separation would be seriously limited for listeners who wished to hear a stereo station falling at a poor phase tracking frequency. Phase ripples in the receiver's selective circuits can also degrade separation figures for phase separation systems substantially.

In its report to the FCC, Meredith-Broadcasting echoed Kahn's concern over the inferiority of the phase separation systems: "When evaluating the five different AM stereo systems that have been proposed to the Commission, the most serious flaw of all the systems, except the Kahn-Hazeltine system, is their sensitivity of phase shift of the carrier with respect to the sidebands. The stereo separation of these other systems can be completely destroyed by a shift of only 45 degrees of the carrier in relation to the sidebands. And a shift of just 15 degrees in the Harris system is sufficient to cause stereo separation to disappear. From the various tests, measurements, and audio recordings of WOW and KCMO, the Kahn-Hazeltine system was insensitive to phase shift of the carrier with respect to the sidebands."

Mono and Stereo Compatibility

Both RKO Radio and Westinghouse-Broadcasting agreed, after testing the Kahn-Hazeltine system, that there was no loss of mono coverage while broadcasting in stereo using that system. Leonard Kahn points out that, unless this were true, none of the stations involved with his system would have willingly operated over extensive periods of

(Continued on page 10)
Audio Grounding Systems

Springfield VA... This month I'm going to talk about one of the most neglected areas of broadcast and recording studios: the grounding system. I've had to fix more than one station where virtually every input brought up on the console has hum and/or audible above the residual noise. In these situations it looks like there is a persistent ground loop. No matter how the audio shield is lifted or connected, the hum and/or RF doesn't go away. The way to approach this kind of problem is by looking at the ground as a system.

First look at the building electrical ground. Initially this ground is installed by the electrician. The AC electrical neutral, or return path, is insulated from ground everywhere in the system, except at the main building ground where they are bonded together. This main ground is usually a water pipe or outside ground rod. Remember that a small difference of potential exists between the AC ground and neutral at virtually all points except the bonded ground. The third wire, or U-ground, of the AC plug, metal conduits, switch enclosures, and armored cable shields are considered an electrical ground and are connected to the outside (main) ground point. A chassis which is bonded or connected to the third wire is a real life-saving feature since it causes the fuse to blow if a voltage source short to the chassis.

In a broadcast or recording situation, the third wire electrical grounds can raise havoc. Electricians are concerned with ground voltages of hazardous nature, but this safety grounding does not always provide an adequate grounding system for interfacing devices with low level audio, so I always establish my own independently controlled grounding system.

How To Start

I begin by finding the main electrical ground at the building. Each control room must have an independent insulated wire or strap to the main building ground. In low level RF environments a #6 A.W.G. (for less than 100 feet) of insulated copper strap can be connected from each console chassis to the main building ground. RF environments require a .25 to 4 inch wide solid copper strap from the main building ground to the transmitter, but one must make sure the bare strap is insulated from any contact with structural metals or AC conduits. If it is impractical to run an independent ground from each control room (eg: hi-fi rooms), a #6 or #4 A.W.G. ground buss can be run to the main building ground and then terminated at a convenient location in the facility. Each audio console should be independently grounded only to this point: this chassis ground point at the console becomes the main ground for that room.

In each control room the main ground cable should be firmly bonded to the console. The metal rack frames should have a #12 wire or a 3/16" wide copper strap which is run along the entire length of the rack frames and then bonded at several points to the racks. Leaving the rack, this strap or wire is fully insulated and runs directly to the main studio ground.

For grounding devices such as cart machines and other peripheral equipment which is not enclosed in a bonded rack, a piece of #16-18 A.W.G. two conductor cord is soldered to the main ground cable from each floating device in the studio.

The third wire AC grounds for each chassis may then be lifted at the AC plug with a commerical ground lift adapter. But remember a safe and reliable main ground is a pre-requisite to tampering with the third wire grounds.

In High RF

Up to this point I've addressed the grounding problems in low to medium RF environments, and I'd like to take some time to discuss the special problems caused in saturated RF environments. The ground lead itself can act as an antenna, causing a RF difference of potential between a chassis and the main ground. This is especially true of units that are not enclosed in a bonded rack. In this case, the ground lead should be a cable using a #20 twisted pair with a foil shield and a static drain wire. Use both conductors for a ground lead and connect the static drain at the main ground point only. This provides a shielded ground wire which is very useful in thick RF fields. If RF still persists, a 1.5 F capacitive capacitor should be placed between the audio drain wire (which would normally float) and the audio ground of the offending piece of equipment. At the transmitter site, the main building ground is the strap which grounds the transmitter to the earth ground. I always use foil shielded twisted pairs and balanced lines for audio routing. The foil is an excellent electrostatic and RF shield. The drain wire should only be connected at one point: the point of lowest audio signal. For example, on a tape deck, the chassis is grounded either through the rack or as an independent connection to the main studio ground. The shields of the tape output line float at the deck and are connected only at the console input termination. The record input lines have their shield drains connected at the deck only and the drain is floated at the distribution amp or at the console output.

What's Best

In the above paragraph I mentioned the importance of balanced lines in audio routing. This leaves two options: a transformer or an active balanced circuit. Some people believe that transformers will solve all of their grounding problems. But transformers have problems of their own, problems which Bill Ashley discussed last month in B.E.E. I also mentioned some of these problems in November's column (Dealing with Square Wave Response) and the people at Jenson Transformers responded with information on some of their state of the art products. They are producing some transformers with good square wave response, and common mode rejection ratios of 85-90db at 1KHz and 55-60db at 10KHz. Remember, these common mode figures are also achievable with well designed active balanced inputs if the components are precisely matched for good common mode. The common mode

(Continued on page 11)

Bill Sacks on "The Audio Process"
TW PHASE on the Headwheel Modulator.

Excessive horizontal drift is caused by extreme temperature variations. This condition should be avoided at all costs. The ideal environment should be temperature and humidity controlled. The only time “Variable” TW should be used is when there is insufficient range of the “Fixed” TW circuits. This condition is normally caused by editing on tapes made on another VTR or on the same VTR but with a different headwheel. However, the same rule applies—do not change the “Variable TW Position” control after the first edit is made with the correct phase. It may take several edits to find the “correct” phase.

The procedures described above make the assumption that the VTR is correctly set-up as detailed in the RCA IB’s. Any problems should be corrected prior to editing.

Finally older RCA VTR’s can be updated to the TR-60 version of the Headwheel Modulator module and the Lineklock module.

I enjoy your publication, keep up the good work.

Eric R. Address
Director of Engineering
E.J. Stewart Inc
Broomall PA 19008

Errata

The last sentence in the second paragraph in the article, “Do We Still Need Transformers?” appearing last month on page 2 should have read “under 0.05%” instead of “under 0.5%” as shown. On page 6, Figure 1, there should of be an arrow going from the “Resistor Matrix” box to the “MSMV #3” box.

On BEE

Editor:

While reading the November 1979 issue of the Exchange, I was struck by the lack of prices associated with equipment for sale. Not one ad in twenty-five gave any hint of the asking price. Looking back at some past issues, it seems that there has been a progressive deterioration in that area. The present state of affairs makes the publication virtually useless for its original intended purpose.

I believe that your publication will only be useful in the broadcast industry if it is a ready reference for availability in prices on used equipment. While I can see that persons listing expensive equipment might wish to withhold the price for negotiating purposes, I can see no reason at all for those advertising items under, say, $500 not to publish the price. In fact, I believe it would be much to your advantage to make that a requirement of any listing. Believe me, if I were in the market for a $400 “volumax” I would not be inclined to call each of the listings in your Exchange to find out who had the best deal. I would certainly not want to phone someone to find out that their microphone offering was $30. On the other hand, I might immediately buy either one of these items from a listing if the price and condition were immediately at hand.

You started out with a fine service to the industry. Please do not let it get off the track.

Lawrence Behr
President
Behr Associates
Greenville NC 27834

BEE Replies

Thanks for the comment Larry. As usual we often get our best ideas from your Readers.

Effective with this issue, client’s asking prices (when given) will be included on the Key Code list along with the names and addresses. So, if you haven’t already, subscribe the key to BEE with the Key Code list included. (By the way, we removed the asking prices from the listings a few months ago because it was creating trouble with our foreign readers, as prices often might be higher for them.)

Reverberation

A dry performance in a studio, not nearly as exciting as one in a large concert hall with good, natural reverberation. Reverber adds color, dimension, and therefore excitement to the listening experience. Along with being beneficial in regard to loudness, reverber is also a signal enhancer.

In Cars

Morning and evening drive times are the “hot” times for a radio station. The listener usually devotes his undivided attention to that radio. Since the automobile is such a small enclosure, it is not the best listening environment. A touch of reverber will seemingly expand the listening space in a car, thus making it a more desirable atmosphere for listening. Remember the old car reverberators? They were used to create the illusion that the car was a large concert hall. Too much reverber will again be distracting, but just a touch will increase listening pleasure. The vast majority of audience, no matter what format, do not listen to the radio on top-of-the-line audio equipment. Neither car speakers nor the small table model or portable radio, no matter how expensive, can take the place of a nice home stereo system. There is so much at stake that signal enhancement is necessary. The listener may not know why he prefers a certain station among several with similar formats, but his radio is tuned there. If a listener is pleased with the signal quality, he will stay tuned to that station not only in his car, but in his living room as well. A little reverber added to the signal can make the difference.

The right amount also gives a station a certain “sound.” A chief engineer at a top MOR station in Dallas recently stated, “I suppose one of the main reasons we use reverber on-line is to give our station a little more warmth, and a little bit different sound than any others in our market.” “When a listener finds us,” he continued, “he knows he’s found us because we sound different. He might not realize why we sound different, but he knows what we sound like. He might not realize why we sound different, but he knows what we sound like. Our use of reverber is subtle but effective.”

Other Advantages

Reverb added on-line is not limited to the “loudness” applications; stations emphasizing wide dynamic range in their audio signal can find it especially attractive. Additional reverberation fills in the holes during the quieter passages, thus improving the signal-to-noise ratios, and thereby attracting the “fringe” area listeners. High quality reverber is also very important in the production room. Much care is taken in writing, producing, and mixing a jingle to obtain every last ounce of loudness. A jingle can appear louder than program material through the use of compression, equalization, proper instrumentation, voicing, and many other tricks. Reverber is also a vital tool used to increase loudness in a commercial. The advertising client is pleased that his commercial appears louder, and a happy client is one that will be back.

A reverberation unit intended for broadcast usage absolutely must be of highest quality. It must have a smooth and flat response over the reverberant field passband, and must

(Continued on page 2.)

Grounding

The rejection ratio of a single op amp differential input stage is sensitive to the termination of its input resistors. The input noise rises with low source impedances. The 3 op amp type instrumentation amplifier is the best amp suited for this purpose since the differential input is impedance buffered (see Walt Jung’s Op Amp Cookbook, pp 242-43). The gain of the cross coupled differential input stage is always unity for common mode signals. More on common mode trimming techniques in a later column.

I’d like to close asking for comments. Let me know what problems you’re having in the field and how you’re dealing with them. Send in topics you want to see discussed and include some information about what you’re doing for audio in the 80’s (Bill Sacks, c/o BEE, PO Box 1238, Arlington VA 22210).
Used Equipment For Sale...

- MCI JH 528-28 Console. 28 ins/outs, traded for famous studio for new MCI JH 556, top maintenance, all latest modifications, producer desk, an excellent value...

- MCI JH 418-24 Console. 24 ins/outs, traded for MCI JH 538C, light use, home studio, perfect condition...

- MCI JH 416-16. Maintained in top condition, 16 ins/outs (expandable to 24), trade on new MCI JH 600 Console, a real bargain...

- MCI JH 100-16. 2"/4" track recorder with Auto Locator, good condition...

- Scully 100-16 Record. 2"/4" track with all the extras, spare cards, motors, heads, 8 track heads, regular daily operation in a New York City studio...

- Scully 262-4. 1/2", 4 track in good condition, ever popular. Scully 4 track is always a good value...

**Rumor Mill**

oaston notes: faithful reader takes us to task for calling that new video repository (Mixdown, Oct. '79). Owner of Boston's most solid successful studio. Seems he thinks he should either wear or take the crown, so we will notify him to "...one of oaston's most... etc. OK?

at least on the R&T (nee Sound alece, nee Bell Sound) caper into! All gear, furnishings, etc., moved out just before Thanksgiving.

**FOR THE SOUND OF THE 80'S**

**RED SERIES time/sync**

-Experience remarkable improvement in monitoring by adding Time/sync Crossovers to your present Big Red or other Altec 604 systems. For new installations, try our new Red Series Time/sync monitors. Go into the 80's with a great new sound!

Red Series Monitor System
2 speakers plus Time/sync crossover...$1,995.00
Time/sync Stereo Crossover...$645.00

**TECHNICAL HELP WANTED**

Audiotechniques has continuing requirements for experienced technical engineers with solid electronics background. Excellent benefits. Send resume to: Greg Hanks, Technical Manager, Audiotechniques, Inc., 1519 Broadway, New York, New York 10019.
Stereo Decision

Kahn has also suggested that the phase systems would be susceptible to a "sibilant ghost" problem, and in comments submitted to the FCC he feels he has proved his case. The supporting evidence involves a submission tape by Harris of tests performed at the ONERA in Paris. On the tape, which was recorded through a modified Sansui TU-X1 tuner 35 miles from the WGN transmitter, the "sibilant ghost" effect can be heard. In fact, Kahn made a similar recording by playing the same record over the XETRA-AM, San Diego, which has been testing the Kahn system for some time. In his submission to the FCC, Kahn included a copy of all the recorded material as well as the Lissajous patterns as shown in Figure 1. As can be seen, the original recording shows good separation, as does the Kahn test, but separation is gone in the Harris YCPM system.

Steve Dana (of BEE), Bill Sacks (of Carl T. Jones Associates), and Brett Cosor (of Evolution Marketing) listened to the tape submitted by Kahn using an AIWA ADK40-U cassette deck, an Audio Pro TA-150 high slew rate amp, and a pair of KEF 303 minimum diffraction speakers. The results were as reported by Kahn, namely a "sibilant ghost" effect on the Harris recording, and none on the Kahn recording. While the effect was there to hear, it should be noted that this was not a true A-B test, and other factors (such as other processing equipment in use at either station) may have made a difference in the performance of the AM stereo systems. Unfortunately, no station has run true A-B tests with all the AM stereo systems under evaluation (but that's another story).

AM Stereo and Normal Modulation

Another issue that the Kahn-Hazeltine system has realistically confronted is the demand for extraordinary levels of modulation in the AM broadcast band. Obviously, the economics of AM radio would not permit any sacrifice in the "lowest sound level possible." The AM stereo system that intends to look twice at the AM band must be ready to hold up under the strain of the big AM sound. Again, the Kahn-Hazeltine system is the only system that, when exposed to overmodulation, does not cause severe operating problems: noise breakup, pops (Magnavox, Belar and Motorola), and foldover envelope distortion (Harriss). This insensitivity has allowed all stations using the Kahn-Hazeltine system to modulate in a normal fashion and still maintain their monophonic coverage.

Two Receiver Method for AM Stereo

Kahn believes that another advantage, unique to the Kahn-Hazeltine ISB system, is its two receiver stereo method. This two receiver method allows stereo reception without the listener buying new equipment; thus AM stereo would be available to even the most economically pressured listener. Kahn submitted two receiver reception tapes to the Commission and although he admits that, as an engineer, he can understand the incredulity of those who find it difficult to believe that two matched or nearly matched receivers, at a job that they were not designed to do, he goes on not only to provide specific examples of this phenomenon, but also to assert that "two receiver reception, under actual receiving conditions, sounds superior to some of the other systems using special receivers." The Kahn-Hazeltine two receiver method is important for the broadcast and for the manufacturer as well. It permits a stereo sound without rendering one equipment line obsolete or creating a need for a new consumer product that might limit the availability of AM stereo for reception that are unable to afford additional equipment, and consequently, the viability of AM stereo itself.

AM Stereo and 9 KHz

Although many broadcasters and even some members of the FCC have felt that the AM stereo issue was in danger of being studied to death, the AM stereo decision has been pushed aside for some time now while the Commission deliberated on a move to reduce the AM bandwidth from 10 to 5 KHz. Although the FCC has now approved this decision, it still has to be presented to a Western Hemisphere Conference early in 1980 for a final appraisal. While some FCC officials may have, in the past, suggested that there might be some relationship between the move to a narrower bandwidth and a subsequent decision to scrap AM stereo because of the amount of space that would require on that band, and because of a question of "possible interference," the FCC's Office of Policy and Rules has assured BEE that there is no linkage between the two issues. An FCC spokesman reported to BEE that, in fact, the special task force created by the FCC to investigate the consequences of 9KHz issued a definite statement to the Commission indicating absolutely no linkage between 9KHz and AM stereo. One may assume, on the basis of that special task force's report to the Commission, that the FCC was fully aware, while approving the move from the 10 to 9KHz bandwidth, that the possibility of an AM stereo approval would not be in any way affected by the move to a narrower bandwidth. Although some engineers in both the public and private sectors may register criticism against the idea of AM stereo, the official stance of the FCC recognizes no incompatibility between the move toward a 9KHz bandwidth and the move toward AM stereo.

For some time now, AM broadcasters have been struggling under a competitive disadvantage with FM stereo. The Kahn-Hazeltine system, the original AM stereo and the most generally supported by the broadcasters themselves, may well, as Lin Broadcasting so aptly states, "...add another channel, so to speak, to AM broadcasting. We believe that AM stereo will offer the public a choice between two stereo alternatives in stereo broadcasting, so that this ability for choice will not only serve the public interest, but enable AM radio to compete and remain a viable medium in the future." It's time now for the FCC to act.

See Action-grant on page 15... subscribe to BEE
Para Radiodifusores de México!

Usted ahora tiene acceso a la lista de equipo de radiodifusión más extensa en el mundo.

Ofrecemos más de 1,000 referencias en cada publicación.

Debido a un acuerdo exclusivo con esta publicación Broadcast Equipment Exchange (BEE), Guarantee Radio se compromete a ofrecerle a usted y a los demás radiodifusores de México esta gran oportunidad. En las siguientes páginas usted encontrará, convenientemente catalogadas, más de mil referencias de equipo usado de radiodifusión.

Con esta extensa selección, Guarantee Radio le permite comprar equipo de uso con la misma facilidad como si lo comprara nuevo. Examine nuestra lista y convénsese de que este servicio que le ofrece Guarantee Radio le ahorrará largas horas y dinero en su búsqueda de equipo usado.

Para más información, incluyendo precios llamenos al teléfono:

512-723-6913

Guarantee Radio Supply Corp.

Wholesale Distributors

1214 Turbide St.
Laredo, Texas 78040

Circle 114 on Action-gram
**AMPLIFIERS**

**Want To Sell**

- Marantz Model 77 preamp (pre Japan), excel. cond.
- Columbia 2300 tube amp, double row, excav. cond.
- Peavey CS-800 stereo amp, 400 watts per ch., 800 watts mono, like new with book. Key Code 1-12
- McIntosh MC 400, excel. cond., Key Code 1-9
- Technics SU-3011, 25-watt per ch stereo, amplifier, new in original carton, w/warranty. Key Code 1-14
- Markon Model 5 Key Code 1-9.
- Spectran solid state pre-amp's (3). Key Code 12-66.
- Knight Stereo Pre-Amp, tube model. Key Code 1-11.
- Toshiba 70W pre phono equalizer (Micro series). Key Code 12-58.
- BGW 100 power amplifier, Key Code 12-58.
- Southwest Technical Products 215 A power amplifier, solid state, 15w. per ch, works well. Key Code 11-23.
- Quad 303 Power amp (English) 45 watts/ch, Quad 33 preamp, Quad FM 25. Tuner. Key Code 11-25.
- McIntosh MC-60 mono tube amp (2), excel. cond., recently factory overhaul. Key Code 11-43.
- BW 700B, 800 watt power amp w/bal inputs (brand new). Key Code 11-25.
- SEA 2200 power amp (200 watts/channel). Key Code 11-25.
- CM Preamp CC-1, an early solid state classic, plus many assorted vintage tube amps in varying condition. incl. heath W-4AM's, Eico HE-20's, HE-87, Bogen D13-20, etc. Key Code 11-25.
- Dynaco 70 tube-type power amplifier, 35w. per ch. Good condition. Key Code 11-23.
- MB Model 9 preamp with graphic EQ. Key Code 11-25.
- McIntosh C-8 pre-amps (2) with power supplies. Key Code 11-17.
- Shure M-64 phono preamp, like new. Key Code 11-23.
- Collins 122 remote amplifier, fair condition. Key Code 11-49.

**Want To Buy**


**ANTENNAS & TOWERS**

**Want To Sell**

- Cable clamps and misc. tower hardware. Key Code 1-76.

---

**International Contact Section**

For more information on any product listed in BEE contact the following companies:

**In Canada:**
- United Video Ltd
  - 1485 Trole Street
  - Ottawa, Ontario K1B 3J4
- Canada 613-741-5554
- Norbec Video Ltee
  - 4315 Girouard
  - Montreal, Quebec H4A 3E5
- Canada 514-481-3483
- In Mexico:
  - Exclusivo, para mas informacion, llamen:
    - Antenna Sponsor Supplies
      - 1314 Ibiride Street
      - Laredo TX 78040 U.S.A. 1314-723-6913
- In Other Countries:
  - Broadcast Equipment Exchange
    - PO Box 1238
    - Arlington, WA 22210 USA
    - Tel: 703-525-0400
    - TELEX: IMASICS 64953
    - Cable: IMASICS ARLINGTON WA

**Southwest Technical Products 216/A graphic Equalizer, built from a kit, 9 frequency steppers. Good condition. Key Code 11-23.
- Edcor, Inovonics, Orban, Ubel, Delta Labs, Technics, dBx, Lexicon. Evidente, Strand, sound, etc. All available from Full Compass Systems, 6729 Sbury Blvd. Des Moines, IA 50319. Tel: 660-527-1100 or TWX: 910-268-2745.
- Grado signature model 15204 carbon fiber, hand made, never used. Key Code 11-72.
- Soundcraftman 20-12 EO. Key Code 11-47.
- Want To Buy
- Patch panel, 24 pair, double row. Must be in good condition. Key Code 11-12.
- Patch cords, single or double plug reinforced cables. Need at least six pair. Key Code 11-12.
- Make R-1 or similar reverber for production use. Key Code 11-37.

**AUTOMATION EQUIP**

**Want To Sell**

- Schafer 800T stereo bar. 15" speed, slow-speed, network joiner. 800T 500 model random select. cart. noon. 5 rack. Key Code 11-33.
- ITC 750 series reel play back only, gd. cond. Key Code 1-23.
- Schafer system, complete, 3 Ampex reel-to-reel decks, 3 cartridges, and time announce, lots of spare parts. Key Code 1-486.
- Tone Sensors, 2.5 Hz for automation, in gd. cond. Key Code 1-74.
- Gates DC-10 clock with model 1A time announce unit, gd. cond. Key Code 1-23.
- Remote control for live assist for SMS CP-2, Key Code 12-64.
- IGM RAM automation used 16 months. all updated modifications. Includes 4 ITC reel decks, time announce, 3 cartridges, 4 racks. Original cost $24,000. Replacement cost $27,000. Will take best offer. K Confort, KSBN, Box 96, Little Rock AR 72203. 501-378-0200.
- Continental “Probe” Automation systems. 2 Scully 270 decks with individual 25Hz, 2 cartridges, 1 single play (stereo). Key Code 1-64.
- Automation system including SCM DP-2 with 10 cartridges, time announce, logging. etc. Never used. Key Code 11-22.

New Listings are in Italics.

**800-336-3045**
Instructions: Use this form to take advantage of any of the services provided by Broadcast Equipment Exchange. Always fill in the Contact Section below first, then fill in the appropriate service section(s). Remember, BEE provides a FREE listing service for end-users. Listings are printed without the listee's name and address. A Key Code is used instead. Paid subscribers receive their issues of BEE with the matching Key Code list. Non-paid subscribers do not; they pay for the Key Code only when they order it (see the Subscription Section below).

CONTACT SECTION:
Name
Title
Company/Station
Address
City
State Zip
Telephone
(Verifiable number must be provided)
Signature

KEY CODE ORDER SECTION:
TOLL FREE KEY CODE HOTLINE
800-336-3045
In Virginia call 703-885-0400 collect.
...our Hot Line telephone number. When you call, we will give you any Key Code names and addresses and send you the full list with an invoice for $5.

International Readers
See International Contact Section on page 14

READER INQUIRY SECTION:
If you are interested in receiving literature from any of the advertisers, in this issue of the Broadcast Equipment Exchange, then circle the numbers as shown at the bottom of the ads, and we will be happy to forward your request to the appropriate company.

101 102 103 104 105 106
107 108 109 110 111 112
113 114 115 116 117 118
119 120 121 122 123 124
125 126 127 128 129 130
131 132 133 134 135 136
137 138 139 140 141 142
143 144 145 146 147 148
149 150 151 152 153 154

SUBSCRIPTION SECTION:
There are three ways of receiving BEE, so choose the way that suits you best:
1. FIRST CLASS MAIL WITH KEY CODE LIST. Avoid delay ... get in on the action faster! For $25 per year, you get BEE 1st class WITH the matching Key Code number list. (Enclose your check with your order and get 3 BONUS issues!)

☐ Bill me $25 for a 1 year, 1st class mail subscription to BEE including the Key Code list.

☐ Check enclosed for 3 BONUS issues!

2. THIRD CLASS MAIL WITH KEY CODE LIST. Save better than 50% by reducing our handling costs! For $12 per year receive BEE via 3rd class mail WITH the KEY CODE list included. (Enclose your check with your order and get 3 BONUS issues!)

☐ Bill me $12 for 1 year, 3rd class mail subscription to BEE including the Key Code List.

☐ Check enclosed for 3 BONUS issues!

3. You receive BEE monthly WITHOUT THE KEY CODE LIST free via 3rd class mail if you send this form in at least once a year. You buy the Key Code lists for $5 by using the Key Code order section above; only when you need it.

☐ Free without the Key Code list (I’ll buy the list for $5 only when I need it).

LISTING SECTION:
Broadcast Equipment Exchange provides FREE listings for all broadcast or professional sound end users. Send in your “Want to Sell” or “Want to Buy” requirements, and we will list them in BEE for three full months. Hundreds of stations and companies have used us successfully. Why don’t you? The
1. WTS or WTB, Category:

   Text:

2. WTS or WTB, Category:

   Text:

3. WTS or WTB, Category:

   Text:

4. WTS or WTB, Category:

   Text:

5. WTS or WTB, Category:

   Text:

6. WTS or WTB, Category:

   Text:

7. WTS or WTB, Category:

   Text:

8. WTS or WTB, Category:

   Text:

9. WTS or WTB, Category:

   Text:

10. WTS or WTB, Category:

   Text:

11. WTS or WTB, Category:

   Text:

12. WTS or WTB, Category:

   Text:

13. WTS or WTB, Category:

   Text:

14. WTS or WTB, Category:

   Text:

15. WTS or WTB, Category:

   Text:

16. WTS or WTB, Category:

   Text:

17. WTS or WTB, Category:

   Text:

18. WTS or WTB, Category:

   Text:

19. WTS or WTB, Category:

   Text:

20. WTS or WTB, Category:

   Text:

21. WTS or WTB, Category:

   Text:

22. WTS or WTB, Category:

   Text:

23. WTS or WTB, Category:

   Text:

24. WTS or WTB, Category:

   Text:

25. WTS or WTB, Category:

   Text:

26. WTS or WTB, Category:

   Text:

27. WTS or WTB, Category:

   Text:

28. WTS or WTB, Category:

   Text:

29. WTS or WTB, Category:

   Text:

30. WTS or WTB, Category:

   Text:

IMAS BROADCAST EQUIPMENT EXCHANGE accepts no responsibility for the condition of the equipment listed. Classified listings with contact information are available to manufacturers, dealers, brokers, distributors, etc. on a $12 per listing basis. Call or write for complete details. We make no attempt to evaluate equipment, but rather publish exactly what is sent to us by the listers.
AUTOMATION...WTS...CONT'D.

500G stereo automation system, including 2. motors, 2800A reel-to-reel, 2 SMC carousels, Model 500 control module & monitor panel & timer, in 2 racks. Key Code 11-18.


Autogram automatic, includes 2 random-select cart. 1 Scully tape, 1 sequential. Collins 26U-3 limiting amps (2). Key Code 11-16.

Carousel 250 series carousels in good condition, can be easily converted to stereo. Key Code 11-6.

Schafer 800 mono, 10 source, 24 event, w/silence sensor, 25Hz detector, 2 Scully 270 playback decks in two racks: Schafer Brain alone, in rack, Schafer TM-8 controller is not for time announce machines. Key Code 11-53.


Network switch on, IBM printers, IBM type punch card readers, IBM 25 printing card reader, IBM photostat, parts, drawers. Key Code 11-56.

Want To Buy Tone generators for Automation system, must be in excel cond. Key Code 1-59.

Go-Cart or carousels for Automation system in excel cond. Key Code 1-59.

Time cards for Automation system plus logger in working order. Key Code 1-59.

Playback machines w/large reel capacity, operating or repairable, also sensors. Buy outright or swap old mikes. Key Code 1-19.

Autogram, Sparta or similar stereo sequential cartridge type automation Key Code 1-60.

IGM MOS-200 or MOS-400 set up for carousel control. Key Code 1-53.

Sequential automation with logging, small. Key Code 1-60.


Carousel or similar, like Instact, etc units, all cond. Key Code 11-12.

Time Announcer for automation system, must be in good condition. Key Code 12-5.

Cart Machines, rack mounted for automation, in working condition. Key Code 12-5.

Time Generator for automation, must be in excellent condition, 25 Hz. Key Code 12-5.

Carousels for automation, must be in good working condition, new mats. Key Code 12-5.

SMC SSP-30-60 automation PGM's, SMC AS-10 switcher (audio), SMC P.S.A. power supply for above. Key Code 12-32.

CAMERAS (VIDEO)

Want To Sell

Hitachi FP200 Saticon, new, factory warranty, latest model, $8400, complete but w/o lens, incl. 3 Saticons, carriage. Soudex Design, Box 921, Beverly Hills CA 90211.

Ikagami 240 with Saticon tubes, less than 1 yr old, many accessories including batteries, screw shells. $4000, excellent condition. Key Code 12-5.

Ikagami 240 with Saticon tubes, less than 1 yr old, many accessories including batteries, screw shells. Paid $22,400 less than 1 yr ago, make offer. Terry Hamad or Patricia Cherryland, Instant Replay Video Produce, 11-2303 Santa Fe, La., Cincinnati OH 45205, 513-861-7065.

Sony 1610 Color video camera and 3800 lb. motorized tripod. Key Code 11-10.

Sony 1610, (2) Sony 3450, Sony 2850A's w/TRI-Edit controller, V03800, V01600.

Panasonic 15" monitor, plus misc K ey Code 1-6A.

RCA PK-340 8 BW studio cameras, 3 heads w/16"-18" lenses, magnetic iris & zoom, 2, 2CCU, 600 ft of cabling, manuals. Key Code 1-79.

Sony 5000BP (Plumbicon) Color Cameras (3), Colortronic Color Contact and Sync Generator, for $15,000. Special Effects Generator and Phase Shiftier also available. Call Dave in PA, 215-333-3437.

IYC+B & 99 self contained vidicon color camera, 3 pcs with some lens. Key Code 1-44.

Norelco PC-70 camera, with tubes & complete w/pneumatic pedestal & cradle head, good cond, used in studio only. Key Code 12-43.

Panasonic WV-2200 camera w/NV-3085 VTR, NAV-610 color adapter w/power supplies & all hookup cables. Key Code 12-1.

Panasonic WV-3700, portable demo, 1 yr warranty. Key Code 12-34.

Phillips LD420, 2 avai, 3 Tube Plumbicon, w/CCU, 50' cable, 1-10 zoom lens, 2x telexpander, Video Control Unit, ITE cam head, tripod & dolly. Excellent condition. Key Code 12-6.

Hitachi FP-1213, 3-Tube Plumbicon, w/CCU, 50' cable, 1-10 zoom, dollop, excellent condition. Key Code 12-6.


Panasonic WV-2150 KT, demo, full warranty. Key Code 12-34.

Hitachi FP20, 3-saticon tube camera, new with factory warranty. Key Code 11-6.

JVC GC-4400U color camera w/CCU, GA-200 adapter, 33 camera extension cable, and 4KX. Operates good. 1,785 S dollars. Key Code 11-7.

JVC WV8000 Saticon color, for broadcast, 10-6 blanking & 10-1 zooms Fujinon, gen lock cables, cases, etc. (2). Key Code 11-17.


Sony portable pro. B&W slow motion recording camera and VCR, very low hours, 1 hr. rechargeable battery. Trade for Ampex 5800C or 3/4 U-Matic VCR. Key Code 10-1.

Aikey CV-160 with ccu ac power. Solid state two-tube auto white bal, or will trade for 3/4 U-Matic or Ampex 5800C or VHS. Key Code 10-1.

Sony DXC 1610 w/6x1 lens. Key Code 10-25.

RCA TK 80 studio B&W cameras (2), w/zoom lenses, fixed lens cables, manual, power supplies, control units etc., perfect condition, never used. Call IBE, 800-336-3045.


Ikagami HL-33 ENG cameras in good condition. Available from R&B Industries, 825 Grove St., Jersey City N J 07302, 212-924-7910.

Want To Buy

Videocon camera w/electronic viewfinder. Key Code 1-5A.

PC-72 w/len in good working condition. Call BEE at 800-336-3045.

RCA WP-168B power supply, TK-60B remote control unit, very excellent. Transport has AG 350 escutcheon, will install and align new heads and calibrate to your tape. Has interface for Inovon Centrak. Key Code 1-50.


Ampeg FP-100, in excel cond. Key Code 1-50.

Ampeg FP-100, new condition. Key Code 1-50.


Telex II copier. Key Code 1-30E.

Ampeg FP-100, in excel cond. Key Code 1-50.

Ampeg FP-100, new condition. Key Code 1-50.


Ampeg FP-100, in excel cond. Key Code 1-50.

Ampeg FP-100, new condition. Key Code 1-50.


Ampeg FP-100, in excel cond. Key Code 1-50.

Ampeg FP-100, new condition. Key Code 1-50.


Ampeg FP-100, in excel cond. Key Code 1-50.

Ampeg FP-100, new condition. Key Code 1-50.


Ampeg FP-100, in excel cond. Key Code 1-50.

Ampeg FP-100, new condition. Key Code 1-50.


Fresco G-144, UHF broadband amplifier, new, never used. $450.00. 75 ohms input and output. Key Code 1-73-4.

MDM decenter commercial for receiving Home Box Office, w/ant & cable, new ready to view. Key Code 10-2.


Want To Buy
10 watt FM translator, any input or output free, does not have to be sperable. Key Code 1-6-1.

MDM antennas &downconverters. Key Code 12-44.

CONSOLES

Want To Sell
Share M65, 1200 signal mixers (2) exc cond. Key Code 1-36.

Tapeco Mod 6000CF mixer, exc. Key Code 1-36.

Ampex & C-88 stereo mixer console, exc. cond. Key Code 1-75-8.


Ampex & C-88 stereo mixer console, exc. cond. Key Code 1-75-8.

Western Electric 255C mixing console, tube type. Will trade for 1/4" VTR Editor, Camera, TBC etc. (color). Key Code 1-3.

FROM EUROPE!

TWEEDE AUDIO PRODUCTS

AUDIODESIGN & RECORDING SCAMPSYSTEMS

DETROITS PRO-AUDIO WAREHOUSE

(313) 739-7020

Stevenson Interface Series 100 Board. 16 input frame. 9.4. 48k sampling cond. A. Papa, 213-768-6504 or 213-399-9069 or J. D'Anastasio, 609-424-2352 or 216-546-8056.

Bogen mixer-preamplifier, 2 each with 5 mic inputs. High & low impedance output, both in fair cond. Key Code 1-95.

API 1604 console, 124x, expandable to 164x, 10/550A, Eq. 2 comp/limiters, 8 trk monitoring. Key Code 1-410.


Sparta A-15 audio console. Key Code 1-34.

Sonic MX-16 mixer, exc cond. Key Code 1-30-6.

Tascam model 5 mixer console. Key Code 1-32.


Collins 212-B console, poor cond, needs repair. $35.00 w/instruction book. Key Code 12-51.

Ampex AM-10 mixer, exc cond. $395. Autobond, Box 13036, Orlando FL 32895. 305-855-6868.

Russco 505 Studio Master 5 chan. mono, exc cond., $495. Autobond, Box 13036, Orlando FL 32895. 305-855-6868.

Sterilotov AM-48 w/limiter, w/line outputs (2) and SLE-8 2 ch. Key Code 12-11.
Harris stereo 80 console, Key Code 11-15.
Western Electric or RCA tube-type console, Key Code 11-15.
Electrodyna 709 or 710 input modules. Key Code 11-15.

**DISCO & SOUND EQUIP.**

**Want To Sell**

**Big Brute mics, cables, etc., 25:**
Switchcraft XLr's. Key Code 1-22.

**Hammond B-3, chopped for road use. Key Code 1-24.**

**Cardew-Vega GE-2 graphic equalizers (2):**
Key Code 1-22/F.

**Rack locker, 6':** Key Code 1-22A.

**A/D Aria, new w/power supply. Key Code 1-14A.**

Voice of the Theater copies with Atec drivers.

**Maestro Phase Shifter w/3 position foot pad.** Key Code 1-14B.

**Assial-Leg Digital Reverberation Timer. Key Code 1-628.**

**Anvil flight cases, 20 hole mike case. Key Code 1-22C.**

**Echo Pex w/foot switch. Key Code 1-14C.**

**Shure mixers, RTS patch panels, Auratone speakers. Dynaco Preamp, Dynacomp, Lafayette headphone, Lafayette mixer, (2) Fisher reverber chambers, (3) metal 19" panels.**

**Audio studio monitor loudspeakers in cabinets, (2) direct boxes, (4) fixed boxes, microphone snake plus cables, Harman cassette, Garage turntable.**

**Magnecord PT-6 cables. A. PAPA. 213-168 4646 or 213-399-9069 or J. D'ANAST. 609-424-2352 or 524-1588.**

**Technics by Panasonic speaker stereo systems.**

**Audio-Technica monitor speakers, **

**Mammoth Stereo 1967-4100 Diploma.**

**Monitor Utility case.** Key Code 1-220.

**Mutoon Octave Divider. Key Code 1-140.**

**Sansui QSE-58 4 ch. encoder. Key Code 1-128.**

**Orban 111-B stereo reverberator. Key Code 12-58.**

**DBX 38X noise reduction system. Key Code 12-58.**

**Dahquist Bi-Amp crossover Model LP-1. Key Code 12-58.**

**MXR Mini Limiter** (4), new, MXR Auto Flanger (1), new, Key Code 12-58.

**Auratone 5 C crossover monitors (pair).** Key Code 12-58.

**Whirlwind snake 8 mics/3 sends, 100' length.** Key Code 12-58.

**Bose 901 speaker and equalizer (1). Wood cabinet, good condition.** Key Code 12-4.

**Pioneer PT-222F-S Stereo, new. (1) Key Code 12-25.**

**Murasound by Whiley Elect. speakers, (2), each contains a 12 & 5" speaker. Attractive deep box. Key Code 12-40.**

**A/B Systems LED power level meter (1).** Key Code 12-10.

**Phase Linear 1000 noise reduction system.** Key Code 12-58.

**LP Jacket Fabricating Plant, sacrifice.** Key Code 12-22.

**Headphone box w/individual 1 pads, custom key. Key Code 12-58.**

**Acoustic Research ARAX speakers (2), new with warranty cards and oiled walnut cabinets. Key Code 12-65.**

**Ampex, Scully, 16 in, 16 out board, complete 8 trk recording studio, excel sound, all related equipment.** Key Code 12-22.

**JBL 4313 studio monitors (pair). Key Code 12-58.**

**Switchcraft 96 jack TAP pay w/100s. Key Code 12-125.**

**Peavey SP 1 cabinets (2). Excellent cond. $600 for both. G. Hutchins, Hutchins Sound, 34 Indiana St, Baltimore 21201. 703-669-1737.**

**Beafield (not built-in), wood, fiberglass, gypsum board and acoustical tile construction, good condition.** Key Code 11-23.

**Bren LD 300 Speaker systems (microphone), 1 pair. Key Code 11-25.**

**Mareantz Imperial 7's, 3 way speaker system (cab dam). 1 pair. Key Code 11-25.**

**DBX 115B crossover. 1200Hz to 3500Hz. Blog frequencies can be changed.** Key Code 11-43.

**Lansing 4310 control monitor speaker systems (2). Three-way, one unit needs a new mid-range control. Good Condition. Will sell as a pair only. Key Code 11-23.

**Duncan 201 SA 2 hybrid speakers, 25,000 Hawai, mono, like new. Also, Duncan slide fader w/ cue switch and Duncan slider, stereo, w/cue switches. Key Code 11-23.**

**Altec 604E Big Red Monitors with Mastering Lab X-over, 1 pair. Key Code 11-25.**

**Quad electrostatics, one unit. Key Code 11-25.**

**Voice of the Theater copies with Altec drivers (new).** Key Code 11-25.

**Custom built horn loaded sound reinforcement systems, using JBL woofer and tweeters, and similar midranges, mint. Key Code 11-43.**

**Allec: 604E duplex speaker in utility cabin (2). Key Code 11-33.**


**EV Interface A's w/passive EQ unit, 1 pair Key Code 11-25.**

**Shure M63 Audio master EQ unit. Key Code 11-25.**

**showco M2500 disco mixer. Inputs 1 turntables, 2 tapes, mic. Has 3 ch. of graph. EQ. Key Code 11-1.**

**Altec Lansing 417 12" muscular inst. speaker Key Code 11-25.**

**JBL N1200S crossover network. Key Code 11-25.**

**Sony SQ 1000 quad decoder. Key Code 11-25.**

**JBL 4341 monitor speaker systems, 4 with built-in spotlights, pair. (4) 5000 watt from spotlight specs. (2). 400 copper wires, 3000 solid state, 2000 watt.**

**Koss K/6 stereo headphones, like new.** Key Code 11-23.

**EV-15-3 stage PA speakers (newest model) 1 pair. Key Code 11-25.**

**Phase Linear 7000 in rack frame with fans. Key Code 11-25.**

**EV-15 used digital crossover. Key Code 11-22.**

**Eventide digital delay line, perfect condition.** Key Code 11-25.

**Tapeco 6200B, 6 w inputs, like new condition.** Key Code 11-55.

Want To Buy

**Micro-Trac arms, 12" (2) or 30g, cond. buy 2, swap old mikes. Key Code 1-19.**

**Dolly A, B, Bk of 22 & 44 to fit m16 rack. Key Code 1-41.**

**Pioneer T309 for Project 60 speakers. Key Code 12-25.**

**MCM MX-716 choral, used, of Solid State.** Key Code 11-17.

\* \* \* \* \*

**LIMITERS**

\* \* \* \* \*

**Want To Sell**

**Uria LA-4 limiter/compressors (2). Key Code 1-25.**

**CBS 4110 VoluMax, 4 yrs old, excel stereo, recently inspected. Key Code 1-65A.**

**Gates 6631 limiter, stereo pair. Key Code 1-24.**

**Collins 262U-2 FM Limiter. Key Code 1-17.**

**CBS 4450A Audimax, 4 yrs old, excel cond, stereo, recently inspected. Key Code 1-65B.**

**Gates S-398 limiter amplifier. Key Code 1-1.**

**Altec 438-A Limiter (working w/ sparse meter. Key Code 1-25.**

**Dorrough Tri-Band Compresor/Limit w/ pink noise test generator and both standard & manual high frequency limiting cards, like new. Key Code 12-61.**

**Kahn Syntrapeak. Key Code 12-64.**

**CBS 4400 VoluMax. Key Code 1-44.**

**Uria LA-4 compressor/limiters (2). Key Code 11-25.**

**Harris AM peak limiter, solid state. Key Code 12-84.**

**Aureg 9473A, solid state, gd cond. Key Code 12-23.**
 offerings.

**Miscellaneous**

**Want To Sell**

- Telefunken U47, U48, M251. Key Code 11-78.
- RCA 44 series A thru BX and RCA 77 Western Electric 639. Key Code 11-12.

**FCC Radio operator licensing curriculum complete test questions and answers for FCC exams elements #3, 2nd class license and element #4, 1st class license. Will sell to any school training facility. Key Code 1-47.**

- Vacuum capacitors (variable) 7500 volts/800B magnetic vapor rectifiers. Key Code 1-75D.
- Fairchild solid state power supplies (5), 6617/24, (2) dual output, plus or minus 15-24, 567/46A and 667/11 (Key Code 1-75D).
- Control Data Corp. Model LGP-30 stored program computer, minimum capability, single address, 4096 word magnetic drum memory, with punched paper tape permanent file, computer less than 1 year old, consists of memory unit, arithmetic unit and control unit. Sell or exchange for studio equipment. Key Code 1-63.
- Equipment rack, 19" custom made, wood and/or power, various assorted cables, various lengths. Key Code 12-58.
- Thordarson CHT and Tru-fidelity type T15590, T155C4, 20A26, 20A27, T2A36, 3521, 3522, 22595, etc. Key Code 11-47.
- Bud enclosed 36", 19" rack cabinet w/whips, blank wrinkle finish Fair condition. Key Code 11-23.
- Open 36", 19" rack w/heavy-duty casts, gray finish, very good cond. Key Code 11-23.

**Want To Buy**

- Rack mounted metal cartridge racks, hold 40 carts each. Key Code 1-59.
- Patches (not double plug, not over 3 test leads. Any condition as long as repairable. Key Code 12-9.
- API model 5001 B scale VU meter (2). Key Code 12-27
- RCA and Western Electric catalogues of tube-type equipment. Key Code 11-2.

**Rotary Attenuators**, stereo, 600 in/out. 20 step, ZDB/step w/cues, need 10 Key Code 12-27

**MONITORS**

- **GE BM-1A mono FM frequency & modulation monitor w/manual on 59.5 MHz. $100. C. Coleman, KGAB, Box 5553, Ventura CA 93003, 805-647-0364.**
- Metron Model 510 AM frequency monitor. Key Code 1-1.
- Gates M-5693 AM modulation monitor. Looks new but doesn’t work. Key Code 1-75C.
- Hewlett-Packard 3358F freq. mod. on 94.3 MHz, now in service, but needs work, with book. Key Code 12-65.
- Gates M-5693 modulation monitor, needs work. Make offer. Key Code 12-44.
- Collins SC-1A scanner, solid state, needs work. Make offer. Key Code 11-8.
- General Electric BM-3-A frequency & modulation monitor for 13040C. Calibrated to 120% modulation. Excellent condition. Key Code 11-67.

**Want To Buy**

- Type approved modulation monitor for 89.3 MHz. Key Code 1-58.
- FM modulation and frequency monitors, prefer 98.3 MHz. Key Code 1-25.
- **GR Model 1931-A monitor in gd cond or easily repairable. Key Code 12-30.**
- Monitor (modulation) DC input, works. Key Code 12-56.

**Movie Production Equipment**

- **Want To Sell**
  - Magnetopt scan converter, super 8, 8mm, 16mm, 35mm splicers, 4 complete control panels. Key Code 1-56.
MOVIE PROD...TS..CONT'D.

Motorola M3800B, clamps, blue mag and opt. ext, excellent cond, door and auricon finder. Key Code 12-41.
Bell & Howell Model 846, 16mm sound project., like new w/cooper 5 spare temp. Key Code 12-21.

Auricon Pro 1200 camera, 2 mags wired for mag and cond. cases, all in move cond, new mag head, M11 amp, also opt amp, hardly used. Key Code 12-41.
Bell & Howell Model 8116 16mm movie camera w/case, inoperable electric eye, fair to poor cond, gold for parts, sold as is, case is fairly good cond. Key Code 12-41.

Arri-M & Beaulieu 16mm cameras, zoom lenses, tripods, Spectra meter, sound readers, Neagra-3 playback, lights, other prod equip. Key Code 12-40.
Auricon Pro 600 movie camera, 2 mags, opt amp, 1 lens, cases, cables, like new cond. Key Code 12-41.

Want To Buy
Neumade, HFC, or Moviola 16mm film timer, footprint counter combo w/large single hub, left-to-right, teeth in back, in gd cond. Key Code 12-63.

Neumade G-160 model R-3, 16mm film splicer w/1/16" splice bar, in gd cond, well-used ok, should be complete. Key Code 12-63.

RECEIVERS & TRANSCEIVERS
Motorola Model 70 System, one 45W. VHF base station w/P.L. and four 30W. VHF mobile units, w/L. In use less than 2 yrs., absolutely mint condition. Key Code 12-63.
Motorola, complete Symmetrics including 160MHz w/two mtr's each, gd cond. Key Code 12-41.
McMartin Theory 3000 FM frequency monitor.

Want To Sell
Schiar 48DR transmitter remote control unit, gd cond. w/manuals. Key Code 1-8.
Narda NE2505-8 GaAsFET amplifier, 8 to 12 GHz, gain: 38 dB, output power: 10010Wm. Key Code 12-14.
RC Microwave receivers (3), TR1-1A, RC Microwave receivers (3), TR1-1A, gd working order when removed, complete w/spare tubes and spare units, modifications to 1B and 1C series, one transmitter has a mechanically new head. Best offer. Key Code 12-31.
Motorola STL PCL-505 or comparable unit. Key Code 1-72.
Remote transmitter 30 or 40 watts for 450 MHz frequency range. Key Code 1-77.
Remote transmitter 450 and 150 MHz bands. Key Code 1-76.
STL 950 band tuned to 948 MHz, gd working cond. Key Code 1-70.
STL 950MHz and remote control for FM station, complete w/antennas and SCAs, mono or stereo. Key Code 12-65.
Remote Control, for FM, studio & transmitters units like "Rust" units. Key Code 12-56.
9GHz microwave RCVR & TX (MA-2A series or other). Key Code 11-50.

STereo GENERATORS
Gates FM 250WC stereo generator and exciter all working line. Key Code 1-45.
RCB RTS-1A stereo generator w/manual, 2860, C. Cohlan, KGAB, BR, power supply, 925-647-0643.
Standard Electronics Model 935, tube type, 1200, D. Castellano, Capitol Broadcast Exchange, 4659 W BenjaminHolt Dr, Stockton CA 95207, 209-957-1761.

Want To Sell

Stereophonic W/REMOTE & MICRO-EQUIP.

STereo GENERATORS
Gates FM 250WC stereo generator and exciter all working line. Key Code 1-45.
RCB RTS-1A stereo generator w/manual, 2860, C. Cohlan, KGAB, BR, power supply, 925-647-0643.
Standard Electronics Model 935, tube type, 1200, D. Castellano, Capitol Broadcast Exchange, 4659 W BenjaminHolt Dr, Stockton CA 95207, 209-957-1761.

Want To Sell

Stereophonic W/REMOTE & MICRO-EQUIP.

Want To Sell
Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.

Stereophonic W/REMOTE & MICRO-EQUIP.
TRANSCOM CORP.

Fine Used AM & FM Transmitters and Also New Equipment

Eligibly represented in the Philippines by:

Allied Broadcasting Center Inc.

Site 303, Legaspi City

Paso de Regos, Manila

Call or Write for ALL Your Needs!

PO Box 26744, Elk Park PA 19117, 215-379-6585

Circle 153 on Action-gram

BROADCAST EQUIPMENT EQUIPMENT 21

TRANSCOM CORP.

Fine Used AM & FM Transmitters and Also New Equipment

Eligibly represented in the Philippines by:

Allied Broadcasting Center Inc.

Site 303, Legaspi City

Paso de Regos, Manila

Call or Write for ALL Your Needs!

PO Box 26744, Elk Park PA 19117, 215-379-6585

Circle 153 on Action-gram

Automatic Techniques, Inc. RAIM-1000 time base corrector, recently recalaribrated by factory. Sony Data Systems, Box 7791, Orlando FL 32804. 305-295-3034.

Advent Corp. 1000A. VideoBeam TV color projection unit with self-supporting 7" screen. Low hours and new screen. $2395.

Inderwiesen Assoc., Box 7791, Orlando FL 32804. 305-295-3034.

Vital PA 1 pulse distribution amplifier with power supply and rack, new. Key Code 11-21.

Complete color (3-V) studio package, including cameras, lights, switcher, audio, etc. Key Code 11-64.


TO-4 TV waveform monitor, very clean. Key Code 11-47.

Sony remote RM410 never used. Sony timer TT100 never used. Sony 4cc JC5C, 4cc J10132 30".

Microtron 1600 TBC w/mag-ex. new warranty. Key Code 11-63.

Conray CYB-17, 17" color monitors (2), make offer. Key Code 11-75.


Video production equipment, complete color package w/Katrich FP-1500 color camera, w/CCU, 50" cable, color bar generator, Panasonic 3-V color VCR model NV-2100, also Panasonic pb-only cassette, Dat & Sanford chade head trip dip with/dolly, RAIM-1000 time base corrector, 20 hrs Scotch 60 min cassettes w/shipping cases. Equip. twr. old condition. Key Code 11-53.


Panasonic chroma key generator AS-2000, used 5 hrs. Key Code 11-44.

Want To Buy Video DA’s (complete unit). Key Code 11-50.

Conrad

Tektronix

Color

B&W

6100

SNA

5208

1480

5700

ENA

602

1420

5300

2133

604

528

5200

Rack Hangers also in Stock

Factory Cartons and Factory Warranty

Call for a quote on your systems needs.

Broadcast Systems, Inc.

Gary Fitch

Don Forbes

2822 Jamestown Drive, A-103

Austin, Texas 78758

800 531-5232

Circle 110 on Action-gm

Jates VSEC 427 editing control unit, brand new, full warranty. Key Code 11-36.

JVC 6300-U, as new, w/warranty card returned. Key Code 11-37.

JVC CR3800 3/4 U/Matic VTR, 2 pc used only 40 hrs, brand new in original boxes, individually or all two. Key Code 11-44.


Environize II filtering systems, exc cond, with manuals. Key Code 11-3.


IWC 900 1" VTR with TBC. Key Code 11-79.

Tape cleaner (video), manufactured & designed for factory use and condition. Key Code 11-3.


Panasonic NV-550AA editing U/Matic, exc cond, with factory warranty. Key Code 11-63.

Sony VQ2660 editing system w/RM430, Key Code 10-53.

IWC 700, 1" VTR. Will trade for Ampex 4000C 1" VCR. IWC 800's also available w/FCC license for trade for 3/4" U/Matic Ampex 1000. Key Code 10-1.

Want To Buy


RCA TR3 or TR4 for spare parts, also on headwheel panel cover & doors for TR-3. Key Code 12-34.

JVC 6060, or 6300, used less than 2,000 hours. Key Code 12-28.

Systematic video cassette playback equipment (V8 series) any cond. Also, any 3/4" Son portable player or the video model 1000 color recorder. Will trade for any. Will accept value for trade or will pay small amount. Christian TV use only. Key Code 12-34.


AV-2 VTR's


2. Each Mark 15 video heads.

190,000 feet of new 2" Ampex 175 video tape.

Will accept best reasonable offer, price or parts. Write.

BEE, Box 1238

Arlington, VA 22210

703-625-0400
able to accept and process sient signals without ringing or for limiting so that the sated signals will not be cted. In addition, the electronics aid have an integral wide-band, response mixing amplifier so that desired amount of reverberation can be generated in the reverberator's own electronics. and output connections should transformer isolated, and the unit aid be extensively shielded to act it from radio frequency interference. Many reverberators intended for professional recording studio applications do meet the stringent standards sired for broadcast equipment. Engineers, due to experience in poor quality units, may think it risky to use reverberator on-line, but a high quality unit designed for sdcast use, no problems will be encountered.

For Example

1CMIX Audio Products, Inc. to ure that its Master-Room specification equipment will meet performance requirements of every broadcast and oring studio applications, eloped electronic pulse testing, a test utilizes an electronically duced single cycle sine wave, rerally referred to as a pulse. Pulse in, in a manner similar to time nain reflectometry used in tuning transmission lines, readily reveals the phase performance capabilities of a re-b. Most importantly, it reveals how well a reverberator can handle a nsient signal. As previously mentioned, this is of vital impor ice to the broadcast engineer. Secondly, the pulse enters the chamber, all t remains is the tail of the reverb. efore, the decay characteristics of the actual sound of the reverberator be easily analyzed without any skin effects. Lastly, this type of testing, because of its stringent ure, will reveal any unwanted e-effects, such as the well-known ng, twang, flutter, and ringing it are common to many reverberators. e-over-all performance capabilities be quickly and easily evaluated. The torsional spring is the most popular reverberation medium. Fortunately, low quality units are given spring reverberators a rally bad reputation. Through the principle of reverberation, however, the desirable characteristics have be eliminated. For example, the new Master-Room (XL-305) "near room" has an unusual and highly signal spring reverberation module. This system includes an electro-mechanical spring matrix and is digitally tuned and balanced so that all unwanted side-effects are minimized. This unique technology of the Master-Room units to

---

**DISTRIBUTOR DIRECTORY**

The following is a listing of distributors that serve the broadcast industry and who would be glad to help you with any of your equipment needs. Contact any of them directly, or circle the appropriate number(s) on the Reader Inquiry Card and send it to IMAS today. We will forward your request to the distributors, and they will send you their literature or line cards.

---

**Audio Production Equipment**

- **Sales and Services**
  - TASCAM
  - AKG
  - Manley
  - Ampex Tape
  - Omnitron
  - Ivor

**TRIAD PRODUCTIONS INC**

1910 Ingersoll
Des Moines, IA 50309
515-243-2125

- **Serving Over 2000 Stations**
  - In 19 States

**ELECTRONIC INDUSTRIES INC.**

- distributors of electronic equipment and supplies
- "Call Speakshaven Person to Person—Collect"
- 19 East Irving Avenue
- Dayton, OH 45409
- (415) 233-8930

---

**T&S Electronics**

**Professional Equipment Sales**

- Alco
- AKG
- ATR
- Autogram
- Beyer
- Invotronics
- Otari
- UREI

**PO Box 1846**

**Grass Valley CA 95945**

**Call Collect:**

**916-272-3809**

---

**FULL COMPASS SYSTEMS**

**PRO AUDIO**

6729 Seybold Rd.
Madison WI 53719
Phone: 608-271-1100
TWX: 910-206-2745

---

**BROADCAST EQUIPMENT**

**NORTHEAST BROADCAST LAB INC.**

- Potomac
- LPB
- Amponics
- Phelps Dodge
- Tapco
- Belar
- Technologies
- Otari
- ESE
- Autogram

**EQUIPMENT SALES**

- P.O. Box 1176
- S. Glens Falls, NY 12801
- 518-793-2181

- **Circle 136**

---

**SBCOM ASSOCIATES**

- **AM/FM TRANSMITTERS**
  - Cornell-Dubilier MICA CAPACITORS
  - ITT JENNINGS VACUUM CAPACITORS
  - C.S.P. COILS & ACCESSORIES

- **MANY VALUES IN STOCK**
- 305 Wisconsin Ave
- Columbus, Ohio 43201

- 614-272-6162

- **Circle 144**

---

**PRO AUDIO**

Call or write for our complete equipment list.

---

**NORTHWEST DISTRIBUTOR**

Gene Bidon & Associates
BOX 817
Columbia, Maryland 21044
301-992-4444

---

**Circle 117**

---

**FULL COMPASS SYSTEMS**

Call or write for our complete equipment list.

---

**BROADCAST EQUIPMENT EXCHANGE** 23

---

**PRO AUDIO**

6729 Seybold Rd.
Madison WI 53719
Phone: 608-271-1100
TWX: 910-206-2745

---

**Circle 101 on Action-gram**
We buy — sell — trade all types and makes of used broadcast and cable TV equipment.

... WANT TO SELL ...

Danscoll TSP-101 processing amplifiers (excellent condition).
Quick set 5230 heads and 5450 pedestals (2). Excellent condition.
3/4" editing system consists of 2 Sony VO-2850's and one TRI EA-3 in excellent condition. Asking $10,000.
3/4" editing systems consists of 1 Sony VO-2800, 1 Sony VO-2850 and TRI EA-3 Editor. Excellent condition, less than 100 hrs. of use. Asking $11,000.
2 TRI PPC-1 portable production console c/w 3 colour monitors, 6 input video switcher, audio board and power supply to power portable camera. Excellent condition, asking $7,000 ea.
Ampex 352-1's, 1/4" playback tape decks w/solid state electronics. Good condition.
Trenka Conversion 16mm sound camera. Excellent condition.
LDH-1 cameras (3), complete w/10:1 zoom lens, viewfinder & 100' cable.
Tektronix 149 test signal generator.
Matched sets of 2/3" Plumbicon tubes.
The above listed equipment is only an example of what we have available..Give us a call, we probably have what you're looking for.

... WANT TO BUY ...

Tektronix 528 waveform monitors, 520 Vectorscopes, 1420 Vectorscopes and Tektronix or Leitch Video test equipment.

This publication is distributed in Canada exclusively by United Video Ltd.
All equipment listed herein is available through us.

Call For Details (613) 741-5554

UNITED VIDEO LTD.
1485 Triole Street
Ottawa K1B 3S4 Canada