

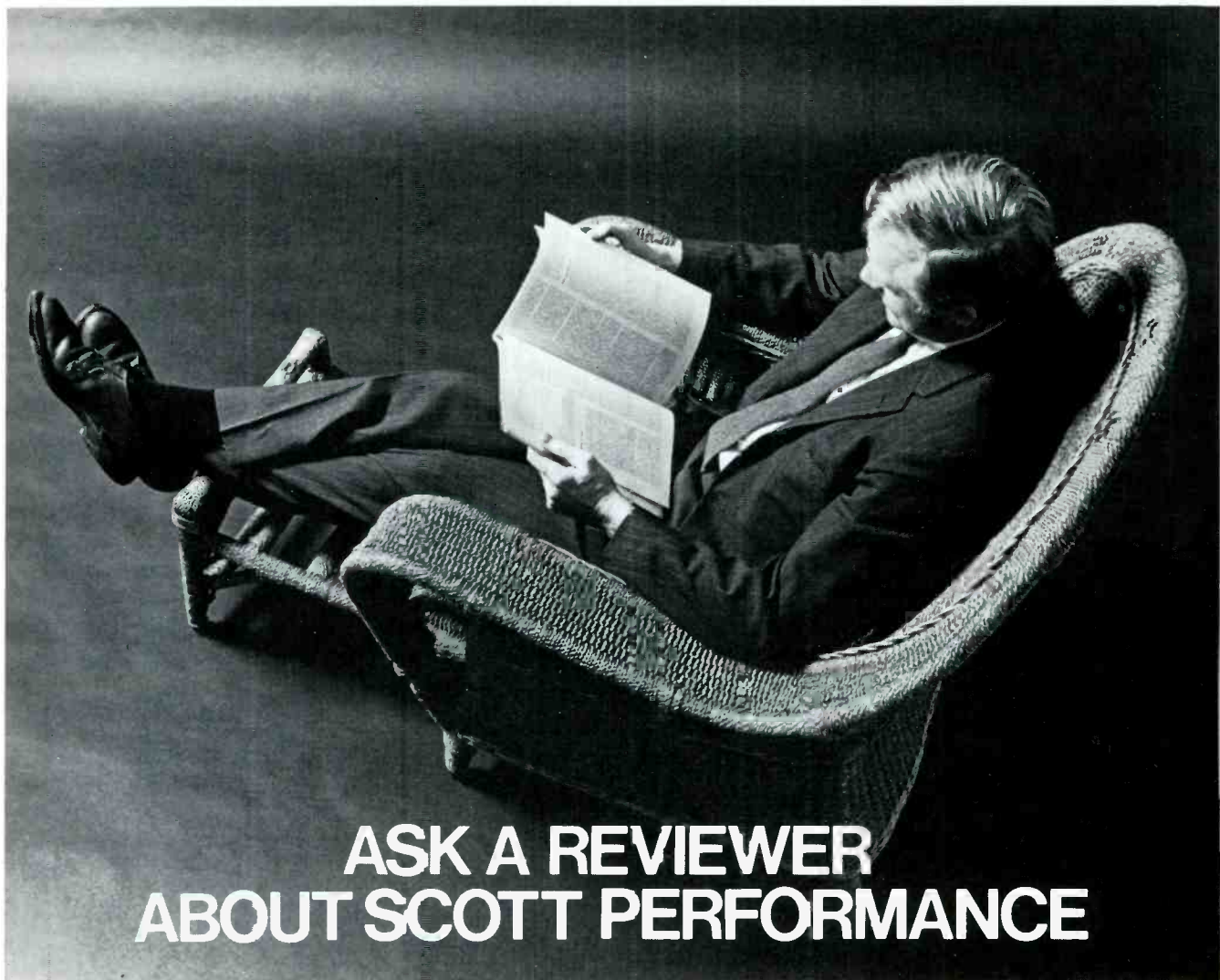
The Authoritative Magazine About High Fidelity

AUDIO

JANUARY
1971
60¢

Canby
Looks at
"The War
of the
Worlds"

Reel-to-Reel Tape Recorder Directory
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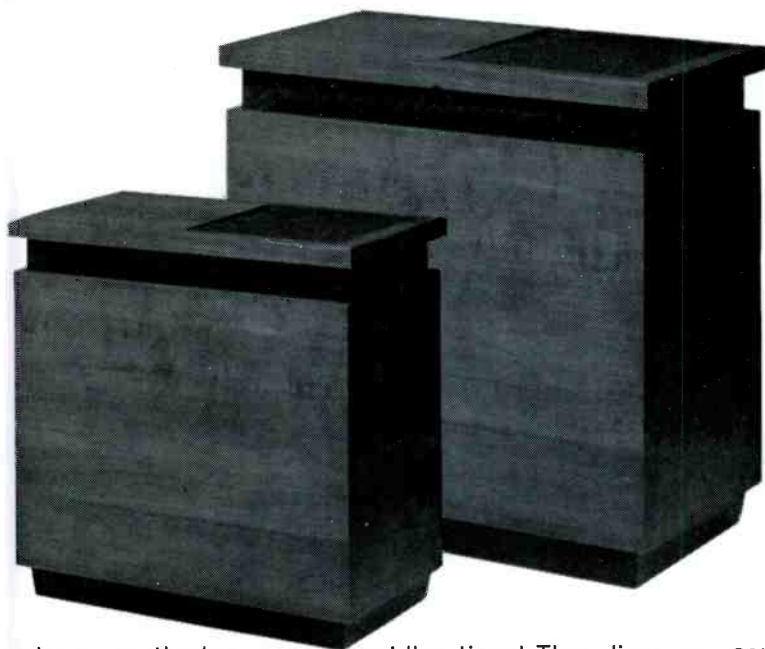
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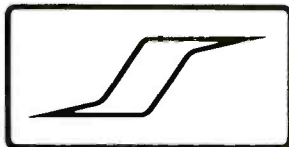
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AUDIO

JANUARY 1971

Vol. 55, No. 1

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AUDIO (title registered U.S. Pat. Off.) is published by North American Publishing Co., I. J. Borowsky, President; Frank Nemeyer and Roger Damio, Vice Presidents; R. Kenneth Baxter, Production Director; Nate Rosenblatt, Promotion Director; Mary Claffey, Circulation Director. Subscription rates—U.S. Possessions, Canada, and Mexico, \$5.00 for one year; \$9.00 for two years; all other countries, \$8.00 per year. Printed in U.S.A. at Philadelphia, Pa. All rights reserved. Entire contents copyrighted 1971 by North American Publishing Co. Second class postage paid at Phila., Pa.

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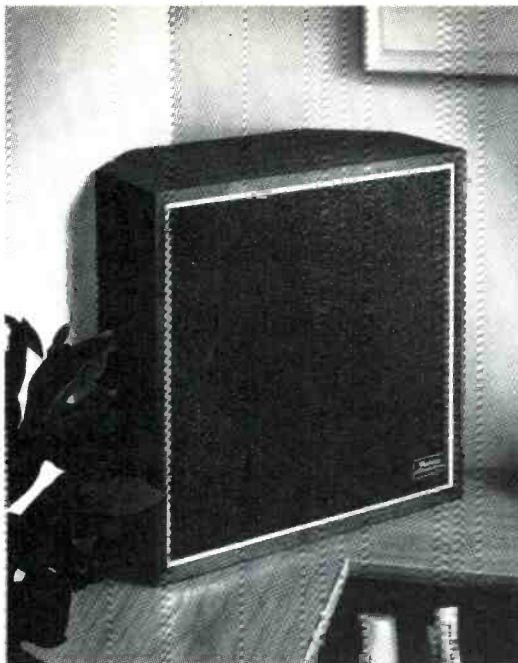
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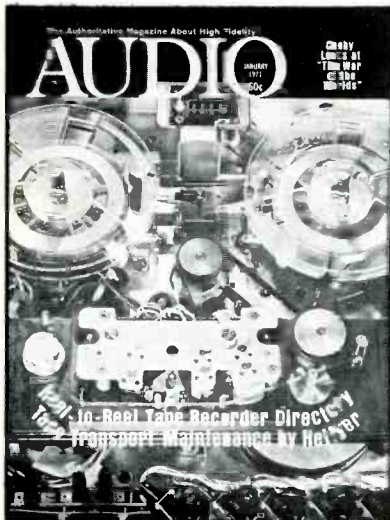
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About the cover—This shows a close-up of a modern quarter-track recorder. First magnetic recorder was made in the 1360s using iron wire instead of coated tape. In ten or twenty years time, tape itself might be superseded by embossed paper or computer-type memory stores—who knows?

Audioclinic

JOSEPH GIOVANELLI

Four Channel Sound

Q. My question is about the new quadraphonic, or four channel, system every one is talking about these days. I have read many articles on the subject. If I understand all of them correctly, the rear right and left channels are about the same as the front right and left channels except that the rear ones have more reverberation. Now, why don't the manufacturers of four channel recorded tapes make them so that each channel is different from the other? What I am trying to say is that it would be the same as a four-track recording in a studio, except that it would not be mixed down to one or two tracks as is now done. That way every listener would balance his system the way he wishes. For instance, if I wanted the guitar to be louder, all I would have to do is to turn up the guitar track. If I wanted the lead singer to have less bass in his voice, all I would have to do is adjust the bass of this channel without disturbing the instrumental backup.

Perhaps I think this way because I attend more and more recording sessions and enjoy every minute. What do you think about this topic? Am I the only one who would like to see (or hear) it that way? Louis Hone, Montreal, Canada.

A. What you proposed is already offered on some "pop" music tapes. Here the audience is surrounded—really in the middle of the performance. You therefore can do anything you want with any of the channels, just as you propose. However, with concert music you probably would not want to do your own mixing. The rear channels generally contain only reverberation, recorded at the rear of the hall. The idea is to attempt to get the concert hall into the living room. The hall brought into your living room might not really sound like the hall in which the tapes were made. I'm not sure such an accurate re-creation is possible in a small room. However, the listener will still get a heightened feeling of liveness which was heretofore unavailable. Possibly binaural techniques can also work out well, too.

Experiments in four channel recording are in the infancy. Reproducing systems have not been standardized. Much research is needed on all fronts before we really have a feel for making such recordings. Some speaker placement schemes which have been proposed are designed so that some of the sound is

produced a short distance from the front of the hall rather than at the rear. Until enough work has been done, we can't know what ultimate recording techniques will be used. Even with standardization of reproducing equipment, I think we can look forward to and enjoy lots of interesting experiments with recording techniques.

In the meantime, even though most of us don't own four-channel tape players and despite the fact that there are as yet no four channel discs, we can still get some idea of four channel sound merely by experimenting on our own with such speaker arrangements as proposed by Dynaco. It involves no major purchases, except possibly for speakers. I believe Dynaco is supplying all interested persons with the proper circuitry to allow them to connect up speakers in such a way that very interesting sonic results are produced.

High- and Low-pass Filters

Q. Will you explain in plain and clear language what is meant by 6 db or 12 db of rolloff per octave, as applied to high- and low-pass filters?

What is the best cut-off point for suppressing scratches on a record? F. Guerrier, Brooklyn, New York.

A. If you feed a signal of constant amplitude into a piece of equipment and if the equipment into which this frequency is fed is flat, the signal in the output of the amplifier will also be flat. However, if we introduce a 6 db per octave rolloff below a certain frequency (which is called the cut-off frequency), it means that if we decrease the frequency by half, the power produced in the output of the amplifier will be one quarter of what it was at a point above the cut-off frequency. (This frequency reduction corresponds to a one octave decrease in frequency.) If we decrease the frequency again by one half, making it two octaves below the cut-off frequency, our power will be reduced to 1/16 of what it was at the cut-off frequency.

Actually, at the cutoff frequency, the filter has just started to work. Hence, the power produced at the cut-off frequency will be about 0.7 of that produced at some midband point.

I have assumed in this discussion that the rolloff is 6 db per octave. However, if it is 12 db per octave, each octave below the cutoff frequency will

result in a decrease of power to 1/16 that of the octave above.

What we have been discussing is a high-pass filter. It allows all frequencies higher than the so-called cut-off frequency to pass unobstructed to the output of the amplifier or any other piece of equipment which might be equipped with such a filter. The low-pass filter, however, produces the reverse situation. Such filters become effective above, rather than below, the cut-off frequency.

I would not say that there is a best frequency above which point the signal should be rolled off in the interest of suppressing record scratch. This frequency will depend on the amount of record scratch, the kind of pickup and speakers, and upon the user's willingness to sacrifice some high frequencies along with the improvement in background noise. Remember that these filters do interfere with the sound produced by the high fidelity system. Some people would prefer to put up with the record scratch so that they can still hear the entire frequency range originally recorded on their discs.

Magnetic and Electrostatic Headphones

Q. What is the difference between electrostatic headphones and "normal" headphones? Sgt. Dennis O. Mueller, APO San Francisco, California.

A. The conventional headset operates in the same way that loudspeakers do. In fact, you could say that the headset is a miniature dynamic loudspeaker, having a moving coil centered in a magnetic field. The coil is fixed to a diaphragm. When signal is applied to the coil, the coil moves in and out, depending on whether it is repelled or attracted by the magnet.

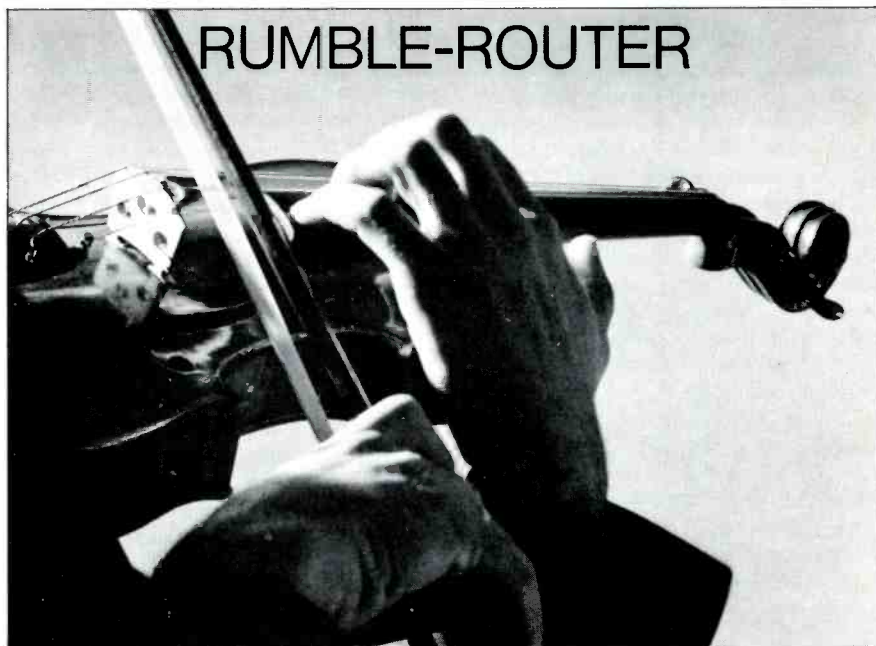
The electrostatic headphone is like an electrostatic speaker. It operates by having a high voltage alternately repel and attract a thin diaphragm. This is the same principle as operates when a comb picks up bits of paper when rubbed through the hair. The static voltage built up on the comb attracts the paper. In both the electrostatic headphone and loudspeaker this attracting voltage is made to vary in accordance with the signal supplied to it by the amplifier.

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Microphone Overload

I would like to comment on the letter from John D. Moss concerning microphone overloading (col. 2, page 16, October, 1970). The question of whether a particular microphone will overload the inputs of a tape recorder or amplifier depends upon the output level of the microphone and the gain of the microphone preamplifier. In the case of the AKG C-451 microphone, which I assume is the one which Mr. Moss is interested in, the manufacturer states that the output level is -39 dB referred to 1 mw/10 dynes/cm². This reference level corresponds to a level of 94 dB SPL at the microphone's diaphragm.

Most microphone preamplifiers made in the United States for use with dynamic microphones feature a first-stage gain of from 40 to 60 dB. It can be seen that a preamp with 60 dB of amplification will produce an output from the AKG microphone of +21 dBm for 94 dB SPL. Even those amplifiers capable of such an output level would be operating dangerously close to severe distortion. And when this microphone is used in a close-microphoning situation where sound levels can exceed 120 dB, the preamp would need to be able to deliver an output of better than +47 dBm. I know of no equipment capable of withstanding anything approaching such a level.

There are two solutions to the problem. One is to use a preamplifier with lower gain, say 40 dB. This would in all probability be sufficient for any situation short of very close pickup of very loud instruments. The other possibility is to reduce the output level of the microphone with a resistive pad.... While the in-line pad might seem to be a simpler and more flexible answer to the overload problem, it is undesirable from the standpoint of its effect on the system's signal-to-noise ratio. The thermal noise level for a 20 kHz bandwidth is approximately -131 dBm, so that a perfect amplifier providing 60 dB of gain would have a signal-to-noise ratio of -71 dBm. Typical amplifier circuits will add from 4 to 12 or more dB of noise, so that the signal-to-noise ratio can turn out to be only -59 dBm. Since a resistance pad in the output of the microphone reduces the level, for example 10 dB, it also has the effect of reducing the possible signal-to-noise ratio by the same amount.

It would be much more desirable to take advantage of the microphone's full output by using a lower-gain preamplifier. A preamp with only 40 dB gain, when fed from a high-output microphone, is capable of a noise ratio of up to -87 dBm (for a circuit adding 4 dB of noise itself). Microphones with exceptionally high output levels, such as the AKG and Neumann models, can often make use of input preamps with as little as 20 dB gain. The advantages for

the signal-to-noise ratio in such a situation are obvious.

So in answer to Mr. Moss, I would say that if the input stage of his preamp provides more than about 40 dB of gain ahead of the volume control, he is headed for trouble unless he pads down the output of this microphone. The exact amount of loss required in the pad would depend upon the maximum sound pressure levels he expects to encounter. The loss should be kept as low as possible so as not to degrade the signal-to-noise ratio any more than necessary.

I have been concerned with the problem of noise vs. maximum signal level for some time. I am currently using a mixing console with 40 dB microphone amplifiers.... I am hoping in the near future to be able to make use of a new console using operational amplifiers with variable gain over a range of 20 to 45 dB and a lower equivalent input-noise level than the present system. This console, in combination with the Dolby A system and the new higher-output Scotch #206 tape, should produce a signal-to-noise ratio that would have seemed impossible only a short time ago. Charles B. Dawes, Evanston, Ill.

Reel Conversion

Q. Can you tell me if it is possible to convert a 7" reel tape recorder to a 10½" one? I realize that in most cases the conversion could not be made within the limits of the tape recorder deck, but if a 10½" reel is to be accommodated, could it not be done by using the existing reel pin as a drive? It appears that if a pulley, mounted on the existing tape drive pin, were used to drive another pulley of exactly the same size on a reel pin secured in an area outside the tape deck, then a 10½" reel could be driven by the machine. The 10½" reels would have to be in the same plane as the existing reels. With a 1:1 pulley drive there would not be any changes in drive speeds, and all functions would remain equal, including fast wind/rewind. I don't believe that any permanent change need be made to the tape recorder. The reel pins outside the deck would be ball bearing mounted to prevent any undue load. I know that there are 10½" reel machines, but they are out of reach of my pocketbook, and the solution I propose may solve my problem in recording classical music. (T. L. Fick, Philadelphia, Pa.)

A. I can offer only slight comment on your proposal for an "outrigger" arrangement, inasmuch as the niceties of good tape drives are rather outside my sphere.

The chief trouble you may encounter, I believe, would be in maintaining low wow and flutter. A pulley drive between reel pins would not necessarily prevent wow and flutter from intruding. Also, there is the question of torque of the feed and takeup reels. While the torques may be satisfactory for the 7" reels, I am not sure they would be so for the 10½" reels on a 1:1 pulley ratio. Some commercial tape machines have attempted outrigger devices such as you propose, but I understand that these have not solved all problems.

Playback Equalization

Q. I am faced with the problem of incorrect playback equalization when playing directly from the tape head into my external preamp. I would like to modify the turnover and rolloff controls of this preamp to conform with the RIAA standard tape playback equalization curves for 7½ and 3¾ ips. I have enclosed the equalization curves and circuits for my preamp. Since the only equalization I use, other than tape, is RIAA for records, I would like to modify any of the other equalization positions for tape playback, one for 7½ ips and one for 3¾ ips. The preamp manual states that for best sound in most cases, when using the tape-head position, one should set the turnover (low-end) and rolloff (high-end) switches to the tape and flat positions. I assume that this meets the playback standard for 7½ ips. (Major Russell W. Kemp, APO San Francisco)

A. It is difficult to advise on specific values of resistors and/or capacitors for equalization of a tape playback-head signal, because in part the equalization must allow for departure of the head from "ideal" performance. Typically, playback heads tend to exhibit some high-frequency loss, and some departure in the bass region—usually somewhat exaggerated response. The 7½-ips playback curve of your preamp comes very close to "ideal." For an "ideal" playback head, a playback curve containing a total of 36 dB bass boost is required between about 10 and 20,000 Hz. The curve you sent me shows boost approaching a total of about 34 dB. Hence you are only about 2 dB away from correct equalization at 7½-ips for an "ideal" head. Allowing for the fact that your playback head may show some
(Continued on page 7)

DOLBY AND MULTITRACK IN LONDON

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Tape Guide

(Continued from page 6)

bass emphasis at very low frequencies, you may be still closer to correct equalization. If desired, you could use your bass tone control to supply a slight extra amount of bass boost in playback.

At 3 $\frac{3}{4}$ -ips, "ideal" playback equalization would involve about 31 dB of bass boost. If you combine your RIAA playback curve at the low end (turnover) with a flat setting at the high end (roll-off), you will again find yourself within about 2 dB of correct equalization for an "ideal" head.

Your alternative course is to experiment with capacitor values similar to those already in the turnover circuit to achieve still more exact equalization. Then you would have to use a standard test tape, and measure playback response.

Low Treble Level

Q. My problem occurs when I am recording a long-playing record from my changer, through my preamp, and into the tape deck. I record at 7 $\frac{1}{2}$ ips, and I find that when I play the tape back through my system the recording is very bassy and boomy. I have to turn the loudness switch off and roll the bass controls of each channel almost completely off and turn the treble controls almost all the way up.

Also, does it make any difference to the recording whether I have the preamp tape-input switch on tape or on input?

Also, I wish to record my 45-rpm records. Can I do this at 3 $\frac{3}{4}$ ips, or should I use 7 $\frac{1}{2}$ ips?

Lastly, I wish to record some old 78-rpm records. How can I do this (equalization, and so on)? (Stephen J. Newhouse, New Hyde Park, N.Y.)

A. Absence of adequate treble may be due to excessive bias current, azimuth misalignment of the record and playback heads with respect to each other, a worn and therefore widened gap in the playback head, faulty equalization in recording and perhaps in playback, collection of tape oxide, dirt, or other matter on the playback head, and an excessively long cable between the tape machine output and the input of the following amplifier. Another possibility is that you are feeding an already equalized playback signal (containing lots of bass boost) into the tape-head input of your preamp, instead of into the tape machine input of your preamp. The tape head input supplies a great deal of bass boost and is intended for a signal direct from the playback head.

It should not matter whether your tape-input switch is in one position or the other.

For best quality, record your 45's at 7 $\frac{1}{2}$ ips.

Recording old 78's satisfactorily is a matter of equalization supplied by your preamp and is not a question involving your tape machine. Play around with the phono equalization and tone control settings of your preamp until things sound right. You might try recording at 3 $\frac{3}{4}$ ips rather than 7 $\frac{1}{2}$ ips as a means of reducing noise without appreciable effect on the desired audio signal.

Excessive Noise Level

Q. I own a quality tape deck, and have been bothered by a high level of tape noise (hiss) during quiet passages of music. I listen to classical music which has been recorded from phono discs. If I play a prerecorded tape, the noise level is quite acceptable. From this I conclude that the problem occurs when recording a tape. If a virgin reel of tape is put on the deck and the volume of the amplifier driving the speakers is set so that the noise level is audible when the tape is playing, the following is observed with no signal fed into the deck: (1) an audible increase in the noise level after recording a section with the record level at its lowest point, but with erase and bias still applied; (2) a marked increase in the noise level above that in Point 1 when the level control is at its maximum position; but not noticeable increase at 2/3 of maximum. I measured the bias frequency to be about 50 KHz, and the waveform appeared to be sinusoidal, but I did not measure the distortion of the waveform. I would like to know: (1) Is this the normal bias frequency for this type deck? (2) If it is, do you think the cause of the noise is the low bias frequency? (3) If I replace the bias oscillator will the record head in this tape desk function properly at a bias frequency of about 80 KHz? Will the erase head work at that frequency? — Dale Simonich, Champaign, Illinois.

A. A bias frequency of 50 KHz seems low for a high quality tape re-

recorder. A rule of thumb is that the bias frequency should be at least 5 times that of the highest audio frequency to be recorded. Hence quality machines ordinarily use bias frequencies of about 75 KHz and upward.

I don't think that the cause of noise is the bias frequency. Rather, I think it is the bias waveform, i.e. distortion in the waveform. Slight amounts of bias distortion which are invisible to the eye on an oscilloscope are nevertheless sufficient to cause appreciable noise. Careful design and high quality parts go into an oscillator circuit that will produce minimum distortion and therefore noise. Nevertheless, even the best tape machines add some noise during recording owing to imperfection of the bias waveform.

If you change the bias frequency, chances are that you will have to increase the amount of bias supplied to the record head, because the impedance of the head rises with frequency. Similarly for the erase head. (On the other hand, there is some chance that for one head or the other you might have to decrease the amount of bias if it happens that the inductance of the head and the capacitance in series with the head are resonant at the bias frequency.)

Bias Application

Q. I am a little confused by something I read about setting bias. I interpreted this to say that bias is set in the playback mode. I had always considered that bias was only used in the record mode. Is bias actually used in playback also? (G. McWherter, Harlingen, Texas)

A. Bias is used only in recording. Bias may be indirectly measured in the course of playback, by adjusting bias while recording until maximum playback output is obtained at a frequency such as 500 or 1000 Hz. (It is further customary to increase bias until playback output drops about $\frac{1}{2}$ dB, thereby making frequency response less subject to moderate variations in bias.)

If you have a problem or question on tape recording, write to Mr. Herman Burnstein at AUDIO, 134 North Thirteenth Street, Philadelphia, Pa. 19107. All letters are answered. Please enclose a stamped, self-addressed envelope.

S.E.A. It's a sound revolution.



JVC proudly introduces the expensive stereo that isn't—model 5010.* Just look what it has going for you.

Its most outstanding feature is the Advanced Sound Effect Amplifier (SEA), JVC's exclusive ± 12 db, 5 zone tone control that opens up new dimensions in sound. SEA divides the sound spectrum into 5 frequency ranges. Let's you compensate for acoustic deficiencies in almost any room. Highlight a voice or musical instrument. Tailor sound to your own personal taste. The chart at the right shows the difference between SEA and conventional tone controls. But SEA is just the beginning.

There's a new FM linear dial scale. Sophisticated FET. Wire wrapped contacts. 2-way speaker switch. 40 watts output at less than 1% IM distortion. A beautiful wood cabinet, and much more.

While you're at your dealer, also check out JVC's Model 5020, 75 watts IHF; Model 5030, 140 watts IHF; and our top of the line, Model 5040, 200 watts IHF.

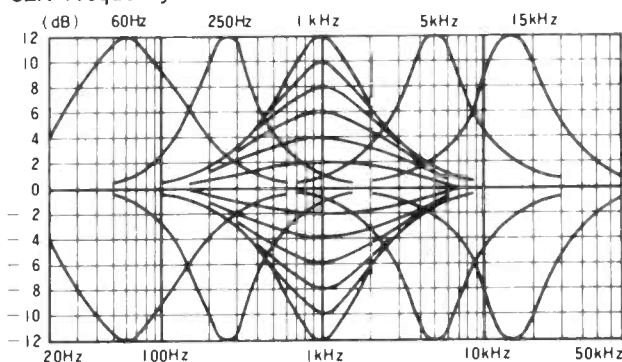
Whichever you choose, you will be choosing the finest. See them all at your nearest JVC dealer, or write us direct for his name, address and color brochure.

*Suggested list price \$229.95

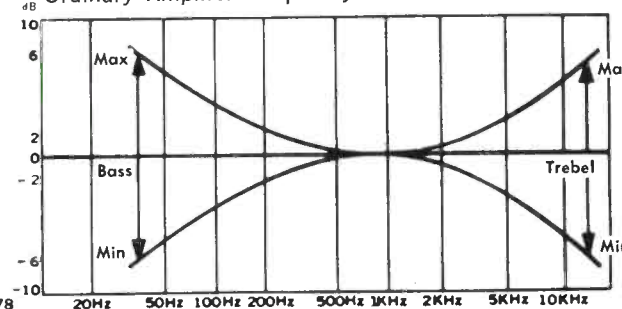
JVC Catching On Fast

JVC America, Inc., 50-35, 56th Road, Maspeth, New York, N.Y. 11378

SEA Frequency Controlled Characteristics



Ordinary Amplifier Frequency Characteristics



Check No. 9 on Reader Service Card

BEHIND THE SCENES

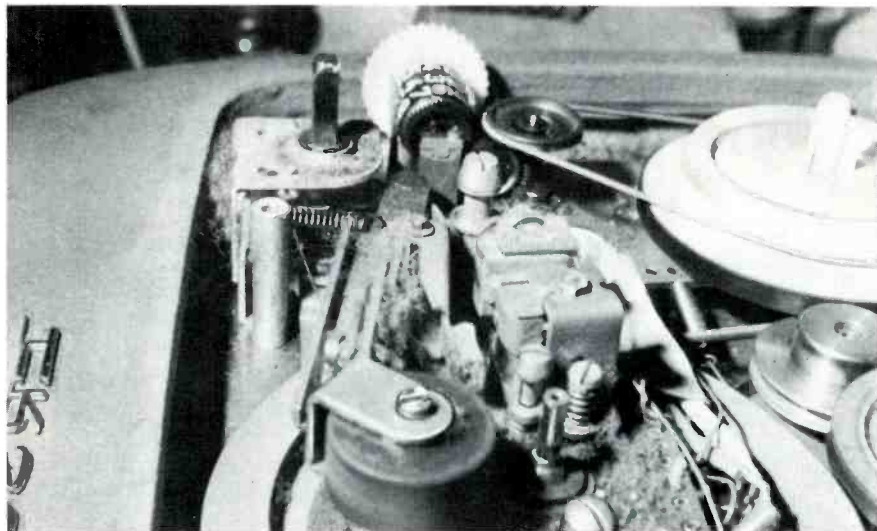
BERT WHYTE

ANYONE who owns a magnetic tape recorder is aware of the basic maintenance procedure of frequent cleaning and demagnetization of the heads, tape guides, and capstan. Great emphasis is given to this procedure in instruction manuals and in almost every

positive solution to this which is of course, a thorough application of elbow grease, Q tips, and cleaning fluid. My professional friends advise me that although there are a number of proprietary head-cleaning fluids on the market, the safest bet is denatured or

every engineer in the room by stating that the demagnetization procedures and the degaussing devices they normally used were totally inadequate for the task. Bill went on to say that the familiar degaussing tool, the coil with metal extensions which angle towards each other to form a narrow "gap," is not only inadequate for an 8- or 16-channel recorder, but won't even demagnetize consumer-tape recorders using quarter-inch tape! I can tell you that statement shook up the troops! What was the answer to this dilemma? Bill said that some device was needed which would not only indicate if a part was magnetized, but check on the efficacy of any degaussing procedure. Also needed was an efficient means of totally degaussing the magnetized parts. Then he reached into his jacket pocket and produced a small two-inch diameter meter with a red spot on the outside of the meter case. Bill explained that this was a small but highly sensitive magnetometer which measured magnetic field strength in gauss. This particular unit has a scale which reads 20-0-20. Zero indicates the absence of any magnetism. The scales to the left and right of zero are multiplied by 0.5 to read in gauss. Deflection of the needle to the right (a plus reading) indicates a North polarity. Deflection to the left of zero is South polarity. In practical use with a tape recorder, polarity is not significant. To use the magnetometer, the red spot is placed against the tape guide, head, or capstan, as the case may be. The slightest deflection of the needle to the left or right of zero indicates the parts are magnetized. The case of the magnetometer is a bit more than a half-inch thick. When measuring the heads on most professional recorders, this does not present any problem since the head gates of these units open wide for easy access. For other recorders and particularly consumer machines where many have heads difficult to reach, you must fashion an extension or probe. This can be a small diameter steel rod, or a nail will do. The nail should be bent at an angle for ease in reaching the heads, the sharp tip filed flat and covered with plastic electrician's tape to protect the heads, and finally demagnetized (which you check with the magnetometer). Then of course, one end of the nail is placed against the red spot on the meter case, the other end on the part to be measured. In my experience with this magnetometer thus far, I have found various values of gauss in the guides, heads, and capstan of my 11 assorted

(Continued on page 12)



This tape recorder requires more than demagnetizing!

book, article, and pamphlet on tape recording. You are given this advice virtually *ad nauseam*. Some people are very conscientious in carrying out this procedure; many more people pay little more than lip service to the idea.

While the need for cleaning might seem obvious, it is apparent that many people don't seem to realize the importance of this procedure. In a recent conversation with the chief engineer of a well-known tape recorder manufacturer, I learned that quite a few recorders are returned to the factory, with the complaint of poor frequency response, distorted sound, audible wow and flutter. Upon investigation, it was found that in the majority of cases the culprit was oxide build-up on the heads, capstan, and pinch-roller. Obviously, the owners of these machines were either very slipshod about cleaning or ignored the procedure altogether. My engineer friend said he was amazed at how many people bought expensive tape recorders, and then used cheap "white box" tape which is particularly subject to oxide shedding. However, he also pointed out that most of the people involved were using good quality, standard brand tapes and apparently were under the mistaken impression that this kind of tape obviated the need for cleaning. He said that the degree of shedding varied from brand to brand, but that in all cases oxide build-up was inevitable. There is a

isopropyl alcohol. Many use Ampex head-cleaner, but warn that this has a zylene base and should not be used on rubber pinch-rollers.

Demagnetization is a considerably more complex problem than cleaning. Even those who are very casual about cleaning, are aware that magnetized heads, tape guides, and capstan can add successive increments of noise to the tapes they play. There is also a partial erasure effect and this can cause noticeable attenuation of high frequencies. There is considerable controversy about how often demagnetization is necessary. Some "experts" say every two weeks, some say at least once a month. Others say it depends on the frequency of use. Many professionals demagnetize every day, figuring that they are "playing it safe." The sad fact is that most of this is guesswork. Which brings me to the point of this brief essay. There is now available an easy, inexpensive, and totally accurate means of determining if your recorder needs demagnetization!

I recently sat in on a technical session devoted to the operation and maintenance of an Ampex MM1000 16-channel recorder, presided over by genial fighter pilot Bill Brock, who is senior instructor for Ampex. Bill was pointing out that noise caused by magnetized parts is particularly reprehensible in the light of low noise tape and the use of the Dolby System. Bill then surprised

Crown

PROFESSIONAL STUDIO EQUIPMENT

Specs	15ips	7 1/2ips
w. & fl.	0.06%	0.09%
f. resp. +2dB	40Hz to 30kHz	20Hz to 20kHz
S/N	-60dB	-60dB

3 speeds - 15, 7 1/2 & 3 3/4ips; hysteresis synchronous drive motor

computer logic controls for safe, rapid tape handling and editing; full remote control optional

torque reel motors
"capable of providing the most faithful reproduction of sound through the magnetic recording medium... to date" -Audio magazine, 4/68

optional Trac-Sync

individual channel equalizers

third head monitor with A/B switch; meter monitoring of source, tape, output and source+tape; sound-with-sound, sound-on-sound and echo

2 mixing inputs per channel

individual channel bias adjust

"construction rugged enough to withstand parachute drops" -Audio magazine, 4/68

\$1790 for basic rack-mount half-track stereo deck, about \$2300 with typical accessories; Formica floor console \$295, rugged portable case - \$69

modular construction with easy access to all 10 moving parts and plug-in circuit boards; deck rotates 360° in console, locks at any angle

RECORDERS & REPRODUCERS



SX711 Claimed by its pro audio owners to be the finest professional tape recorder value on the market today - price versus performance
 ■ Frequency response at 7 1/2ips ±2dB 20Hz-20kHz, at 3 3/4ips ±2dB 20Hz-10kHz ■ Wow & flutter at 7 1/2ips 0.09%, at 3 3/4ips 0.18% ■ S/N at 7 1/2ips -60dB, at 3 3/4ips -55dB ■ Facilities: bias metering and adjustment, third head monitor with A/B switch, sound-with-sound, two mic or line inputs, meter monitoring same as CX822, 600Ω output ■ Remote start/stop optional, automatic stop in play mode ■ \$895 for full-track mono deck as shown, \$995 for half-track stereo deck

SP722 Ideal reproducer for automation systems ■ Meets or exceeds all NAB standards ■ Remote start/stop optional, automatic stop in play mode ■ \$595 for half-track stereo reproducer

Crown tape recorders and reproducers are available in 42 models with almost any head configuration, including 4 channels in-line. Patented electro-magnetic brakes maintain ultra-light tape tension and never need adjusting. They are made by American craftsmen to professional quality standards, with industrial-grade construction for years of heavy use.

All Crown amplifiers are warranted three years for parts and labor. They are 100% American-made to professional quality standards. All are fully protected against shorts, mismatch and open circuits. Construction is industrial-grade for years of continuous operation.

For more information, write CROWN, Box 1000, Elkhart, Indiana 46514

CX822

STUDIO MONITOR AMPLIFIERS



D40

Delivers 40 watts RMS per channel at 4Ω ■ Takes only 1 3/4" rack space, weighs 8 1/2 lbs. ■ IM distortion less than 0.3% from 1/10w to 30w at 8Ω ■ S/N 100dB below 30w output ■ \$229 rack mount



D150

Delivers 75 watts RMS both channels at 8Ω ■ IM distortion less than 0.1% from 1/10w to 75w at 8Ω ■ S/N 100dB below 75w output ■ Takes 5 1/4" rack space, weighs 16 lbs. ■ \$439 rack mount



DC300

Delivers 300 watts RMS per channel at 4Ω ■ IM distortion less than 0.1% 1/10w-150w at 8Ω ■ S/N 100dB below 150w output at 8Ω ■ Lab Standard performance and reliability ■ "As close to absolute perfection as any amplifier we have ever seen" - Audio magazine, 10/69 ■ \$685 rack mount

Check No. 11 on Reader Service Card

Behind The Scenes

(Continued from page 10)

tape machines. For what it is worth, the most consistently high values of gauss I found were not in the heads but in the capstan shafts. Needless to say, this magnetometer is invaluable for anyone owning a tape recorder. The unit is known as the Model 20 Pocket Magnetometer Scale 20-0-20. They are available from R. B. Annis Company, 1101 North Delaware St., Indianapolis, Indiana 46202. The price of this boon? A measly \$4.45!

Now for the second part of this story. Bill Brock says you can place the common degaussing tool against the magnetized parts all day, and the magnetometer will still indicate magnetism. There simply is too weak a field to totally degauss the parts. The answer obviously is a device with higher field-strength. In the case of professional machines, which usually have removable head block assemblies, the entire assembly is placed on a high-output bulk tape eraser, and as Bill puts it, "let it cook for ten minutes." Alternative to this, and a must for consumer recorders with fixed head assemblies, is the use of a portable hand-held bulk tape eraser. These are available at most electronic parts stores for about \$9.00. (See page 30 of this issue.) They look something like an old fashioned flat-iron, except for an open handle. In use, you run the unit very close to the guides, heads and capstan for several minutes. At the conclusion, check the parts with the magnetometer and if there is any residual magnetism indicated, run the degaussing unit another minute or so, or until you finally obtain a zero reading. As Bill says, measurement is so easy, it's a wise man who checks his recorder with the magnetometer before using it for record or playback. Is it worth the trouble to pay this much attention to demagnetization? Bill states that a reading of a few gauss translates into 3-4 dB of noise. If you play a lot of pre-recorded tapes, and you frequently repeat some favorite works, magnetized parts could be very detrimental.

As you know, for quite a spell there have been no hi-fi shows. Recently I told you about the upcoming IHF shows in Westbury, Long Island; and in Newton, Mass. Well, friends, I've had my fill of shows for some time. I attended the Westbury Show and on Press Day played the Mighty Wurlitzer four-channel recording in the Cunningham technique as promised. Everyone was very impressed and most felt as I do, that this is the way to go. Lectured on four-channel sound in a seminar with fellow panelists Len Feldman and John

Eargle, chief engineer of Mercury Records. The show was reckoned a great success with over 12,000 enthusiasts jamming (and that's the word) into the small rooms of the Island Inn. This was a very different crowd than is usual at hi-fi shows and is probably a portent of things to come. This was the youth revolution in full bloom. This was an under-thirty group, almost universally accoutered in typical hippie fashions. Man, some of those cats were really far out! One thing was obvious. Hi-fi really turned them on, and many were surprisingly knowledgeable. For the most part they were well-behaved and were content to soak up the sound. Four-channel stereo of the ping-pong variety was their chief enthusiasm. It is said that the young are well supplied with disposable income. That would seem to be the case, as some would casually point to a six-hundred dollar amplifier and say that is what they use at home. As you might have expected, quadrasonic stereo dominated the Show. You could hardly walk into any room without stepping into the middle of an orchestra. Outside of some four-channel tape recorders, there wasn't a great deal of really new equipment. Electro-Voice was giving closed-circuit broadcasts of Len Feldman's four-channel stereo synthesizer sound. Sansui was demonstrating yet another four-channel synthesizer, their QS-1. Bose was showing their new 501 speaker, employing the direct/reflecting principle in a less expensive version. Several firms showed new models of receivers, up in power out-put and in automatic gimmickry. Dolby equipment was a highlight, but difficult to demonstrate except by headphones because of the high noise levels produced by the milling crowds.

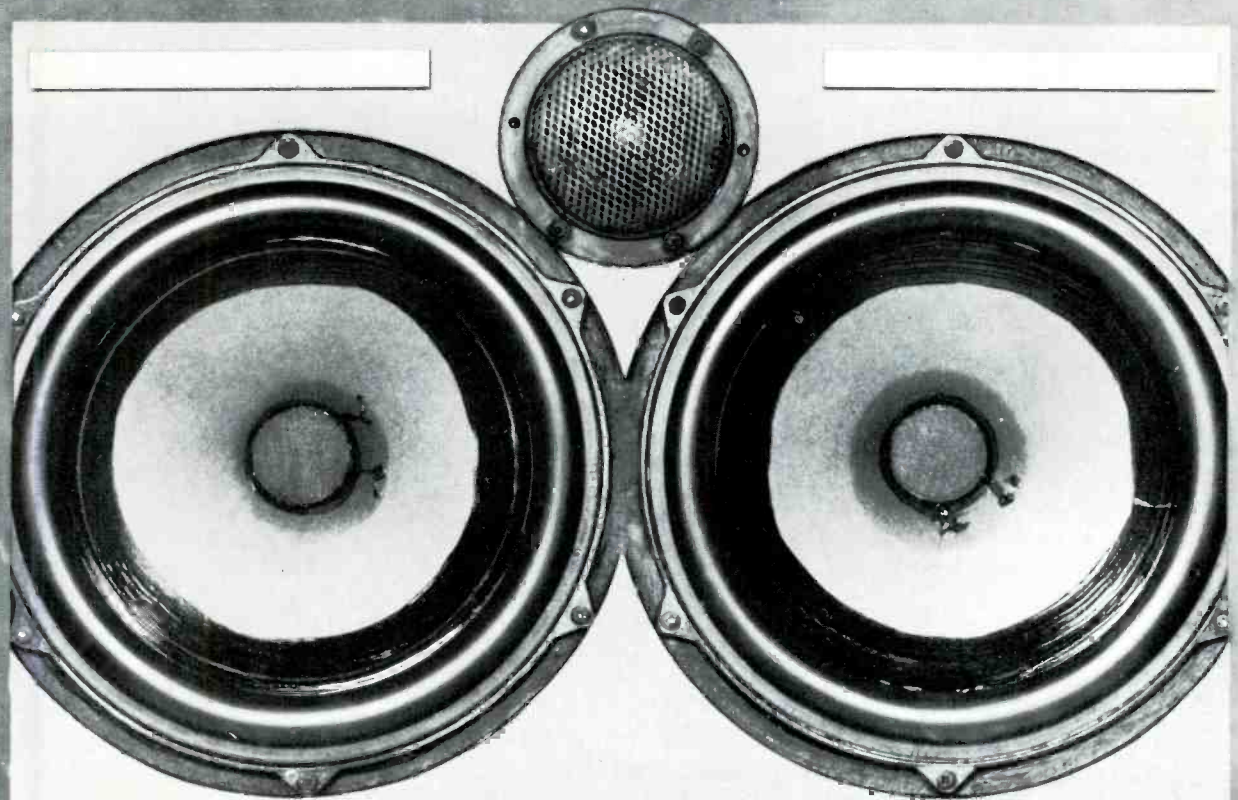
Not much time elapsed after the Westbury Show until the Audio Engineering Society Convention was clamoring for attention. Of all places, the Convention was held at the New Yorker Hotel, the scene of fond memories of many Audio Fairs. Oodles of new equipment on display: new mixing consoles, new tape machines from Scully, Ampex, 3M, and Gauss Electrophysics, new Dolby Models 360 and 361, slimline 1/2-inch high versions of the Noise Reduction System, Crown's new IC 150 preamp and DC 150 power amp. Steve Temmer's Gotham Audio was showing a new variable time-delay unit which can have considerable application to four-channel stereo, especially of the synthesis variety. Gotham has also become the agent for the remarkable Stellavox recorder I reported on some time ago. Steve had it set up with the ten-and-a-half-inch reel adaptor, and the capstan

strobe showed the unit right on speed. By design or accident, Electro-Voice and Peter Scheiber were right next to each other, each guiding people through their four-channel maze of matrixes. JVC caused quite a furor with its four-channel discrete stereo disc. I heard it, and it seems to work well, except that the material used for demonstration didn't satisfy my curiosity as to how it would sound with more demanding music. Some eyebrows were raised by the necessity of a 45kHz signal on the disc and the longevity of such a signal under repetitive trackings. In any case this development needs to be closely watched. Highlights of the technical sessions were the demonstration of the fantastic Teldec video disc system, and a symposium on quadrasonic stereo. At the banquet, a much-deserved award went to affable Rudy Bozak for his contributions to audio.

After the AES Convention, I was off to the Newton IHF Show. This was pretty much a repetition of the Westbury Show, except there were more companies exhibiting. With Advent, Harman-Kardon, Fisher and KLH in attendance, Dolbyized sound fared better than at Westbury and there was intense public interest. Four-channel stereo was everywhere, with most exhibitors playing the same Enoch Light music. It is astonishing to me that people who are in the hi-fi business can make such glaring technical boo-boos, but one company (which I shall leave nameless) had set up a four-channel demonstration using their new omni-directional speakers in each corner.....and then proceeded to **heavily drape** the walls behind the speakers! For the first time in years McIntosh was at a hi-fi show, and it was good to see that diminutive dynamo, Exec. VP. Gordon Gow, who was demonstrating their new MR77 tuner and speaker line. Like many companies these days, McIntosh seems to be striving for an extension of their traditional market, hence the venture into speakers. Astrocom created quite a stir with a four-channel stereo **cassette**. The four channels are in line on the 150-mil tape, and since no material is available in that format, they "rolled their own" by dubbing from their new four-channel open reel deck. Sony was demonstrating four-channel stereo using their new omni-directional "conga drum" speakers, and one of several new four-channel tape decks.

One thing everyone agreed upon was that the Newton show was unquestionably the best-run show ever. A large part of this was due to the setting, which was a virtually brand-new Marriott Motor Inn, situated on the Charles River. Beautiful decor, and good

WHY SPEND \$100 MORE?



Here is the new Dynaco A-50 Aperiodic loudspeaker which costs \$100 more than the popular A-25 loudspeaker.

As thousands of listeners have found, the A-25 gives excellent performance throughout the musical range and satisfies at least 95% of all listening requirements. Many people will not want to spend \$100 more for the last 5% that the A-50 provides . . . its lower frequency response, high power handling capabilities, and slightly more linear impedance curve. The A-50's midrange is also slightly smoother because the new dome tweeter's lower resonance permits a 1000 Hz crossover. For most listeners, these are not substantive differences, but for those striving for perfection, they are worthwhile.

Here is how they are attained in the A-50: The A-50's cabinet consists of two closed chambers, each the size of the A-25, connected through an acoustical resistance consisting of a narrow slot filled with the critical density of fiber glass. The

two 10" woofers and high dispersion dome tweeter are mounted in the top half. The top enclosure provides a high degree of acoustical loading in the critical 50—150 Hz spectrum. This damping is responsible for the outstanding transient performance and flat impedance characteristic of the speaker, and explains why power transfer between an amplifier and the speaker is so efficient with an aperiodic design.

Below 50 Hz the bottom air volume is added to the top, giving a large air mass which combined with the two 10" woofers extends low frequency performance.

The A-50 and A-25 are acoustically compatible and both can be used in the same four dimensional stereo playback system. Your dealer now has both speakers available for your comparison. We know you will be satisfied with the A-25. We also know that for those of you who are seeking that last 5% of performance, the A-50 is worth \$100 more . . . \$179.95.

DYNACO INC.

3060 JEFFERSON ST., PHILA., PA. 19121

IN EUROPE WRITE: DYNACO A/S, HUMLUM, STRUER, DENMARK

Dear Editor,

Third Channel Blender

Dear Sir:

I have just read "How Many Channels?" in the November issue. In this same issue, on page 14, you printed my letter and circuit on a derived center speaker. After reading about triphonic stereo, I now wonder if I haven't been getting something similar with my circuit. Mine is very similar to the Dynaco system except that it does not require "digging into" the amplifier and adding the so-called

"blend" resistor. Since most people will be reluctant to modify a \$500 receiver, I suggest the following circuit.

Please note that another speaker may be substituted for the resistance. You then will have a four-speaker system similar to the Dynaco. Also, the improved version (three-speaker) includes a pot so that any degree of blend or anti-blend may be obtained.

If you want a normal derived-center speaker sound—with all the speakers along one wall—you simply adjust for a null in the cross-

channel leakage. Turn the amplifier balance control all the way in one direction and adjust the pot for minimum volume in the speaker with the reduced signal. If you want triphonic stereo—with the speakers arranged in a triangle—you would adjust the pot for somewhat more resistance.

For those who cannot find an Electro-Voice transformer, you may use a Microtran HM-90, but the distortion may be higher at high-power levels. Use the leads marked +16 and -16. Ground the lead marked zero. You should make every effort to obtain the Electro-Voice XT-1, as it is far superior.

Clyde E. Wade, Jr.

312 E. Cedar

Little Rock, Ark. 72205

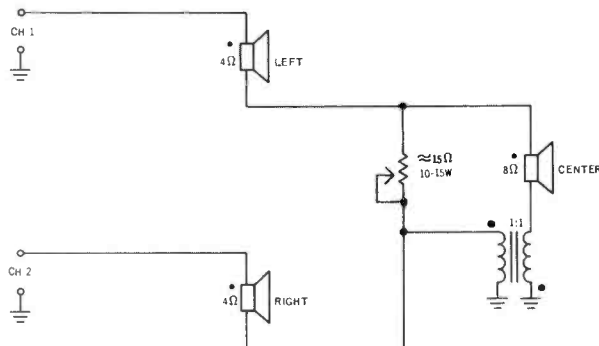


Fig. 1—The transformer must be phased as shown in the diagram or the resistor will not cancel channel leakage.

Off-Center Records

Dear Sirs,

Regarding the controversy about off-center records, those of us who prefer "classical music" may as well face it, we are not going to get any improvement in quality.

As long as record manufacturers can turn out and sell "today's music" at the current rate and get no kick-backs from

(Continued on page 29)

In Memorium



Davis

Arthur C. Davis, pioneer recording and motion picture audio console engineer, recipient of the Audio Engineering Society's John H. Potts Award in 1962, elected

Fellow of the Society in 1955 and Fellow of the Society of Motion Picture and Television Engineers in 1967, died suddenly on November 7, at the age of 62.

Art was born in Salt Lake City on March 11, 1908. While without an extensive formal education, Art became an earned registered Engineer in both mechanical and electrical engineering. Best known for his prolific outpouring of highly innovative breakthroughs in audio control devices over a 40-year design career, Art spent his six years at Altec training and assisting budding, young engineers in addition to designing, developing and producing Altec's entire audio control product line.

Art was one of the co-inventors of Acousta-Voicing and the designer of the original Acousta-Voicing equalizer. His creative output included graphic equalizers, program equalizers, filter sets, loudspeakers, straight line attenuators, gain sets, the first magnetic film recorder system, a multitude of attenuator types,

and state-of-the-art audio console electronics.

Art not only designed the products, but designed and engineered the machines required to manufacture the products as well. During his 40-year career, Art was always found in the top groups of professional designers and refused to compromise simply to achieve larger commercial production.

To those who had the privilege to know and work with Art Davis, the opportunity was universally regarded as a rare privilege, both technically and socially.

In the hearts and minds of his younger associates the words of Thomas Wolfe best describe the life of this unique and gifted man:

"So, then, to every man his chance... to every man regardless of his birth, his shining, golden opportunity... to every man his right to live, to work, to be himself, and to become whatever thing his manhood and his vision can combine to make him... this, seeker, is the promise of America."

THE SANSUI QS-1 QUADPHONIC SYNTHESIZER®



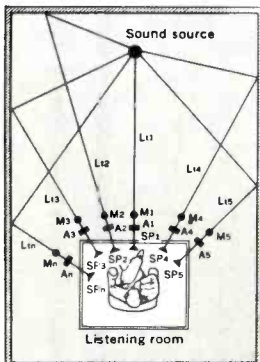
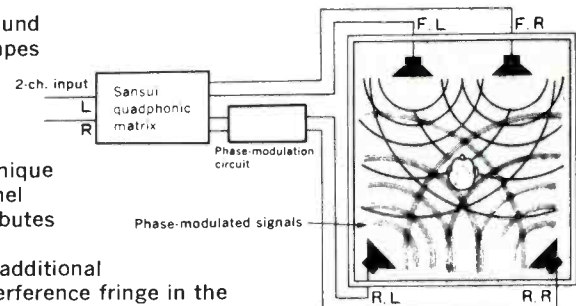
SANSUI QS-1

4-CHANNEL SOUND FROM ANY 2-CHANNEL SOURCE Senses and recovers the ambient information hidden in your stereo discs, tapes and broadcasts

After having discovered that the ambient components of the original total sound field are already contained in hidden form, in conventional stereo records, tapes and broadcasts, Sansui engineers developed a method for sensing and recovering them. These subtle shifts and modulations, if re-introduced, breathtakingly recreate the total of the original sound as it existed in the recording or broadcast studio.

The heart of the Sansui Quadphonic Synthesizer* is a combination of a unique reproducing matrix and a phase modulator. The matrix analyzes the 2-channel information to obtain separate direct and indirect components, then redistributes these signals into a sound field consisting of four distinct sources.

This type of phase modulation of the indirect components, applied to the additional speakers, adds another important element. It sets up a complex phase interference fringe in the listening room that duplicates the multiple indirect-wave effects of the original field. The result is parallel to what would be obtained by using an infinite number of microphones in the studio (M1 through Mn in the accompanying illustration) and reproducing them through a corresponding number of channels and speakers.



The startling, multidimensional effect goes beyond the four discrete sources used in conventional 4-channel stereo, actually enhancing the sense of spatial distribution and dramatically expanding the dynamic range. Also, the effect is evident anywhere in the listening room, not just in a limited area at the center. And that is exactly the effect obtained with live music! This phenomenon is one of the true tests of the Quadphonic system.

The Sansui Quadphonic Synthesizer QS-1 has been the talk of the recent high-fidelity shows at which it has been demonstrated throughout the country. You have to hear it yourself to believe it. And you can do that now at your Sansui dealer. Discover that you can hear four channels plus, today, with your present records and present stereo broadcasts. \$199.95.

*Patents Pending



SANSUI ELECTRONICS CORP.

Woodside, New York • Gardena, California

SANSUI ELECTRIC CO., LTD., Tokyo, Japan • Frankfurt a M., West Germany
Electronic Distributors (Canada), British Columbia

What's New in Audio

Mikado Four-Channel Adapter

This device permits a single regular stereo receiver to pick up and decode the four-channel programs which are being experimentally broadcast in the San Francisco area using the Dorren four-channel system. A limited supply of these units is being offered on a conditional basis, as the FCC will not make its final analysis until actual live broadcast test data and records are available. Price \$99.95.

Check No. 127 on Reader Service Card

BASF Supreme cassettes



These unrecorded cassettes feature an extra-low-noise tape, giving wide frequency range and low distortion. The tape has a special finish which minimizes head wear and is tensilized for high strength and long life. The case has a graduated "tape-view" window and allows smooth winding and playing performance. Four playing times are available: 30, 60, 90, and 120 minutes.

Check No. 128 on Reader Service Card

Altec Lansing 714A receiver

This AM/FM stereo receiver offers 44 watts rms power per channel, rather than 44 watts total as was stated in the September issue. The unit has a power bandwidth of 15 to 45k Hz \pm 1 dB.



Signal-to-noise ratio at rated output is 60 dB, and THD is 0.5 per cent. The FM tuner section has an IHF sensitivity of 1.9 μ V. with a capture ratio of 2.0 dB. Other features include slide-type volume, balance, bass, and treble controls, push button selection of function, and front panel headphone jack. Fail-safe circuitry includes Xtal filters, ICs, and FETs. Price \$399.00.

Check No. 129 on Reader Service Card

Soundcraft Magna-See

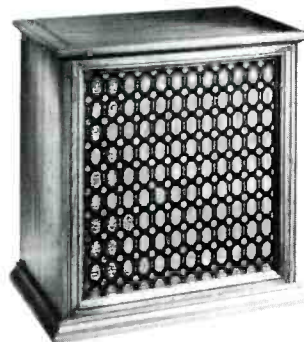


This tape recorder accessory makes magnetic sound tracks visible to simplify editing and facilitate equipment check-out. It enables the user to spot such equipment troubles as improper alignment and balance and head wear.

Check No. 130 on Reader Service Card

Heath AS-101, AS-102 Speakers

Both systems share a common cabinet design, styled in Mediterranean and finished in pecan. The AS-101 Heath/Altec-Lansing features a 15" woofer and a 18" sectoral horn and is said to have



frequency response from 35 to 22,000 Hz. The AS-102 Heath/Bozak, which uses a 12" woofer, a 6" midrange, and two 2 1/2" tweeters, delivers 40 to 20,000 Hz response. Dimensions are 29 5/8" h. by 27 3/4" w. by 19 7/8" d. Price \$259.95.

Check No. 131 on Reader Service Card

RCA Vibrant tape cassettes

This new line of popular-priced unrecorded tape cassettes offers a tensilized polyester, silicone-lubricated, splice-free tape in 30, 60, and 90 minute lengths. The cassettes are color-coded for quick identification and are sold blister packed on display cards to keep dust and dirt out. Prices: C-30, \$1.39; C-60, \$1.69, and C-90, \$2.49.

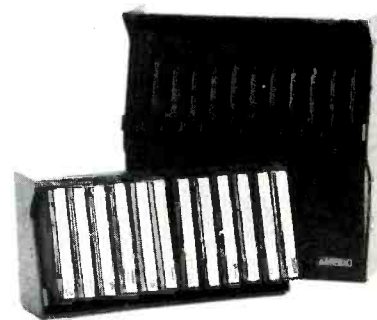
Check No. 132 on Reader Service Card

Automated Learning repeating cassette

This automatic repeating cassette will operate with any cassette recorder or player and requires no special equipment or modification of the recorder. The recorded message can be played over and over with no appreciable loss of fidelity after many thousands of hours of playing time, says the maker. Any length message, from one to 20 minutes, can be loaded on the cassettes by the maker, who will also supply blank cassettes in the same range of lengths.

Check No. 133 on Reader Service Card

Ampex Cassette Caddy



Constructed of walnut-grained styrene, this cassette caddy will hold a dozen cassette tapes. The unit is composed of a sectioned tape tray and an enclosing holder. The tray snaps into the holder portion to either display or completely enclose the tapes. Grooves in the top and bottom of the caddy allow additional units to be interlocked for stacking.

Check No. 134 on Reader Service Card

Martel Model 40W-Mk. III Receiver

This AM/FM stereo receiver is rated at 40 watts rms and FM sensitivity is quoted as 2.0 μ V. Capture ratio is 5.7 dB. The



slim-line chassis is only 3 1/2" high. A full range of front panel controls includes a speaker on-off switch and tape monitor-source switch. Output transistors are mounted on the printed circuit board with individual heat sinks for increased performance. Frequency response for the receiver section is 22 to 22,000 Hz; amplifier, 15 to 30,000 Hz. Price \$134.95.

Check No. 135 on Reader Service Card

To call it "an amplifier" would be like calling a Porsche "Basic transportation"

There is unusual satisfaction that comes from fulfilling a prosaic task in a far from prosaic manner.

Hence this amplifying system: the Sony TA-2000 professional preamplifier and the Sony TA-3200F power amplifier. Together, they perform all an amplifier's standard tasks in a satisfyingly impeccable manner; but their 67 levers, switches, meters, knobs and jacks allow you to perform some interesting functions that are anything but standard.

Dual-purpose meters.

The two VU meters on the preamplifier front panel, for example, are no more necessary than a tachometer on an automobile. But they do serve the dual purpose of simplifying record-level control when the TA-2000 is used as a dubbing center, and of allowing you to test your system's frequency response and channel separation (as well as those of your phono cartridge) and to adjust the azimuth of your tape heads.

A broadcast/recording monitor console in miniature.

The TA-2000 resembles professional sound consoles in more than its VU meters. In addition to the 20 jacks and seven input level controls provided on its rear panel for permanent connections to the rest of your hi-fi system, the TA-2000 boasts a professional patch board in miniature on its front.

Thus, you can feed the inputs from microphones, electric guitars, portable recorders or other signal sources into your system without moving the preamplifier or disturbing your normal system connections in the least. And a front-panel Line Out jack feeds signals for dubbing or other purposes into an external amp or tape recorder, with full control of tone and level from the front-panel controls and VU meters.

The tone correction and filtering facilities are also reminiscent of professional practice, allowing a total of 488 *precisely repeatable* response settings, including one in which all tone controls and filters are removed completely from the circuit.

The amplifier—no mere "black box"

A power amplifier can be considered simply as a "black box" with input and output connections, a power cord, and an on/off switch; and such an amplifier can perform as well (or poorly) as the next one. But in designing the TA-3200F Sony took pains to match the amplifier's facilities to the preamplifier's.

Thus to complement the TA-2000's two pairs of stereo outputs, the TA-3200F has two stereo pairs of inputs, selected by a switch on the front panel. Other front panel controls include independent input level controls for both channels, a speaker

selector switch, and a power limiter (in case your present speaker should lack the power handling capacity of the next one you intend to buy).

Circuitry unusual, performance more so

The single-ended, push-pull output circuitry of the TA-3200F amplifier is supplied with both positive and negative voltages (not just positive and "ground") from dual balanced power supplies. This system allows the amplifier to be coupled directly to the speakers with no intervening coupling capacitors to cause phase shift or low-end roll-off (A switch on the rear panel does let you limit the bass response below 30Hz if you should want to, otherwise, it extends all the way down to 10Hz.)

The individual stages within the amplifier are also directly coupled with a transformerless complementary-symmetry driver stage, and Darlington type capacitorless coupling between the voltage amplifier stages.

As a result, in part, of this unique approach, the TA-3200F produces 200 watts of continuous (RMS) power at 8 ohms, across the entire frequency range from 20 to 20,000 Hz; IHF Dynamic Power is rated at 320 watts into 8 ohms (and fully 500 watts into a 4-ohm load).

But more important by far is the quality of the sound; intermodulation and harmonic distortion levels are held to a mere 0.1% at full rated output, and 0.03% at the more likely listening level of one-half watt. The signal-to-noise ratio is an incredible 110dB. And the full damping factor of 170 is maintained down to the lowest, most critical frequencies (another advantage of the capacitorless output circuit).

The companion TA-2000 preamplifier also boasts vanishingly low distortion and a wide signal-to-noise ratio, but this is less unusual in a preamplifier of the TA-2000's quality (and price). What is unusual is the performance of the phono and tape head preamplifier circuits; for though they have sufficient sensitivity (0.06mV) for the lowest-output cartridges (even without accessory transformers), these preamplifier circuits are virtually immune to overload—even with input signals 80 times greater than normal.

Their sole vice: they are hardly inexpensive

Of course, at a price of \$329.50 (suggested list) for the TA-2000 preamplifier, and \$349.50 (suggested list) for the TA-3200F power amp, this system cannot be considered other than a luxury. But then, it was intended to be. For there are those to whom fulfillment of prosaic tasks is

unfilling. And among them are not only many of our customers, but also many of our engineers. Sony Corporation of America, 47-47 Van Dam Street, Long Island City, New York 11101.

SONY®

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Editor's Review

ON PAGES 36 - 41 will be found a directory of open-reel tape recorders listing some 80 machines. Because of space limitations, cassette and cartridge-type units were not included and these will be reviewed at length in future issues. Open-reel machines are still superior from the hi fi standpoint but the gap (no pun intended) is closing every day. One significant pointer is the announcement by Schwann that 8-track cartridges and cassettes tape numbers will be included in future issues and that the publication will then change its name to Schwann Record and Tape Guide. Said the president, William Schwann, "It's a recognition that 8-track cartridge and cassette tape has come into its own and represents an important and growing segment of the recorded music product." Sales of cassettes are increasing at a fantastic rate—although of course most of them are destined for the pop market. One company alone (Sarex Corporation) has just installed a tape-coating machine capable of producing tape for 250,000 cassettes *per day* The 25-foot-long equipment is automatic and weighs over 15 tons!

Son et Lumiere

For the first time, physicists have been able to use light to amplify sound waves. This news comes from the Polytechnic Institute of Brooklyn and the scientists concerned are Dr. Edward Cassedy and Martin Piltch. The experiments involve the use of a laser beam which causes stresses in a quartz crystal. Ultrasonic waves are then passed through the crystal and the interaction or scattering can result in an amplification. So far, gains of ten have been attained. More information can be obtained from Applied Physics Letters. Vol. 17 (July 1970).

Tri-phonics

The article on three-channel stereo (How Many Channels? by Duane Cooper, November) and the previous contributions from Gerzon and Hafler proved extremely popular and many readers must have surreptitiously sneaked a third loudspeaker into their listening room.

My own experiments have led me to the following conclusions: a rear speaker using the difference signal can definitely add spaciousness and a sense of depth to some recordings. It all depends on the *method* of recording, the tape mix and so on. In general, tapes or discs made with the MS system give

the best results; those made with the more frequently-used multiple mike techniques can sound very dramatic, but often the extra speaker proves a little distracting. The majority of my "listening panel" prefer the third speaker placed slightly in front of the listening area on one side—some like a fourth speaker wired in parallel, placed by the opposite wall. Optimum speaker placement for real "genuine 4-channel reproduction" will again depend on the recording techniques and to a certain extent on the music. Surround sound is fine for most electronic music, choral works, and music specially composed for the medium—but it is less convincing for orchestral or chamber music unless the rear channels supply reverberation only.

* * *

An article on recording with the Hafler method will appear in the next issue—also another controversial article on speaker IM distortion.

* * *

Mike Curb, president of MGM records has called drug groups "the cancer of the industry." He said ". . . the groups appear, smashed out of their minds and describe a great experience they had on drugs. They glorify drugs. I credit hard drug record acts with starting hundreds and hundreds of new drug users." MGM will ban lyrics about drugs and the rock groups who use them. This announcement brought an almost immediate response from Clive Davis, president of Columbia records, who stated ". . . drugs are destructive to mind and body and it is all too clear that their usage must be stopped However this terrible problem must be dealt with intelligently, not by artist witch hunts to which responsible people cannot subscribe. . . . The charge that music, specifically rock music, supports and encourages drug experimentation is, at the least, erroneous and, at the most, a complete reversal of the cultural process. Music is a reflection of a culture, a footnote to events within a society."

Well, there is some truth in the foregoing, but look at the problem this way: youngsters, schoolchildren who are continually conditioned by a barrage of "songs" about the wonders of being "high," must surely have their normal inhibitions broken down long before the pushers appear. . . . Banning drug glorification is admittedly only part of the answer but it is a censorship we can live with—especially if it is carried out by the industry itself. Or so it seems to me.

G. W. T.

THE RECORD LOVERHATER



Edward Tatnall Canby, Author and Critic

The job of the music critic isn't easy. He can help a record make it to the top or damn it to oblivion.

And since many people depend on his judgment when they shop for records, it's logical to ask:

"But what does he depend on?"

Mostly, his ears and his knowledge help him as he listens. Yet the music critic can only hear what his stereo system delivers. If his critical listening is to be unbiased, it must begin with a stereo cartridge whose frequency response characteristics are as flat as possible. One that introduces no extraneous coloration as it reproduces recorded material.

Many record critics do their auditioning with the Stanton 681EE. Recording engineers have long used the Stanton 681A to check recording channel calibration. The 681EE provides that logical continuation of the Stanton Calibration Concept. It has been designed for

low-distortion tracking with minimum stylus force. Its low-mass, moving magnetic system produces virtually straight-line frequency response across the entire audio spectrum. Its built-in longhair brush keeps the stylus dust-free, and protects record grooves, thus reducing noise and wear. Each 681EE is individually calibrated, and the results of these calibration tests are included with each cartridge.

The Stanton 681EE—used by recording engineers, broadcasters, critics and audio professionals—the cartridge that sounds like the record sounds, always.

For further information, write: Stanton Magnetics, Inc., Terminal Drive, Plainview, N.Y. 11803.



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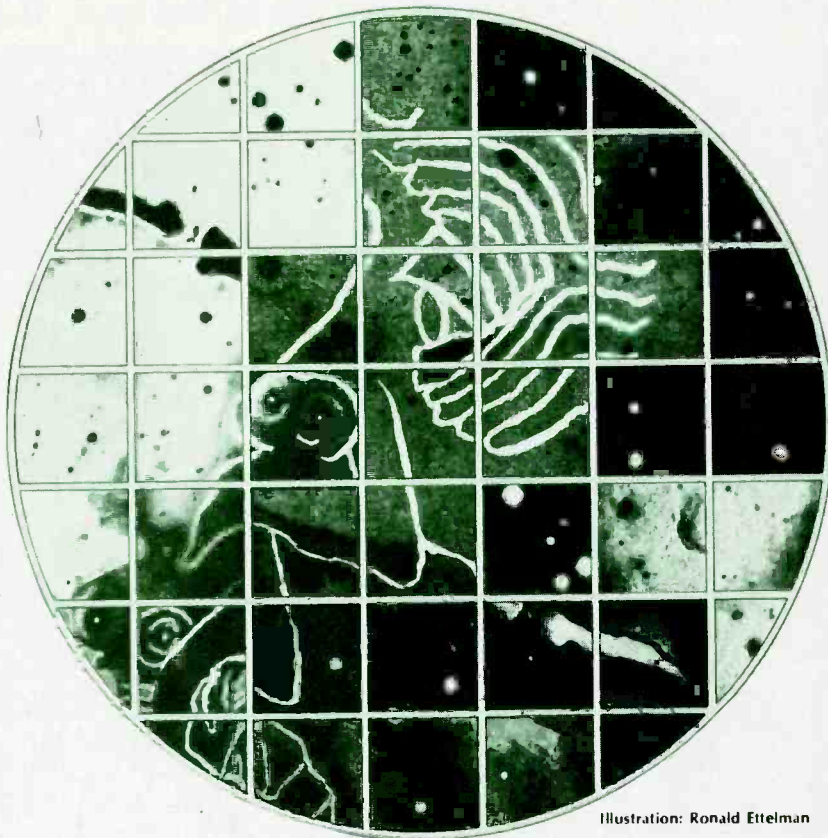


Illustration: Ronald Eitelman

Edward Tatnall Canby **THE WAR OF THE WORLDS**

THE RECORDING: "The War of the Worlds". Evolution 4001 (2 discs, sim. stereo) (\$6.99). Via Longines Symphonette.

THE BOOK: "The Panic Broadcast" by Howard Koch. 1970, Little, Brown. (\$4.95).

PERHAPS they couldn't risk waiting for its 35th anniversary in 1973. Maybe back in 1968, its 30th, nobody happened to think of the idea, or the time just wasn't ripe. Anyhow, we have just passed the 32nd anniversary of the famous 1938 Panic Broadcast, Orson Welles' Mercury Theatre adaptation of H.G. Wells' "War of the Worlds." And now, at last, it is back again for all to hear on a pair of LP records. A race of super-Martians invade Earth via huge rocket ships. The Wells original dates from 1898. Orson Welles, of course, transferred the action to America and the present—that Sunday evening,

October 30th, 1938. It was wholly contemporary.

The play went on the air via the CBS coast-to-coast network. By the next morning, a goodly segment of America was shamefacedly digging out from a shambles of confusion. During the night thousands of solid citizens had taken the broadcast for real—or fragments of it—and had acted accordingly. Stark, zany panic! The highways were full of rocketing cars, fleeing in a wild escape to nowhere. Hospitals were besieged, police departments overwhelmed with hysterical inquiries. People had to be sedated. Cars suddenly roared down quiet city streets through dozens of red lights at top speed, to get away—anywhere. It was the end of the world, for awhile, at least.

We've all heard about it. Some of us still remember, including myself. I was listening in at Princeton, New Jersey, just *five miles* from the alleged scene of the first Martian landing! For all

these years it has been a source of pride to me that, all unknowing, I listened for a few moments, with growing perplexity, then let out a loud horse laugh. Some fake! In a few more moments I recognized the original, the H. G. Wells classic. Maybe it was the very nearness of the Martians, at Grovers Mills, a hamlet on the other side of Princeton Junction only ten minutes driving time away, that made the thing seem so preposterous. But there were Princeton professors who spent that night frantically searching for the impact point of the "meteor" (they must have heard only part of the story, like most people). *They* believed. So did millions all over the nation, for of course Welles and his script writer Howard Koch had quickly landed Martians all over the place. CBS network, remember, and so everybody had to be in on it.

To be sure, I had been reading H. G. Wells since childhood. My father knew him and I had met him. We owned a presentation set of the complete H.G.W. and I had read every one of the early "science fiction" stories long before science fiction came of age. "The Time Machine" was my favorite and "The War of the Worlds" wasn't far behind, along with "The Invisible Man." So it didn't take me long to straighten things out.

The Wells original was then some forty years old. The Welles re-creation on the other hand, was totally of the moment. That was the idea: To adapt a timeless story (more or less) to a very timely moment, the *precise present*. That's what did it.

More important, as we look (and listen) back, was the means: radio, and the language of broadcast communication. However ingenious, the printed script could have fooled nobody. Not even Howard Koch's classic allusions to current geography and believable events, direct impetus for the panic, could have done it on paper. What mattered was that all this was *on the radio*—and how could radio be wrong? How could it miss, considering the way people listen to radio? It was a setup for panic.

The language of broadcasting is full of redundancy because, like the highway signs that flash by, one exposure isn't enough. By its very nature, radio is heard in fragments. Only the big, simple ideas register, and even these are easily distorted when excitement takes over. We hear what we need to hear. As for details, they seldom penetrate. Lost in the shuffle. As every writer of commercials knows, if you want to get over specific points you repeat and you

repeat. It's the medium. During my own half hour radio broadcast I keep a constant image before me of thousands of people tuning in and tuning out every second. Radio's over-all attention span is good for perhaps two minutes. Beyond that, you must count on repetition. I always do, even for the intelligentsia! Again, it's the nature of the beast.

In times of emotional stress, in broadcasts that offer stressful material, the fact-absorbing ability of the listener goes down virtually to zero. It is an awesome phenomenon. Most of Orson Welles' 1938 audience heard only a few moments of the show, not too many listened the full hour. But a predictably tiny proportion of *all* listeners got the essential message—*This is a dramatization*. In that time of profound unrest, right after the Munich settlement that settled nothing, most listeners grasped just one horrible idea—*CATASTROPHE*—right here at home. It was a living nightmare coming true, right on the radio, and without a second thought thousands of them turned and ran for their lives.

As Howard Koch explains in his book, there is an authority in a broadcast announcement that carries more sheer emotional weight than any other form of communication. So great, indeed, that the mere presence of obvious falsehoods and/or inconsistencies rarely stand in the way—if we hear them at all. We believe what we think we hear. We close our minds and surrender ourselves to broadcasting's authority, without defense. We did then. We could today. I do not think this power is one bit less awesome now than in 1938, nor are we basically any more reasonable in its presence.

On that famous October evening, radio was for the first time really put to the test, though we had known its power and we were already used to the rantings of polls and indexes and forecasters, telling us how many millions were listening and how the sales curves had jumped. But this went far beyond sales power! It was modern mass communication exposed at last for its full potential. And quite by mistake though, in fact, Welles and Koch intended exactly the impact they got. They merely underestimated it by a thousandfold. (As to old H. G. Wells, when informed of all the fuss he merely remarked, it is said, "How odd!")

I have a modest additional contribution to make in the face of these happenings, so long ago. I had a quick and unexpected reaction to these discs, the first time I had actually heard "The War"

since the original broadcast though the occasion has always been in my mind. I had heard that program in 1938 as fresh, contemporary radio, entirely realistic. The years rolled on and, insensibly, I continued to imagine it just that way, fresh still, and contemporary, right out of normal radio. Wouldn't you?

And so when the records began to play I almost fell over in surprise. Not because of the dismal lack of "fi," which I had expected. (The recording is assembled from a number of disc transcriptions of marginal quality.) What hit me was the antiquated *style* of the radio presentation, out of another world. Had radio really changed that much? I wouldn't have believed it.



Such formal, didactic announcing, high tenor voices, almost scolding, such lecture-like news broadcasting! Announcers today are invariably baritones, and they do not scold; they are disciplined but informal. Not these! They are shouting to the multitudes, instead of talking to you in your living room. They don't sound like announcers. The news doesn't sound like any news you ever heard. (But it did, then.)

Such quaint verbiage! I had really forgotten. All polite formality, in a stylized, old fashioned manner, still with a lot of the turn-of-the-century courtliness like the old acoustic discs. "Ladies and gentlemen, we take you now to....." "Ladies and gentlemen we interrupt this program for the latest news bulletin....." Those ladies and gentlemen were back every few moments, even at the end of the world. We have no need for such formalities now. "We present" "We are honored.....", all flowery linguistic handlebars that we have streamlined away. No fancy introductions today. We just throw it right at them. We don't bother to "take you now" anywhere. We just go. And so-and-so reports, from Hong Kong or South Africa or wherever.

And the fades! Fade in, fade out, fade over and under. Music coming up, music fading down, musical bridges, up, under and out. A lost language! We simply cut, straight from one thing to another, nowadays, via switching or tape-edit or cartridge. That bilious, seasick fading in and out sounds extremely odd to present ears, where once we took it as basic and so weren't even aware of it. The language has changed.

And the interviews! A famous "professor" of the old school (Orson Welles, of course), complete with rolled Rs. Longwinded scientific explanations, full of hot air. A fake weather report, total nonsense. We would spot it today, quick. That ticking sound in the (supposed) Princeton Observatory, where the professor is ensconced, ascribed to "vibrations" in the telescope mechanism: obviously it was a cheap alarm clock held up to a convenient CBS mike. Indeed, most of the sound effects of that day are, by our standards, crude and unconvincing. Even the big guns firing against the Martians sound to me suspiciously like studio drums, with rolled cymbal crashes for the echo. (The live studio orchestra? There was one.) Sound effects were done in the studio in those days. Now, we tape them for real.

Conclusion 1: If you heard it today, you would be unlikely to fall for that 1938 broadcast, unless you were in a near-hysterical state. Not because you are so rational. Because *it doesn't sound like a broadcast* any more.

Even if it were to be redone with precisely the same sound but in hi fi stereo, you still wouldn't fall. The 1938 radio style has gone into history. It isn't contemporary. Our medium since then has enormously refined itself, powered up its special language in terms of its own best parameters. We should look (and listen) with new awe at this communications instrument which—for better or worse—we now have at our command. Even without TV it is very, very potent.

Conclusion 2: On the other hand, if "The War of the Worlds" or its equivalent were to be cast into modern broadcast terms, for an entirely *contemporary* effect—what then? Without the slightest doubt, we would fall for it once again. And this time we might precipitate a much more serious near-end of our world, from which we would be unlikely to recover (shamefacedly) by the next morning.

In all truth, broadcasting is now an awesome power and we should never forget it. Will the next test perhaps be the real thing?

Tape Transport Maintenance

PART 7: Cassette Mechanisms

H. W. Hellyer



Advent Model 200

A MAN would have to be blind and deaf to be unaware of the growth of cassette- and cartridge-loading tape recorders over the past couple of years. They will not—as some of the more hysterical reviewers have implied—completely oust the reel-to-reel machine. Each has its own virtue; each its particular application. Cassettes have come to stay, however, and the number of tape decks using a variation of the patented Philips system has swelled alarmingly (or satisfyingly depending on which side of the fence you sit).

The real audio-buff tends to look down at packaged tape, whether cassette or cartridge. He is making a mistake. Whatever system you choose, the standard of modern tape and the improvement of modern mechanics, allows you to enjoy the best of good music at home, on the move, anywhere. As Bert Whyte found (*AUDIO*, April 1970) for lower level listening “at apartment house level” and for sheer convenience, cassettes could not be matched. He noted the excellence of the tape in the DGG cassettes that had just come to his notice, and commented on the hiss which impaired the dynamic range when played at high levels through a high fidelity system.

Our Bert, still tingling from his train-catching tramp through the snow with the Stellavox, may have overlooked the fact that the DGG tapes were recorded to CCIR characteristics, and he does not mention what equipment was used for his replay experiments.

He is right, though, to say “Until this bug-a-boo of hiss is conquered, cassettes will never realize their potential.” Right, too, to point out that progress was and is being made. Recent researches by Ed Canby have given us a clue to the future of the cassette. With Dolbyized recordings and super-quality tape, we shall get to the standard it is now possible to reach with disc and with reel-to-reel recorders of the better quality at 1 $\frac{1}{2}$ in./sec. Maybe sooner than you think.

Now is as good a time as any to take a more intimate look at the cassette-loading mechanism, with its special maintenance problems. Cartridges we shall have to leave for later—there are still too many ways of doing the same thing where multi-track operation is concerned. But the cassette mechanisms are all based on an original Philips’ design, however much succeeding manufacturers try to trick it up. This design found its way to the market in 1963, called the EL 3300, in Europe. The U.S. invasion followed three years later reversing the usual trend.

Cassette Recorder Design

Design of a portable tape recorder is not just a matter of whittling down a larger machine. Nor is it simply achieved by

arranging a battery supply and fitting a handle! There are special circuits for drive control and some ingenious ways of compromising and combining RECORD, PLAY and INDICATOR circuits. In addition to this, modern techniques of electret microphone construction permit the building of a really compact portable with no trailing leads.

Power supplies present few problems. With motors capable of achieving sufficient torque even from as little as 3 volts, and overall consumption during RECORD or PLAY limited to a few milli-amps, battery-stowage space need not be great. The present tendency is to add a simple transformer and rectifier circuit, with rudimentary smoothing, to allow operation from a.c. supply. But the price for this added convenience must often be paid in an increase of noise level during recording.

Some authorities disclaim this as a drawback. “Most recording is done in the field,” they argue, “so the a.c. facility can be used on replay.” But the crunch comes when one has to dub off those precious cassettes onto open reels for convenient and economical storage. Then, the use of batteries is expensive and the use of an a.c. supply can still raise the noise level more than may be tolerated. Perhaps the solution lies in the rechargeable cell—slowly gaining ground among enthusiasts.

Normal method of power-supply switching is a leaf spring actuated by the insertion of the a.c. adapter. In some cases, extra power is available by this action, and in more than one design there are three alternative power-supply circuits, adapted for use with internal cells, from an automobile battery and from house current.

But I exceed my brief as much as the exuberant Bert did and must come back to basics. And nothing could be more basic than the motor supply. Without it the recorder is just so much trash. And with it, unregulated, the recorder may be little better. As batteries run down, so the motor slows, falters and finally stops, and this is not a regular decline. It is considered better for the supply to drive the motor at full available power as long as can be, then stop. This is the way power supplies are tailored nowadays. The regulator ensures a supply until the batteries are no longer capable of sustaining the load, and then the regulator cuts in and the motor cuts out. We shall see later how this can be done.

Simple motor-control circuits start with the Zener diode, preventing the applied voltage from rising above a pre-determined amount, then combined with an adequate overload capability for long life. In the most refined designs they have sensors and differential amplifiers, monitoring the speed and regularity of the tape transport. One or two examples we shall discuss have performance specifications well up to professional rating.

It's not an easy decision to make. There's such a wealth of precision built into every Dual that even the testing laboratories can measure only small differences in performance among the Dual 1215 at \$99.50, the 1209 at \$129.50 and 1219 at \$175.00.

This raises an interesting question for you to consider: What are the important differences to you among these three Duals?

Let's consider them in turn.

Even our lowest priced turntable, the 1215, boasts features any turntable should have (and few do).

Its low-mass counterbalanced tonearm accepts the most sensitive cartridge available today and tracks flawlessly as low as $\frac{3}{4}$ gram.

Tracking force and anti-skating settings are ingeniously synchronized, so one setting does for both. The cue control is silicone-damped, and eases the tonearm onto the record more gently than a surgeon's hand.

The hi-torque motor brings the heavy $3\frac{3}{4}$ pound platter to full speed in less than a half turn, and maintains that speed; within 0.1% even if line voltage varies widely.

And it even has a control to let you match record pitch with less fortunate instruments such as out-of-tune pianos.

Even a professional doesn't need more.

But you may want more. In which case the 1209 offers some refinements that are both esthetically pleasing and add something to performance.


For example: its tonearm tracks at as low as a half gram. Its anti-skating system is calibrated separately for elliptical and conical styli. Its counterbalance features a 0.01 gram click-stop. And its motor is hi-torque and synchronous.

Now what could the 1219 add to this?

The only true gimbal suspension ever available on an automatic arm. Four identical suspension points, one ring pivoting inside another.

And the Mode Selector, which shifts the entire tonearm base — down for single play, up for multiple play — so that the stylus will track at precisely the correct angle (15°) whether playing one record or a stack. The tonearm is $8\frac{3}{4}$ " long, and the 12 inch dynamically balanced platter weights 7 pounds.

So the question really isn't which Dual is good enough, but how much more than "good" your turntable has to be. If our literature doesn't help, perhaps a visit to your dealer will.

United Audio Products, Inc., 120 So. Columbus Ave., Mt. Vernon, New York 10553. 

Now that you know you want a Dual, the next question is which one?



1215 — \$99.50

1219 — \$175.00

1209 — \$129.50

Check No. 23 on Reader Service Card

Fig. 1—Showing schematic layout of major components of Philips-type cassette recorder.

Fig. 2—With cassette partly ejected and the tape run through to its leader, the pressure pad and spring and the cutaway portions of the cassette are visible.

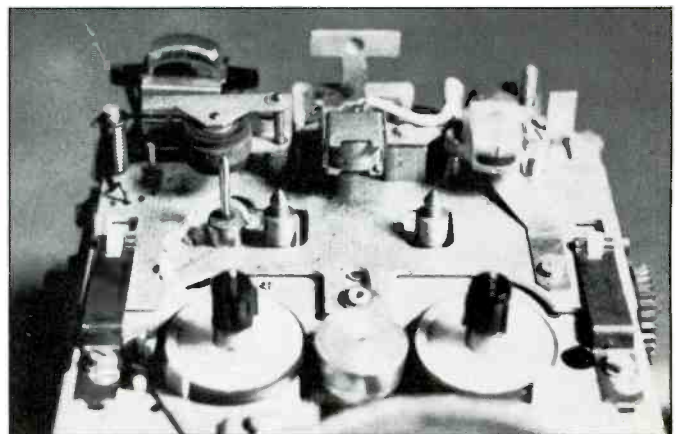
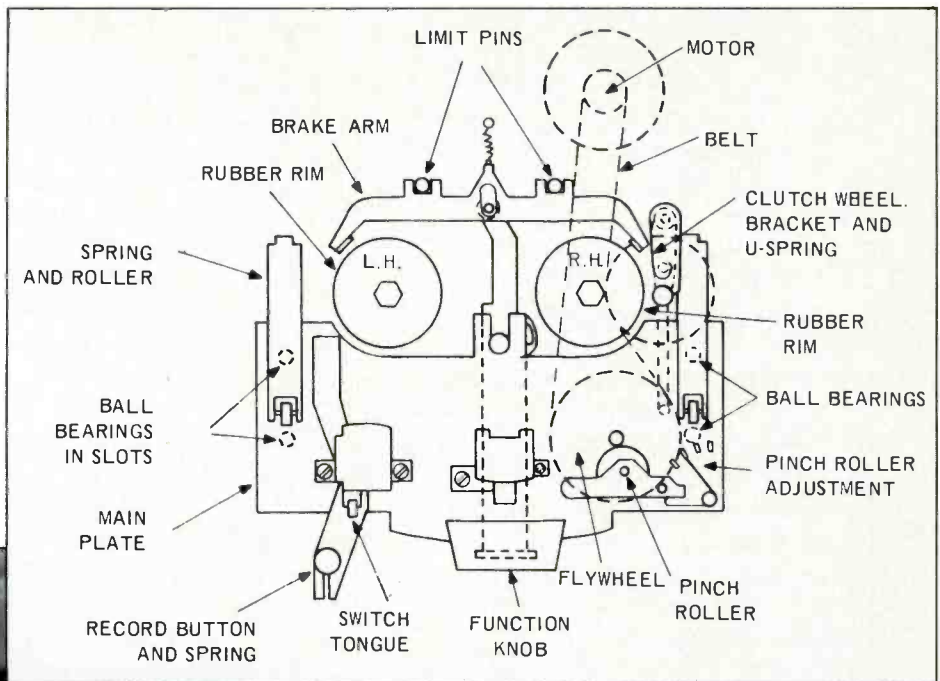


Fig. 3—Showing upper portion of Philips-design deck, looking forward toward the head and function buttons.

For most cassette tape recorders, a deck layout such as that of Fig. 1 is quite usual. Small turntables with sprung, splined tops engage the hubs of the cassette and locating pins minimize the amount of lateral play. As the run of the tape across the front of the cassette (oxide coating outwards) cannot be altered, it is necessary to advance the heads and pressure roller every time we select **PLAY** or **RECORD**. (See Fig. 2, where a partially ejected cassette has been run back to its transparent leader to demonstrate the apertures and recesses in the front of the cassette.) The darker shading of this traveling plate in Fig. 1 makes this easier to understand but does not show the various clearance slots and abutments that are needed. These can be studied better in Fig. 3, where an alternative view of the stripped deck is given.

The first thing evident is the need for a shaped cutaway for the capstan spindle and elongated holes for the cassette locating pins. These are shown in greater detail in Fig. 4, where we also become aware of the simple spring adjustment for pinch-roller pressure. The outer arm of this spring is fitted to the end of the roller arm. The nearer the roller the captured end of the spring is placed, the greater the inward pressure.

Also plainly visible in both these shots and indicated in Fig. 1 are the very important springs and rollers which guide the head plate forward correctly when **RECORD** or **PLAY** are selected. The plate runs on ball bearings, which click into detents at the limits of travel. Again, simplicity is the aim, and the designers earn a salute for the effectiveness of their baby. Once or twice, I have had trouble with the sliding plate, but the cause has generally been a bit of dirt gumming up the spring rollers and allowing them to override. The solution is obvious!

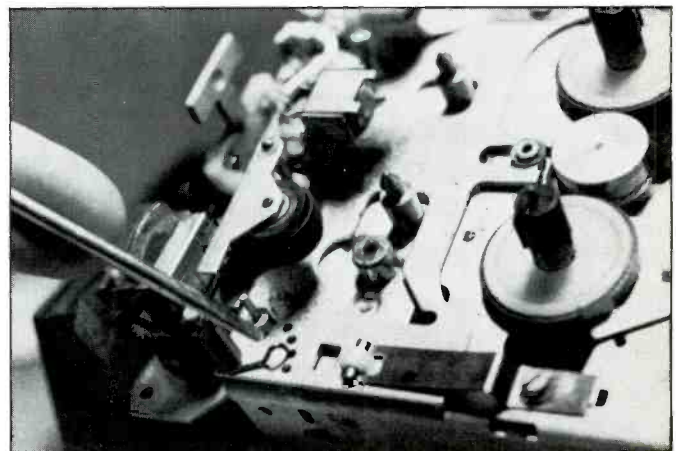


Fig. 4—Pinch roller adjustment is indicated by the screwdriver. The flywheel and capstan spindle have been removed.

CAN YOU GUESS

WHICH FACTOR IS MOST RESPONSIBLE FOR THE LEADING POSITION OF THE BOSE 901 DIRECT/REFLECTING® SPEAKER SYSTEM?

IS IT:

1 The Rave Reviews?

(Circle the number at the bottom of this page on your reader service card for complete reprints of the nine reviews and a list of BOSE dealers in your area.)

2 The 12 Years of Research? — research that went

beyond the collection of graphs and numerical data into the basic problems of correlating the perception of music with speaker design parameters.

(Copies of the Audio Engineering Society paper 'ON THE DESIGN, MEASUREMENT AND EVALUATION OF LOUDSPEAKERS', by Dr. A. G. Bose, are available from BOSE Corp. for fifty cents.)

3 The Sound of Music Through the 901?

(Enjoy it at your nearest BOSE dealer or in the more comfortable surroundings of your friend's home.)

THE ANSWER:

(AS INDICATED BY CUSTOMER SURVEYS)

The research made it all possible and the rave reviews cause people to listen to the BOSE 901. BUT, the surveys show that the sound of the 901 is, by far, the major reason that owners of large and small speakers trade for the 901 and that newcomers to stereo select the 901. That's how it should be — you are not buying reviews or research the relevance of which rests completely upon the 901's ability to produce music with a fidelity that you will immediately recognize as superior. You are buying sound.

LISTEN TO THE BOSE 901 IN DIRECT COMPARISON WITH ANY OTHER SPEAKERS, REGARDLESS OF SIZE OR PRICE. YOU WILL ONLY APPRECIATE WHY WE MAKE THIS REQUEST AFTER YOU HAVE MADE THE EXPERIMENT.



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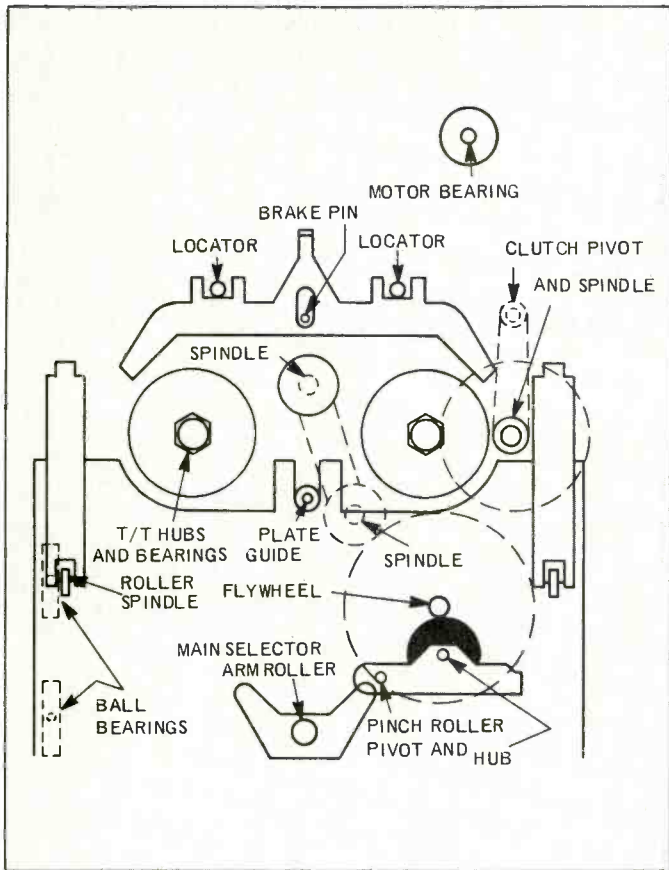


Fig. 5—Showing lubrication chart. Apply light oil to rotating parts and medium grease to sliding parts.

Lubrication

Well, maybe not so obvious, for the most frequent failures I encounter are caused by over-indulgence in lubricants. Cleanliness comes first. My old Nanny used to tell me it was next to Godliness—on some tape decks it is next to impossible! On the Philips design only a steady hand and a fine brush may be needed. Lubrication is limited to a drop of light oil on rotating parts and a smear of medium grease on sliding parts. To make life easier, I include a rough chart (Fig. 5) showing the main lubricating points on this deck. Please note—the motor should never be oiled. Any attempt to do so will result in noisy operation since the brushes will pit. When motors get sluggish, they can sometimes be completely stripped and cleaned and the bearings lightly lubricated. Whether or not you do so depends on your time/economy scale. Some of these motors defy reassembly anyway. A drop of oil on the top bearing is enough.

Reverting to the deck assembly, we see that the head plate is pushed forward by a roller operated by the function selector arm. This is held by a nylon circlip. In several other places in this deck we find such securing devices and they have one drawback—they dislike being disturbed. If one is servicing any great number of these cassette machines, it is wise to lay in a stock of spare circlips and washers.

The brakes are mere lugs on the brake bracket, engaging the rubber rims of the turntables. The bracket is held off by a spring attached to the rear part of the spring blade which holds the cassette into place, illustrated in Fig. 1 but removed in Fig. 6 to show more clearly the transverse spring that aids the engagement of the brakes. Possibly because of the enclosed nature of a cassette and a consequent lack of freedom of the supply "spool" to run on, very little trouble is encountered

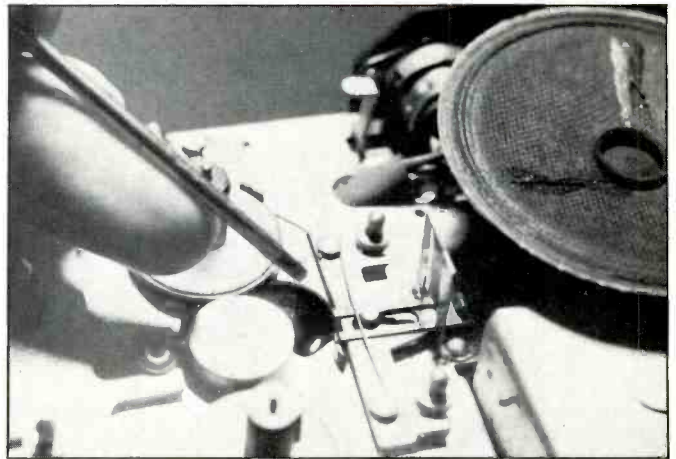


Fig. 6—The transverse spring, indicated by the screwdriver, aids engagement of the brakes, which are lugs on the bracket.

Fig. 7—Showing the underside of the deck, with main-drive belt and lower flywheel bearing removed.



with brakes, and the most frequent service problem I have had with the variants of these mechanisms has been a fouling of a pin in the forked slide.

Clutch Mechanisms

Not so fault-free are the clutch mechanisms, however. The main-drive belt (another vulnerable item) couples motor pulley and flywheel and runs against one section of the clutch assembly. With a motor of 3,000 rpm, this flywheel turns at 6 cycles per second to give the rated speed of 1 7/8 in./sec. tape travel. Looking at Fig. 7 which has both belt and lower flywheel bearing removed, we can see the three main parts of the clutch design. Nearer the camera is the clutch wheel, driven by the belt. This is mounted on a bracket with a hook spring applying regulated inward pressure, and the two sections of the clutch have a felt disc between for transmitting the necessary torque, but allowing slippage. The upper section drives the spindle that engages the rubber rim of the take-up turntable. This can be seen in Fig. 3. Adjustment to the required 120-150 grams is made by bending the spring. Not so evident is the need for alignment of motor pulley, clutch wheel, and flywheel for correct transmission of torque. The flywheel bottom bearings, simple pads as shown in Fig. 7, permit some adjustment, and quite often the bracket fixing holes are slightly elongated. The motor seating, especially after replacement with an alternative type, may have to be packed up so that the lateral and the vertical alignments, of the motor pulley are accurate. There is a small amount of adjustment, the pulley being secured by a screw to the shaft, as shown in Fig. 8.

Lift this page and drop it... you'll see how gently the Miracord 50H treats your records.



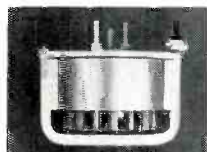
A gentle touch of the push-buttons brings forth a gentle reaction from the Miracord 50H. The dynamically balanced arm responds gently with its frictionless bearing system, faithfully and flawlessly tracking the intricate record grooves. Gentleness, however, is just one attribute of the 50H, a clue to its superior performance is found in its features.

Stylus overhang adjustment is essential for optimum tracking. Another automatic turntable does feature this adjustment, but it's internal and difficult to set. The Miracord 50H offers external overhang adjustment with built-in gauge

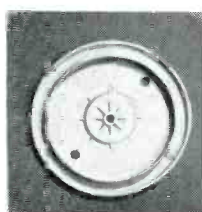


ment, but it's internal and difficult to set. The Miracord 50H offers external overhang adjustment with built-in gauge

no shifting, no guesswork, no templates. Other turntables offer a kind of synchronous motor. The 50H uses a *Papst hysteresis synchronous* motor with outer rotor for unvarying speed accuracy regardless of the voltage fluctuation or loads. The Papst motor is usually found in professional studios.



Consider cueing: in one leading automatic turntable, cueing does not operate in the automatic mode. In automatic, cueing is the ideal way to interrupt play for a moment when there is a stack of records on the spindle. The 50H provides silicone-damped cueing in both automatic and manual modes.



Another important feature is the 50H turntable. It is a heavy, one-piece, non-ferrous metal casting, lathe-turned to precise dimensions and then individually dynamically balanced. This contributes to the smooth, steady motion of the turntable, free of rumble, wow and flutter.

Nothing we can say short of experiencing it yourself can better describe the gentle way in which the Miracord responds and preserves the best in your records. Find out for yourself. Miracord 50H, \$175 less cartridge and base. Miracord feathertouch automatic turntables start at less than \$100. Benjamin

Electronic Sound Corporation,
Farmingdale, N.Y. 11735/a
div. of ISC/available
in Canada.



Miracord 50H



Check No. 27 on Reader Service Card

Dear Editor

(Continued from page 14)

the kids, they could care less about the serious music market.

Off-center pressings don't hurt the sound of music that is purposely distorted before recording. Possibly, it even helps it, I don't know.

Where a long clarinet or piano passage can hurt the beauty of Debussy's music, if the tonearm weaves back and forth as much as $\frac{1}{8}$ of an inch, it might add to the cacaphony created by Blood, Sweat and Tears, and the kids just don't care.

Yours truly,
Thomas Coane
55 Curtis Ave.
Wallingford, Conn. 06492

McIntosh

Dear Sir:

Some months ago I received the September issue of your magazine listing products of the different companies involved in selling consumer hi fi products.

I noticed in the issue that no products of the McIntosh Company were listed. I also noticed in a later issue, which included some additions to the earlier listing, that again no McIntosh products were listed. Was there some reason for the omission of McIntosh products? Do you plan to test any McIntosh products in the foreseeable future?

Andrew R. Agee, M.D.
Minneapolis, Minn.

McIntosh did not wish to be listed in our annual directory. While there are several McIntosh products we would like to test, we are not presently engaged in testing any of them.

—Ed.

Eccentric Spindle

Dear Sir:

I quite agree with your comment on my letter concerning off-center phonograph records, which you were kind enough to publish in the October issue, that the problem lies with the record manufacturers, except on one point.

My closing suggestion that someone produce a turntable with an adjustable eccentric spindle was intended partly to be humorous, but only partly, for if the record manufacturers began making only perfectly-centered

ERRATA Jensen Headphones

Sharp-eyed readers will have noticed the name Jensen on the phones at the top of page 25 in the December issue. However, the model number, HS-2, was missing on some copies.

records tomorrow, many of us would still be left with a lot of cherished performances with sound unsteady in pitch.

J. D. Reed
5467 S. Cornell Ave.
Chicago, Ill. 60615

Technical Articles

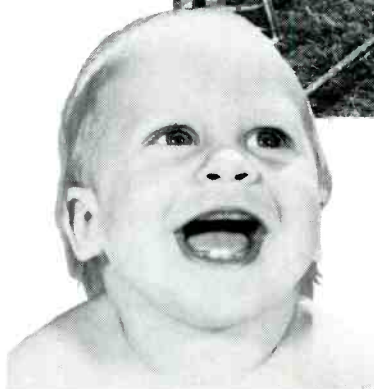
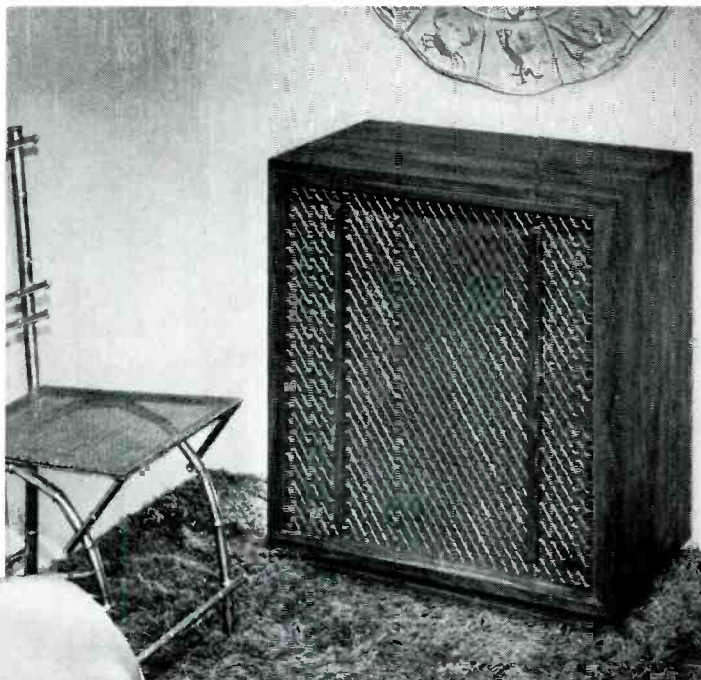
Dear Sir:

In the November issue Dear Editor column, reader P. Kelley complained of an

article being "too technical." As a tyro I found the most mundane test report incomprehensible at first. With much interest and considerable time, even the most comprehensive test reports leave something to be desired. It is only those difficult technical articles that expand our knowledge of high fidelity. Please don't reduce your magazine to the run-of-the-mill ad copy types.

A. D. Ewart
Vancouver, B.C., Canada

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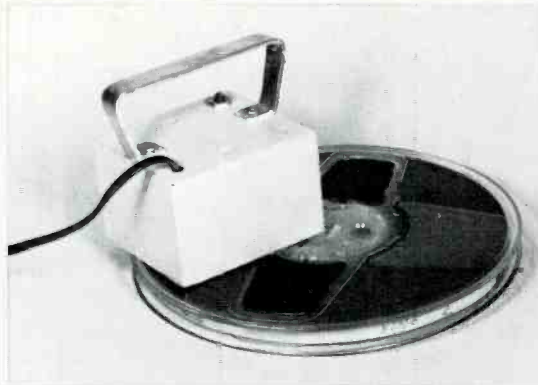


Fig. 1

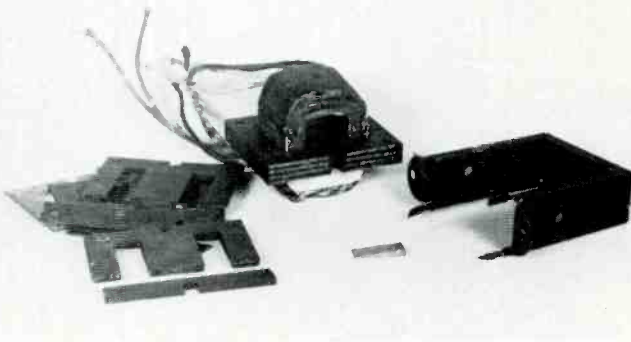


Fig. 2

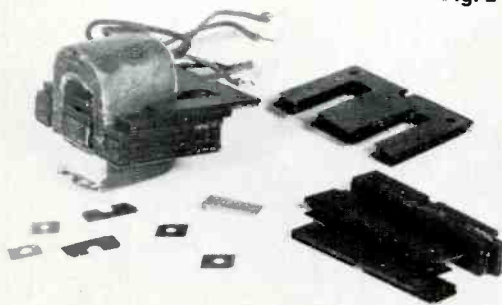


Fig. 3

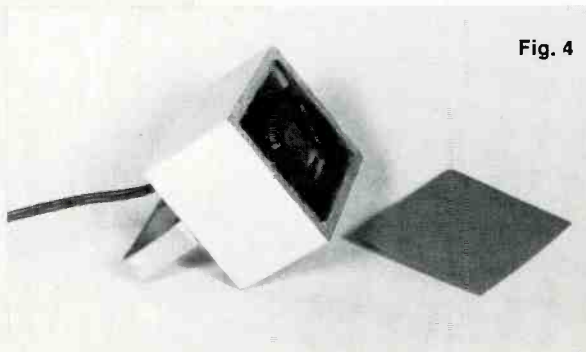


Fig. 4

THE NEXT best thing to using a fresh, new roll of tape for recording that important concert or other one-of-a-kind performances is to bulk erase an old reel of tape. This is especially important if the erase head on your recorder is not very efficient, or if you use high-output tape, which is difficult to erase. Otherwise, the previously-recorded material may be audible during the more quiet passages of the new recording.

A bulk tape eraser consists of a coil of wire wound around a laminated-iron frame open on one side. When the coil is connected to an a.c. source and held near a reel of tape, the magnetic circuit is completed through the iron oxide coating on the tape, effectively erasing any recorded material. Commercial tape erasers use a specially-designed coil, but you can make your own eraser using almost any old transformer. Good results have been obtained with filament transformers, audio output transformers, and power-supply chokes. All you have to do is take the transformer apart and rearrange the core pieces. The accompanying pictures will show you how.

To use the eraser, hold it directly against the reel of tape and turn on the power. I used a push-push switch in this version, but this is only a convenience item. You will hear and feel the tape vibrate at 60 Hz. Move the eraser all around the reel, then repeat on the other side. Slowly move the eraser several feet away from the tape before turning off the power. ●

Fig. 1—This transformer was salvaged from a vacuum-tube amplifier. Pry up and straighten the four tabs, and remove the frame. Pull out the wooden wedge(s), and remove the core pieces by prying them apart with a sturdy pocket knife. Do not cut into the core winding! **Fig. 2**—Reassemble the E-shaped pieces, facing them all the same way. Discard the I-shaped pieces. Clip off and discard any extra-length tabs on the two outside core pieces. **Fig. 3**—Reinsert the wedge(s), and clip off all wires except the primaries (plate-to-plate for an audio output transformer). **Fig. 4**—Pass the a.c. connection cord through a rubber strain-relief grommet and then through a hole in a suitable box. Connect the a.c. cord to the coil, making certain each connection is well taped and the whole is well insulated. Locate the grommet, and mount the coil. Cover the bottom of the box with cardboard. Fasten a handle with screws, and paint the box.

Which stereo hobbyist are you... the listener or the experimenter?

Pioneer caters to both.

As a reader of this magazine, listening to music is undoubtedly one of your more relaxing hobbies. In which case the Pioneer SA-900 Integrated Amplifier and TX-900 AM-FM Tuner are for you. Together, they produce the finest stereo sound reproduction. And, if you want to go one step further into the realm of stereo experimentation, this is where to start.

For instance, the SA-900 permits you to operate the pre and main amplifiers separately. You can connect an electronic crossover and two power amplifiers for 3-channel multi-amp stereo. And for added effect you can patch in a reverb amp. The possibili-

ties are limitless. With music power at 145 watts IHF (50+50 watts RMS, at 8 ohms, both channels operating) there's unbounded power to spare. Harmonic distortion is less than 0.08%. Stepped tone controls provide the finest precision adjustments. As High Fidelity (July 1970) commented: "... For an amplifier as good as this and with as many useful features, you'd expect to pay considerably more than the (\$259.95) price listed."

The TX-900 AM-FM tuner combines ideally with the SA-900 amplifier. Using three FET's and two RF stages in the front end plus two crystal

filters and four IC's in the IF section, IHF sensitivity ($1.7\mu\text{V}$), selectivity (65dB) and capture ratio (1.5:1) are superb. Tuning is precise with a bright spot indicator and twin meters. A variable muting switch accommodates weak signals while suppressing inter-channel noise. \$259.95

See and hear both units at your local Pioneer dealer.

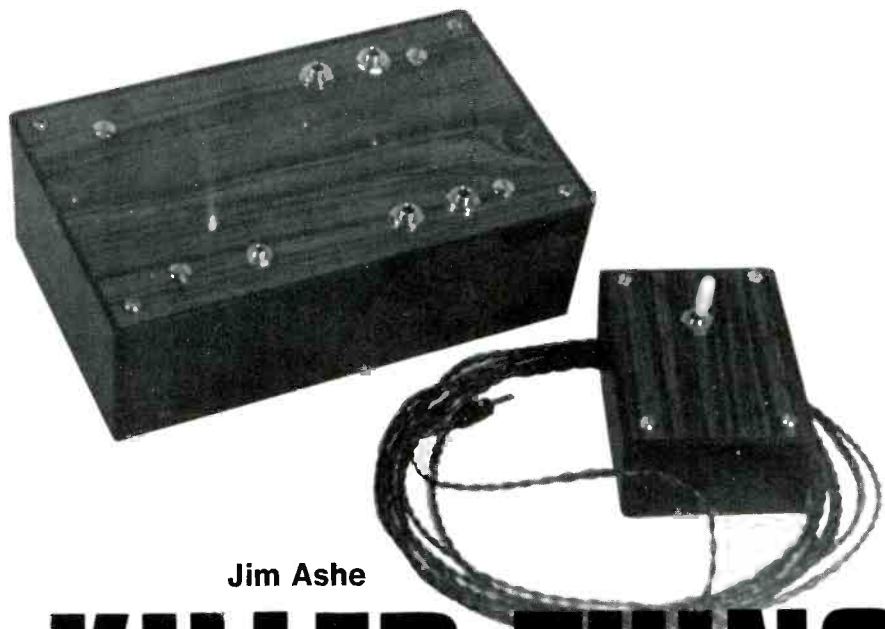
Pioneer Electronics U.S.A. Corp.,
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Jim Ashe

THE KILLER THING

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KILLER

IF YOU tape record radio and TV material, using your machine's PAUSE control for real-time editing, maybe you suffer from Taper's Lunge.

Taper's Lunge is marked by periods of gradually increasing nervous and muscular tension, released at moments keyed to commercials and station breaks. The release may be accented by rich Anglo-Saxon commentary. The Killer Thing described here is a simple device that reduces Taper's Lunge nearly to the vanishing point. This simple system improves off-the-air editing by reducing control motion to a hand-held switch operation.

Basically, it's a relay device in two boxes: one for control, the other for audio switching. From a modern engineering view, it's inelegant, obsolete, and works fine. See Fig. 1 for the schematic.

Because the input capacitors are grounded through resistors and the output circuits are connected to the same ground, connection into a circuit carrying accidental d.c. doesn't develop switching transients. The relay points develop no offset voltage, as would simple transistor or diode-switch circuits. Again, no thumps. The circuit through D1 dissipates inductive stored energy to avoid high-voltage pulses near the audio lines. With these considerations managed, the Killer Thing is as electrically unobtrusive as a piece of wood, except for doing its job. And it uses easily available parts.

A little thinking generates variations on the original. The Killer Thing could be assembled with only one relay, reducing costs. Or it might be wired as a cross-coupling switch that offers some interesting possibilities.

Construction

The finished Killer Thing is complete in two boxes with no power leads. One box fits the hand; it contains a switch and a pair of phone jacks. The other holds the relay and audio circuits and six pen cells for power. Standard audio leads patch the signal in and out of the relay box, and an inconspicuous cable completes a control connection to the hand switch.

A small 1 × 2 × 3 in. plastic utility box fits the hand nicely. It fits still better after its sharper corners are scraped and softened by a sharp knife or some sandpaper on a block. An SPDT switch goes in the box's aluminum panel and is connected to a working and a spare phone jack. Which is which depends upon user preference, but the spare is included because it might come in handy someday!

While the original Killer Thing uses subminiature phone jacks and plugs, if you're unskilled, choose the common miniature types. The subminiatures look good but assembly is pretty delicate. The original cable was 10 ft. long, made from one length each brown and black, #26 stranded wire. The two leads are adjusted and checked for equal length by observing equal sag when the cable is stretched across the room. Then a minute's spinning with one end chucked in an electric drill puts in a permanent twist. This makes a good, inconspicuous control cable. Since the cable carries about 10 milliamperes (one hundredth ampere) of current, wire size isn't critical. Lamp cord or lightweight speaker cable, for instance, would work very well.

The relay box begins as a normal 3¼ × 6½ × 2 in. utility box from Radio Shack. Four half-inch spacers hold a piece of perforated terminal board under the aluminum panel as shown in Fig. 2. This board is a piece designed as a box cover. It makes a good circuit board after edge filing and notching for wires and box clearance. A row of terminal clips toward one end of the board keeps the batteries from slipping into the electrical works, though nuts and bolts would work. Polyurethane scraps prevent rattling. The batteries are mounted in a plastic utility holder.

All parts go on terminal clips, with extra clips as relay terminals. This doesn't improve circuit operation but it's reliable, workmanlike, and looks good. Mounting parts on the clips before wiring helps avoid mistakes. All wiring is on the board side facing the aluminum panel; parts look at the box bottom.

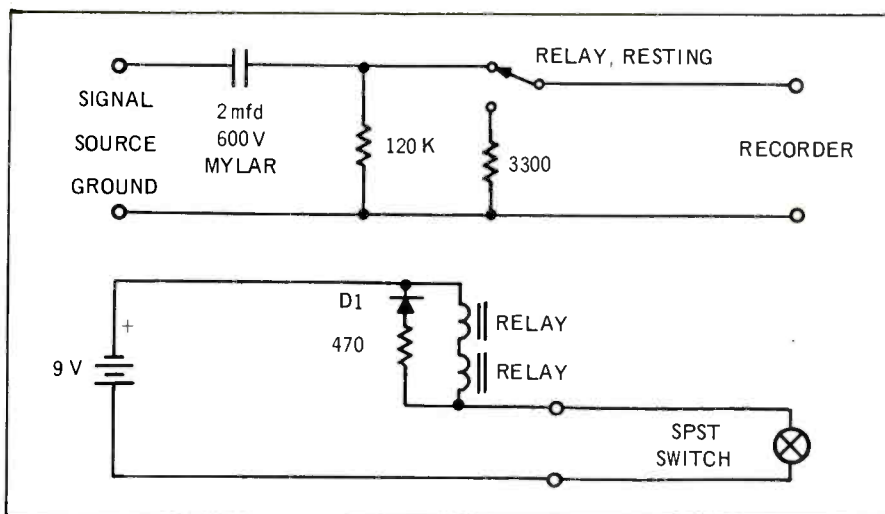


Fig. 1—The Killer Thing circuits are very simple. The audio switching circuit appears twice in the stereo version, once in the monaural version. Use whatever input and output connectors are convenient.

The relays are Radio Shack #275-004, and it turns out these have odd threads. They take the same screws that hold covers on the Radio Shack utility boxes. A junked box from previous work donated two appropriate screws. For the kind of use the Killer Thing gets, the relays could have been held in place by their leads through the terminal board to clips.

Wiring goes fast, using #22 solid wire with thermoplastic insulation. Bare wire serves wherever there's no chance of a short. Wiring is uncritical, but good planning puts the relay-control wiring at right angles to any audio leads it crosses.

A wood-grained vinyl plastic covering, such as Contact paper, improves the raw aluminum panels. This requires care. First, all four panel edges are filed to make clearance between panel and box. After rough edges are scraped

smooth, a piece of the pressure-sensitive vinyl plastic is cut an inch oversize (a half-inch per side) and gently removed from its backing paper.

The backing paper goes on the bench, panel over it, and the plastic is gently rolled onto panel and backing paper. Then the paper is pulled off, and if the work is bad, it's done over using new materials. When it's right, the four corners are cut at 45 degree angles, and the plastic edges folded tightly over the metal. A sharp knife trims out the holes. With a little practice this procedure makes very satisfactory, attractive panels.

Now the jacks go in the panel and get short leads before circuit board installation. Jack connections go through appropriate notches in the board to clips on the parts side, and the job is done. Ease on the panel screws, since the vinyl plastic wrinkles fairly easily.

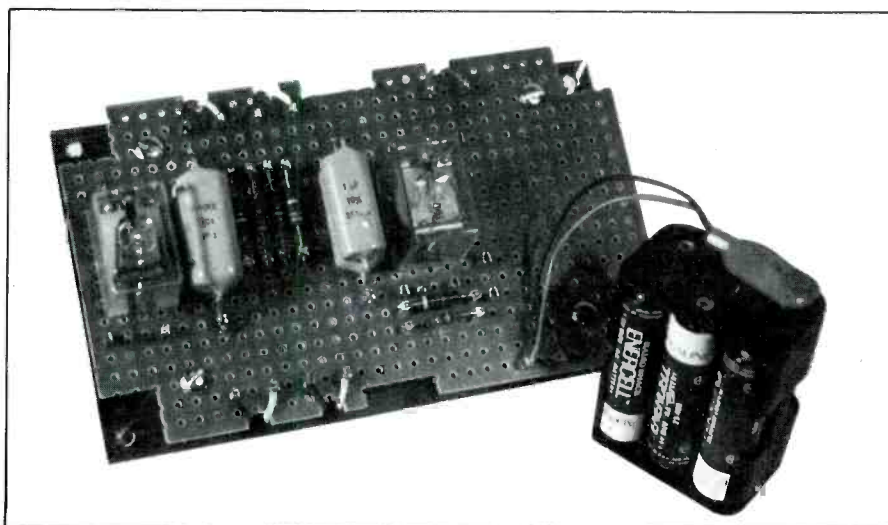


Fig. 2—A piece of perforated terminal board, designed as a box top, fits nicely inside if its edges are filed. Corners, box center rib clearances, and five notches for wires all can be cut with hacksaw and file or nibbling tool.

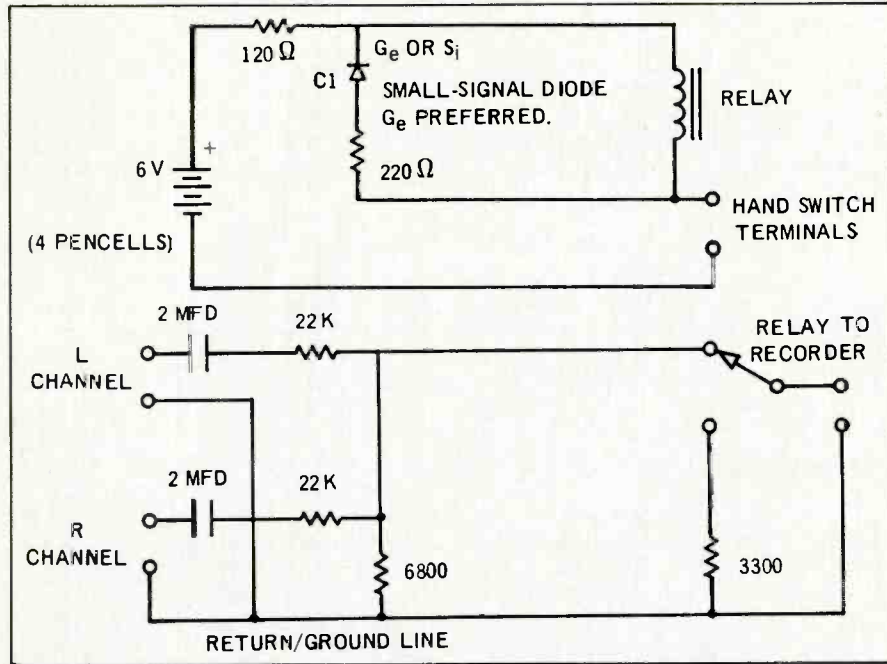
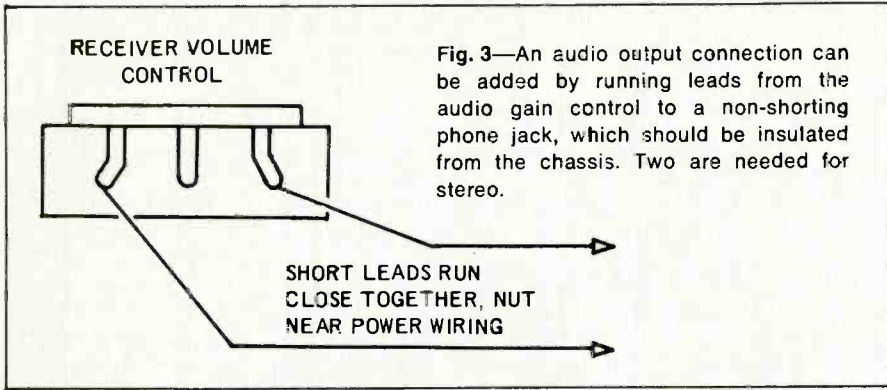


Fig. 4—A few parts changes are in order if one relay is omitted to make a monaural Killer Thing, and four pen cells provide adequate power. The mixer circuit for combining stereo channels into monaural could be placed in the Killer Thing box.

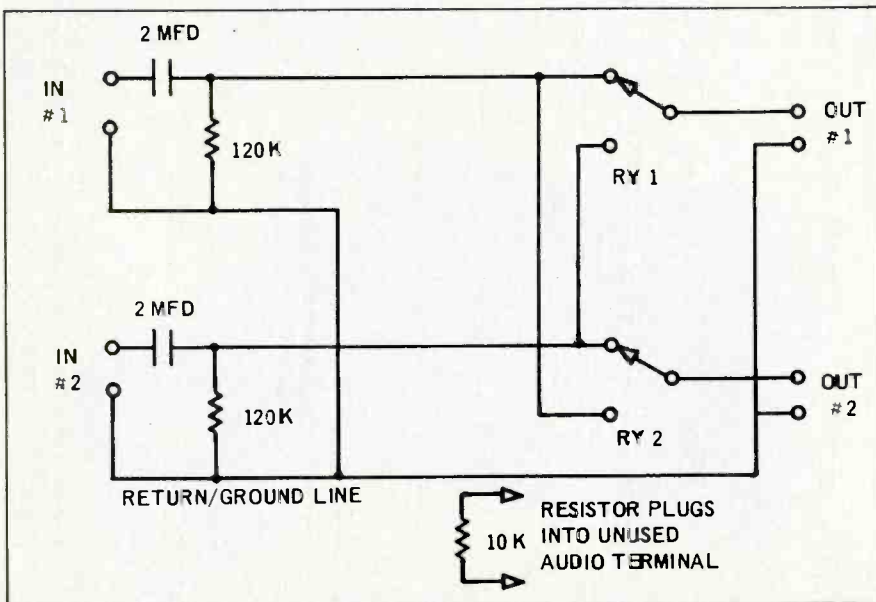


Fig. 5—The Killer Thing relays can be wired to cross-switch two audio circuits. An optional load resistor plugs into the unused jack to simulate a missing circuit.

Application

The Killer Thing goes between receiver and recorder without any special provisions. Where the receiver has no audio output connection, one is easily added by running leads to the audio gain control. (See Fig. 3.) A nonshorting phone jack is installed out of the way with no connection to anything except audio signal and return leads. It should be insulated from any metal chassis. If the audio is fairly strong at this point, as it usually will be, no special care is needed in wire placement. Leads should be short anyway. In use, which hand-switch positions are AUDIO-ON and AUDIO-OFF depend upon which hand-switch jack is used. Assembly with one jack and changing wire connections in the hand unit would work as well at a tiny parts-cost saving.

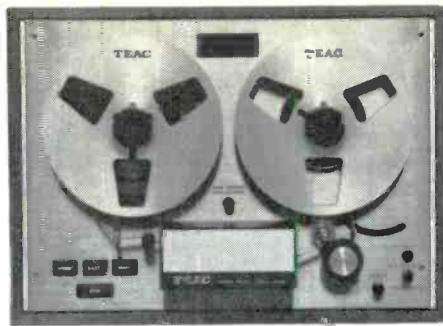
Battery life approximates battery shelf-life. An estimate based on Eveready's Battery Book comes out roughly 130 hours of actuated-relay time. Assuming a commercial-duty factor of 15 per cent or 9 minutes/hour, and two hours work per day, then the pen cells should go 430 days. But few users will follow that regular a schedule. If you make a Killer Thing right now, you can put in new batteries every even-numbered New Years Day.

The Killer Thing in use gives a fine sense of power. It edits accurately, since it works easily. When removing extended "clutter" (several commercials end-to-end, an increasing practice), the recorder can be PAUSED and started up again when the verbiage approximates an end. Then the audio is returned as the program material resumes.

Figure 4A shows how one relay can be eliminated for a monaural Killer Thing. Figure 4B shows how two stereo channels can be brought to one monaural, with equal emphasis to each. This circuit could be fitted in the relay box. It loses some signal but it's simple, and usually there is signal to spare. This arrangement might be used to store large amounts of monaural on a four-channel tape.

Another variation uses the Killer Thing for cross-switching. This is versatile since a modified Killer Thing can switch an input between two outputs, or two inputs into one output. That will come to you in a moment. Figure 5 shows the circuit, which unfortunately doesn't mix with the original Killer Thing design. Note the optional load resistor so the unconnected circuit thinks it's still loaded. This Killer Thing variation could be interesting to modern music workers who want to unobtrusively reverse channels.

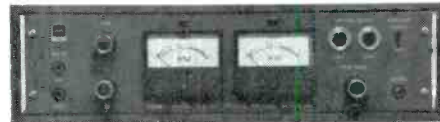
TCA-40



TCA-40

= TCA-40

4-track, 4- and 2-channel playback

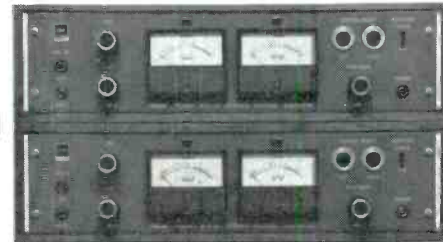


RA-41

= TCA-41

4-track, 4- and 2-channel playback
2-channel record

(record amplifier)



2 RA-41's

= TCA-42

4-track, 4- and 2-channel playback
4- and 2-channel record



TCA-40

(Mounting cradle and dust cover optional)

HIGHER MATH

Three decks, three capabilities: the Simul-trak® TCA Series from TEAC.

Buy one, add onto it, and you're up to the next model. Keep going till you reach the top. Or start at the top, and get everything going for you at once.

All three units feature 4- and 2-channel playback – the only brand with auto reverse. And Models 40 and 41 can be modified to the full 4-channel capability of Model 42 as shown. Meanwhile, any one of these decks is compatible with your present 2-channel equipment without modification.

Other 4-channel tape decks may look like ours. But they either have only one motor – or they cost a king's ransom. (They don't sound as good, either.)

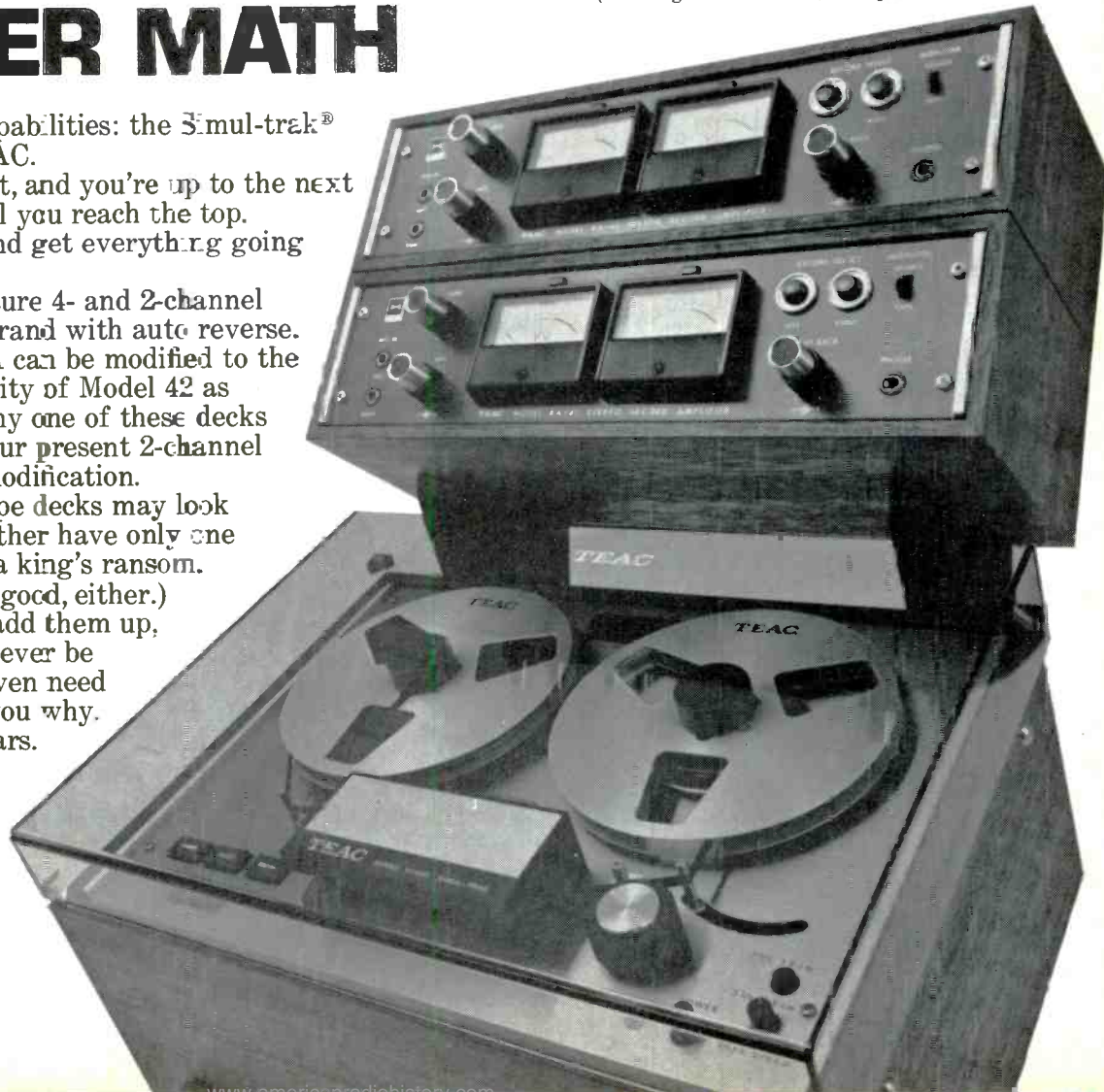
And any way you add them up, the TCA Series can never be obsolete. You don't even need a slide rule to show you why. Just a good pair of ears.

TEAC

TEAC Corporation of America
2000 Colorado Avenue
Santa Monica, California 90404



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OPEN-REEL TAPE RECORDERS

THE FIRST practical magnetic recorder was the "Telegraphone" invented by Poulsen in Denmark as long ago as 1890. Experimenters had been using machines that recorded on iron wire for at least thirty years before that but they were unreliable, Rube Goldberg contraptions giving poor results. Poulsen's Telegraphone was surprisingly good mechanically but the biggest improvement was the use of a special steel wire that had a lower distortion and better signal-to-noise ratio than possible with ordinary iron wire. It was eventually made under license in America and Europe and by all accounts was quite successful. Steel wire was used in these and other recorders for the next thirty years or so although there were, of course, continual improvements in the magnetic characteristics with the employment of new alloys and better methods of manufacture. Examples of wire recorders used by broadcasting authorities in the 1930s include the Blattnerphone in Germany and the Marconi-Stille in England. This latter machine, used quite extensively by the BBC, had large metal reels that could accommodate 10,000 feet of tungsten steel tape. These reels, as you might expect, were very heavy and it took two men to lift one! Not the sort of machine to carry around. . . . A big step forward was use of bias, that is the introduction of a high frequency voltage superimposed on the recording signal to reduce distortion. The basic principles were formulated by Carlson in 1921, who took out further patents in 1927.

Wire recorders were produced in this country until the late 1940s when they were supplanted by machines using coated tapes. This idea was not new—in fact one Mberlin Smith suggested the use of cotton or silk tapes impregnated with magnetic particles as far back as 1888. Of course, it was quite impractical (what could you expect from a man with a name like Mberlin?) and it was many years before all the problems were solved. Well, most of them. In 1928, Pflaumer in Germany took out a patent covering a method of coating paper or plastic tape with magnetic material and a few years later the German AEG-Telefunken company brought out the "Magnetophone," the first commercial tape recorder.

During the war, German scientists made considerable progress with the development of tape recorders and



Alexander Poniatoff (right) with Harold Lindsay, project engineer on the first Ampex recorder, together with an Ampex Model 200 recorder.

special oxides suitable for tape coating. After the war, these tape recorder inventions were brought to the attention of several American companies who were not impressed. They said the equipment was not practical, it was cumbersome, the tape could be broken too easily, and so on. However, one engineer who was more far-sighted was Alexander Poniatoff who had formed the Ampex company in 1944. He was so convinced of the future of tape recording that he immediately switched his company—then consisting of 27 people—over to development work in that field. One year later, in 1947, he demonstrated the famous Model 200, a professional machine intended for broadcasting applications. As he remarked later, "This was the beginning of the new era in magnetic recording in America." Although he was referring to the broadcasting aspect, his words could have applied equally well to tape recording as a whole.

Since then we have seen many refinements and inventions such as multi-tracks, ferrite heads, chromium-dioxide tape, videotape, the Dolby system, and cassettes. At one time—not so long ago—it was necessary to use tape speeds of 15 or even 30 ips for high

fidelity reproduction, but this requirement fell to 7½ and now 3¼ ips—which of course, gives longer playing time. Cassette recorders playing at 1½ ips were not even considered medium-fi two short years ago but they are improving rapidly, and there are now several machines on the market claiming a response up to 15 kHz with low distortion. However, at the present state of the art, open-reel recorders are still superior in terms of fidelity—which takes into account wow and flutter as well as frequency response, distortion, and signal-to-noise ratio.

The specifications presented in the following pages are in tabular form which was first used in 1965 to facilitate comparisons. Readers should bear in mind that these specifications are those supplied by the makers—they are *not* the result of our tests or measurements. Methods of measurement vary from manufacturer to manufacturer but in general the figures are compatible.

Obviously, not all available recorders are listed. Some manufacturers did not supply us with the necessary information, and some products had to be omitted due to space limitations.

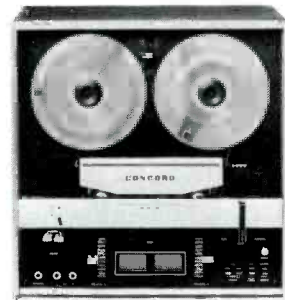
For a directory of tape recorder manufacturers, see page 61.



Ampeg AX-300



Astrocom/Marlux 407



Concord Mark IV



Crown 800



Ferrograph Series Seven

Indicate speed by letter code:

	A	B	C	D	E	F	G	H
15					X	X	X	
7½	X	X	X	X	X	X	X	
3¾	X	X	X	X	X	X	X	
1¾	X		X	X		X	X	
1½			X					

* at the highest speed of the machine

MANUFACTURER	MODEL	Speeds (See letter code)	Power Amp(s) Built in ?	Max. Reel Size, In.	No. of Heads	No. of Tracks	No. of Motors	Drive Motor Type	Drive to Capstan	Frequency Response Hz to kHz? ± 2 dB	Wow and Flutter, %	Signal-to-Noise Ratio, dB*	Fast Wind, 1200 Ft., Sec.	Mic Input Z, Ohms	Rec'ng Level Indicator Type	Dimensions, W x D x H, In.	Weight, Lbs.	Price	SPECIAL FEATURES
AIWA	TP-719	A	Yes	7	2	2	2	d.c.	Belt	100-10K ± 5	0.25	43	165	10K	Mtr.	16½ x 13 x 3½	16½	149.95	3-way power source (a.c., batt, car) auto/manual rec. level contr.; attache-case.
	TP-1012	A	Yes	7	2	4-Stereo or Mon.	2	d.c.	—	50-18K	0.15			10K	2 Mtrs.	13½ x 12¾ x 7¼	17¼	149.95	4-digit counter, 4" x 6" spkrs., auto shut-off, 2 uni-directional mics, 3-way power source.
ALLIED	TD-1030	A	No	7	2	4	1	cap. start	Belt	30-18K ± 3	0.15	50	210	10K	2 Mtrs.	15½ x 13½ x 6¾	23	135.00	Linear lever contrs.; retractable pinch roller; 3-digit counter; auto shut-off.
	TR-1080	A	Yes	7	4	4	1	cap. start	Belt	40-19K ± 3	0.15	47	160	10K	2 Mtrs.	19½ x 12¾ x 12¼	38	299.95	Auto rev.; records in both dir.; solenoid operation; detachable spkr. encls.
AMPEX	AX-300	A	No	7	6	4	3	Hys.	Idler	20-20K ± 3	.09	55	55	High	2 Mtrs.	16½ x 14½ x 8	45	649.95	Speed logic cct; outside tape-bias and VU mtr. calib. ports; 6 hds-2 rec; 2 play; 2 erase.
	2161	A	Yes	7	4	4	1	Hys.	Belt	20-22K ± 3	.07	52		110K	2 Mtrs.	18" x 13¼ x 7	42	529.95	Bi-directional recording; 2-sec. auto threading; auto-rev. system.
	AX-50	A	No	7	3	4	1	Hys.	Idler	20-20K ± 3	0.12	55		High	2 Mtrs.	16½ x 15¾ x 8½	23	279.95	Auto tape lifter; sgl. function contr.; 3 heads-erase, deep-gap rec, deep-gap play.
	755A	A	No	7	3	4	1	Hys.	Belt	20-20K ± 3	.08	48		150K		13 x 15¼ x 6½	27	249.95	
ASTROCOM/MARLUX	407	B	No	7	4	4	3	Hys.	Belt	30-20K	.07	50	60	10K	Dual Meter	21 x 14½ x 10½	40	459.95	Auto-rev. pb; sws, s-o-s; sol. contrs.
CONCORD	MK IV	A	No	7	4	4	1	Hys.	Idler	20-23K ± 4	.08	55		15K	2 Mtrs.	18½ x 13 x 6	25¾	299.79	Auto rev. p.b.; silent sensing; dual capstan.
	MK 8	A	Yes	7	2	4 or 8	2	Ind.	Belt	50-12K	.2	45		2K	2 Mtrs.	18 x 16¼ x 8¾	49	289.79	
	MK III	A	No	7	3	4	1	Hys.	Idler	20-27K ± 3	.09	55	116	15K	2 Mtrs.	18½ x 13 x 6	25¾	249.79	Var. echo contr; tape source monitor; 4 pre amps.
	MK II	A	No	7	3	4	1	Hys.	Idler	20-23K ± 4	.09	55	116	15K	2 Mtrs.	18½ x 13 x 6	25¾	199.79	As above.
CROWN	SX724	B	Opt.	10½	3	4	3	Hys.	Belt	20-25K ± 2	0.09	60	45	350K	2 Mtrs.	19 x 15¾ x 9	45	995.00	Dual mic and/or line mxg; 5" mtrs; opt cntr, \$39.00; wal cab, \$70.00; mon amp, \$229.00.
	SX824	B or F	Opt.	10½	3	4	3	Hys.	Belt	20-25K ± 2	0.09	60	45	350K	2 Mtrs.	19 x 15¾ x 9	48	1,495.00	Computer-logic "Pro-800" deck; opt. rem. contr; other options as above.
	CX822	E	Opt.	10½	3	2	3	Hys.	Belt	30-50K ± 2	0.06		45	250 (bal.)	2 Mtrs.	19 x 17½ x 9	53	2,120.00	Same deck as above, w plug-in electronics-tone contrs; tape echo; prof. mxg; opt noiseless rem contr. \$185.00.
FERROGRAPH	704 A-S	A or E	No	8½	3	2 or 4	3	Ind.	Idler	30-17K ± 2	.08	60	60	10K	2 Mtrs.	14¾ x 16 x 8½	37½	649.00	724 A-W in wal. case, \$699.00 724 A-P in port case, \$699.00 also avail. w ampls. and spkrs.

OPEN-REEL TAPE RECORDERS --- Continued



KLH 41



Hitachi TRQ-727



JVC 1694



Kenwood KW-8077

MANUFACTURER	MODEL		Speeds (See letter code)	Power Amp(s) Built In?	Max. Reel Size, In.	No. of Heads	No. of Tracks	Drive Motor Type	Drive to Capstan	Frequency Response Hz to kHz ± 7 dB	Wow and Flutter, % *	Signal-to-noise Ratio, dB*	Fast Wind, 1200 Ft., Sec.	Mic Input Z, Ohms	Rec'ng Level Indicator Type	Dimensions, W x D x H, In.	Weight, Lbs.	Price	SPECIAL FEATURES
GRUNDIG	TK 248U	B	Yes	7	4	1				40-16K	0.15	50	100K	1 Mtr.	17 x 13 ³ / ₄ x 8	35	299.95	Automatic input level. SOS. Optional 1 remote control.	
	TK 246U	B	Yes (1 ch)	7	4	1				40-16K	0.15	50	100K	1 Mtr.	17 x 13 ³ / ₄ x 8	35	249.95	Power output on one ch. only.	
	TS 600	B		7	4	1				30-18K	0.15	50	100K	1 Mtr.	16 ¹ / ₂ x 14 ¹ / ₂ x 7 ¹ / ₄	-	399.95	Available with power amplifiers as TK 600.	
HITACHI	TRQ 727	A	No	7	3	4	1	Ind.	Idler	30-18K ± 3	.12	53	240	10K	2 Mtrs. 15 ¹ / ₂ x 7 ¹ / ₄ x 16	21	149.95		
	TRQ 770D	A	No	7	3	4	1	Sync	Idler	20-23K ± 3	.12	53	240	10K	2 Mtrs. 16 ¹ / ₈ x 17 ³ / ₈ x 8 ⁷ / ₈	35	259.95	Automatic input level control. Auto-repeat, auto reverse, auto shut-off.	
	TRQ 730D	A	No	7	3	4	1	Hys.	Idler	20-23K ± 3	.12	52	240	10K	2 Mtrs. 16 ¹ / ₈ x 13 ³ / ₄ x 7 ¹ / ₂	24	189.95		
JVC	1224	A	Yes	7	4	4	1	4p	Idler	30-20K ± 2	0.15	47	160	10K	2 Mtrs. 38 x 12 ³ / ₈ x 7	38.5	329.95	Auto rev rpt stop; 20-W output.	
	1694	A	Yes	7	3	4	1	4p	Idler	30-20K ± 3	0.15	52	150	10K	2 Mtrs. 15 x 12 x 8	20	169.95	Single contr for rewind, stop, play rec, pause, f.f.	
	1545	H	Yes	5	1	2	1	4p	Idler	100-7K	0.4	35	180	1K	-	11 x 9 x 3 ³ / ₄	7.3	69.95	Portable-a.c. or batt. operation.
	1541	H	Yes	5	1	2	1	Hys.	Idler	100-7K	0.4	35	180	1K	-	11 x 9 x 3 ³ / ₄	7.3	69.95	As above; incld mon. sw.
KLH	41	A	No	7	3	4	1	Ind.	Belt	50-15K ± 3	0.15	60*	130	1K	2 Mtrs. 14 ¹ / ₄ x 11 ⁷ / ₈ x 5 ⁵ / ₈	23	199.50	*Includes Dolby system; with Dolby in s/n is 68 dB.	
KENWOOD	KW-8077	B	No	7	6	4	3	Hys.	Idler	20-20K ± 3	.04	52	70	10K	2 Mtrs. 17 x 19 ¹ / ₄ x 9	46	549.95	Auto rev. rec play, mic-line mixing, eqzr. contr. loading, 5-step equal.	
	KW-5066	A	No	7	4	4	1	Hys.	Idler	25-20K ± 3	.15	50	150	10K	2 Mtrs. 16 x 15 ¹ / ₂ x 7	22	199.95	Bias adjust, S-on-S; echo; full-track erase; noise filter.	
	KW-4066	A	No	7	3	4	1	Hys.	Idler	25-20K ± 3	.15	50	150	10K	2 Mtrs. 16 x 12 ¹ / ₁₆ x 7	22	129.95	Auto stop, slide vol. conts, tape source mon. mode switch.	
LAFAYETTE	RK 960	A	Yes	7	4	4	2	4p	Belt	30-22K ± 3	.25	50	-	10K	2 Mtrs. 22 x 15 ¹ / ₂ x 8 ¹ / ₄	44	229.95	Auto rev; dual capstan drive; bi-directional recd.	
	RK 710A	A	Yes	7	2	2	1	4p	Ind.	60-12K	.25	42	-	600	1 Meter 11 ⁵ / ₈ x 12 ¹ / ₈ x 6 ² / ₈	16	69.95	Horiz. or vert. oper.	



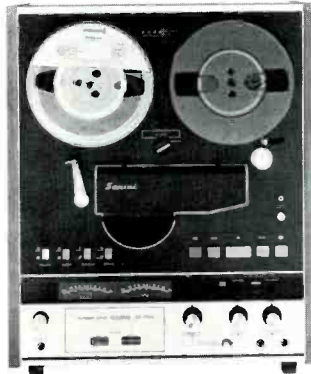
Sony 650



ReVox A77



Panasonic RS-736



Sansui SD7000



Pioneer T-600F

MANUFACTURER	MODEL	Speeds (See letter code)			Power Amp(s) Built In ?	Max. Reel Size, In.	No. of Heads	No. of Tracks	No. of Motors	Drive Motor Type	Drive to Capstan	Frequency Response Hz to kHz* ± 7 dB	Wow and Flutter, %	Signal-to-noise Ratio, dB*	Fast Wind, 1200 Ft., Sec.	Mic Input Z, Ohms	Rec'ing Level Indicator Type	Dimensions, W x D x H, In.	Weight, Lbs.	Price	SPECIAL FEATURES
		E	A	B																	
PANASONIC	RS 736	E	No	7	3	4	1		Idler	20-20K	.09	> 50	140	2 Mtrs.	16 ⁷ / ₈ x 18 ⁵ / ₈ x 7 ³ / ₈	35	349.95	Hot pressed ferrite heads; tape and speed eq'n.			
	RS 796	A	No	7	4	4	1	Sync	Idler	30-20K	0.10	> 50	180	2 Mtrs.	19 ³ / ₈ x 14 ¹ / ₈ x 8 ¹ / ₂	32	249.95	Auto reverse record and play.			
	RS 768	A	No	7	3	4	1	Sync	Idler	20-20K	.09	> 50	150	2 Mtrs.	18 ¹ / ₂ x 13 ³ / ₈ x 8	21	219.95				
PIONEER	T-600	B	No	7	4	4	1	Hys.	Belt	50-15K ± 3	0.12	50	120	50K	2 Mtrs.	17 ¹ / ₄ x 17 ³ / ₈ x 8	33	299.95	Auto reverse rec and play.		
REVOX	A-77	B	Opt.	10 ¹ / ₂	3	2 or 4	3	Servo	Direct	30-20K ± 2	.08	58	60	Lo, Hi	2 Mtrs.	16 x 14 x 8	34	529.00	Electronic-governed capstan motor; all-metal low-wear heads; 15 ⁷ / ₈ -ips version.		
ROBERTS	771X	A	Yes	7	3	4	1	Hys.	Belt	30-22K ± 3	0.15	50		5K	2 Mtrs.	20 x 14 x 10	42	329.95	X-field hd; s-o-s; 4-dig. counter.		
	333X	G	Yes	7	7	4-4-8	1	Ind.	Belt	30-23K ± 3					2 Mtrs.				559.95	X-field hd; recs reel to ctg. and reel to cass; auto shutoff; counter; tape lifter.	
	5050XD	A	No	10 ¹ / ₂	4	4	3	Hys.	Belt	25-22K ± 3	0.2			25K	2 Mtrs.	14 ³ / ₈ x 17 ³ / ₈ x 9 ³ / ₈	48	599.95	X-field hd; 24-hr. progmg; auto cont. rev; mag brakes.		
SANSUI	SD 7000	B	No	7	4	4	3	Hys.	Belt	15-25K ± 2	0.06	> 60	100		2 Mtrs.	21 x 17 x 10	60	679.95	Auto rev w 20-Hz sig. rec. built in; auto rewind; opt. rem. contr; auto sleep sw.		
SONY SUPERSCOPE	366	A	No	7	3	4	1	Ind.	Idler	20-25K ± 3	0.09	55	90		2 Mtrs.	16 ⁷ / ₈ x 8 ⁵ / ₈ x 14 ¹³ / ₁₆	22 ¹ / ₂	229.95	Source tape mon; lo-noise tape sw.; vert. or horiz. mounting.		
	352-D	A	No	7	3	4	1	Ind.	Belt	30-25K ± 3	0.12	55	120	Low	2 Mtrs.	15 ³ / ₈ x 7 ¹ / ₂ x 1 ³ / ₈	18	179.95			
	650	B	No	7	3	4	3	Hys.	Belt	20-22K ± 3	.06	54	90	Low	2 Mtrs.	15 ⁷ / ₈ x 6 ³ / ₈ x 16 ¹ / ₈	40	399.50	Feather-touch solenoid operation opt. 2-track; plug-in head assy; opt. rem. contr.; eq. selector.		
	666D	B	No	7	4	4	3	Hys.	Belt	20-22K ± 3	.09	53	60	Low	2 Mtrs.	17 ³ / ₈ x 16 ⁵ / ₈ x 8 ³ / ₈	48 ³ / ₈	575.00	Auto-rev; ultra h.f. bias; SNR noise reduction; solenoid oper.; auto tape lifters.		
	780	A	No	7	3	4	3	Servo	Belt	20-25K ± 3	.04	56	90	Low	2 Mtrs.	18 ³ / ₈ x 22 ¹ / ₈ x 10 ⁷ / ₈	57 ⁵ / ₈	695.00	Auto-reverse; 6-head function; dual capstan drive; ferrite heads; auto program scanner; rem. contr.		
	770	A	No	7	4	2 or 4	1	Servo	Belt	20-22K ± 3	.09	58	120	250	2 Mtrs.	16 ¹ / ₂ x 15 ⁵ / ₈ x 3 ¹³ / ₁₆	24 ³ / ₈	750.00	Noise reduction; built-in limiter; mic= line mixing; var. speed contr.; scrape flutter filter; 4th head for 4-or 2-tk p.b.		

OPEN-REEL TAPE RECORDERS --- Continued

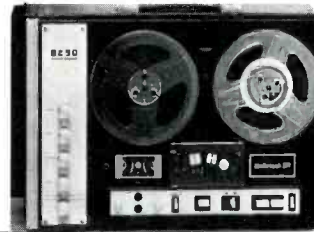
Tandberg 6000X



Telex 2001



TEAC A-1500



Wollensak 6250

Indicate speed by letter code:

	A	B	C	D	E	F	G	H
15					X	X	X	X
7 1/2	X	X	X		X	X	X	
3 3/4	X	X	X		X		X	X
1 7/8	X		X	X			X	X
1 1/2			X					

* at the highest speed of the machine

MANUFACTURER	MODEL	Speeds (See Letter code)		Power Amp(s) Built In?	Max. Reel Size, In.	No. of Heads	No. of Tracks	No. of Motors	Drive Motor Type	Drive to Cassette	Frequency Response Hz to kHz ± 2 dB	Wow and Flutter, %*	Signal-to-Noise Ratio, dB*	Fast Wind, 1200 Ft., Sec.	Mic Input, Z, Ohms	Rec'ng Level Indicator Type	Dimensions, W x D x H, In.	Weight, Lbs.	Price	SPECIAL FEATURES
		Spd.	Spd.																	
TANDBERG	6000X	A	No	7	3+ Bias	2 or 4	1	Hys.	Idler	40-22K ± 2 1/2	.07	62	105	200	2 pk. rdg. Mtrs.	15 1/2 x 12 1/8 x 16 1/2	21	499.00	Cross-field rec head. Automatic overload limiter. Remote control, phono inputs.	
	1200X series	A	Yes	7	2+ Bias	4 or 2	1	Hys.	Idler	40-18K ± 2	0.1	58	120	Low	2 Mtrs.	15 3/8 x 11 11/16 x 6 7/8	23	485.00		
	3000X	A	No	7	3+ Bias	2 or 4	1	Ind.	Idler	40-20K ± 2	0.07	60	105	200	2 pk. rdg. mtrs.	15 1/2 x 12 3/8 x 16 1/2	20	299.00	Cross-field rec. hd.	
	1600X series	A	No	7	2+ Bias	4 or 2	1	Ind.	Idler	40-20K ± 2	0.1	58	100	Low	2 Mtrs.	15 3/8 x 11 11/16 x 6 7/8	20	249.00		
TEAC	A-7030U	F	No	10 1/2	4	2 or 4	3	Hys.	Belt	40-20K ± 2	0.06	58	66	10K	2 Mtrs.	17 1/4 x 8 x 20 1/4	62	749.50	Similar to above, but 4-track with auto. phase-sensing rev.	
	A-7010U	B	No	10 1/2	4	4	3	Hys.	Belt	45-15K ± 2	0.88	55	66	10K	2 Mtrs.	17 1/4 x 8 x 20 1/4	62	849.50	Touch-buttons; NAB hub adapters; plug-in head assy; extra 4-track play head; cue contr; opt. full rem. contr.	
	A-6010U	B	No	7	4	4	3	Hys.	Belt	45-15K ± 2	0.88	55	90	10K	2 Mtrs.	15 1/2 x 7 x 18 1/4	52	664.50	Touch buttons; phase-sensing auto rev; plug-in head assy; opt. full rem. contr; sep. units.	
	A-1200U	B	No	7	3	4	3	Hys.	Belt	50-15K ± 3	0.12	50	100	10K	Dual Mtr.	17 1/2 x 9 3/4 x 17	41	299.50	Built-in s-o-s and echo; outer rotor torque motors; opt. rem. pause contr.	
	A-1500	B	No	7	4	4	3	Hys.	Belt	50-15K ± 3	0.12	50	100	10K	2 Mtrs.	16 11/16 x 11 1/2 x 15 1/4	42	399.50	Built-in s-o-s and echo opt. remote control unit, automatic reverse.	
TELEX (VIKING)	2001	B	No	8 1/4	3	4	3	Hys.	Belt	45-18K ± 2	.18	52	80	HIZ 600	2 Mtrs.	19 3/4 x 14 1/2 x 8		799.95	Die-cast frame push-button solenoid opr. built-in whisper fan.	
	433	A	No	7	3		3		Belt	40-18K ± 3	.2	54	70	50K	2 Mtrs.	15 1/4 x 8 3/4 x 14 1/4	30	374.95	Opt. remote pause control and speakers with built-in amps. Walnut base also available.	
UHER	10,000	C	Yes	7	4	4 or 2	1	Hys.	Idler	20-20K	.04	54		2 Mtrs.	17 1/4 x 13 3/4 x 7 3/4 inc. lid	30	550.00	Complete rdg studio.		
	4400	C	Yes	5	3	4	1	Sync		40-20K	0.10	50		2 Mtrs.	11 x 9 x 3 1/2	8	459.50	Prof. portable hi-fi stereo.		
	5500	3 3/4	Yes	5 3/4	3	2	1	Hys.		40-16K	0.15	48		Meter	13 x 10 x 6	16	379.50	Student-instr. tcig. mach; auto lecturing machine.		
	263	A	Yes	7	3	4 or 2	1	Hys.	Idler	30-20K	.05	55		Dual Meter	17 1/2 x 13 3/4 x 7 inc. lid	23	299.00	Simpl. prof. rcdr w intchg. 2- and 4-track hds.		
WOLLENSAK	6250	A	Yes	7	3	4	2	Hys.	Pulley	35-20K ± 2	0.12	54	90	2.2	2 Mtrs.	20 1/2 x 13 1/2 x 7 1/2	25	379.95	Self-contained mon. spkrs; rec. bias sel; tape/source mon.	
	6150	A	No	7	3	4	2	Hys.	Pulley	35-20K ± 2	0.12	54	90	2.2	2 Mtrs.	16 1/2 x 13 1/2 x 6 1/2	18	279.95	Deck for prof. rcdg; rec. bias sel; tape/source monitoring.	
	6120	A	Yes	7	2	4	2	Hys.	Pulley	40-18K ± 3	0.15	50	90	2.2	2 Mtrs.	16 x 5 x 3	18 1/2	199.95	Excl. fwd-rewind braking system.	

FOUR-CHANNEL DECKS & RECORDERS



Sony 854-4



TEAC TCA-42



Telex-Viking
Quad/Sonic 2+2



Wollensak 6154

MANUFACTURER	MODEL	Speeds (See letter code)		Power Amp(s) Built in ?		Max. Reel Size, In.		No. of Heads	No. of Tracks	No. of Motors	Drive Motor Type	Drive to Capstan	Frequency Response Hz to kHz*		Wow and Flutter, %*	Signal-to-Noise Ratio, dB*	Fast Wind, 1200 Ft., Sec.	Mic Input Z, Ohms	Rec'ing Level Indicator Type	Dimensions, W x D x H, In.	Weight, Lbs.	Price	SPECIAL FEATURES
		B or F	No	10½	4	4	3						Hys.	Belt									
SONY/ SUPERSCOPE	854-4	E	No	10½	4	4	3	Servo	Belt	20-30K	0.03	59	-	Low*	4	Mtrs.	17 3/8 x 10 x 22 1/8	61 7/16	1,395.00		*Bal. Cannon XLR mic inputs; dual capstan drive; 4-track, 4-chan rec and p.b.		
	654-4	B	No	7	4	4	3	Hys.	Direct	30-22K ±2	0.04	57	60	Low	4	Mtrs.	16 1/4 x 9 5/8 x 20	48 3/16	750.00		4-track, 4-chan rec. & p.b.		
	652-4	B	No	7	4	4	3	Hys.	Direct	30-22K ±2	0.04	57	60	Low	2	Mtrs.	16 1/4 x 9 5/8 x 18	46 3/16	549.95		4-chan p.b.; 4-track stereo rec. and p.b.		
	366-4	B	No	7	4	4	1	Ind.	Belt	20-25K	0.09	55	120	Low	4	Mtrs.	17 x 9 5/8 x 18 3/8	2Q 13/16	479.95		4-track, 4-chan rec. and p.b.		
TEAC	SIMUL-TRAK TCA-40	B	No	7	3	4	3	Hys. 2 spd.	Belt	50-15K ±3	0.12	50	100	10K					12 x 17 1/2 x 7	37	365.00		Compatible 4- and 2-chan stereo p.b. deck; 4 p.b. amps; auto reverse for 2-chan. operation.
	SIMUL-TRAK TCA-41	B	No	7	3	4	3	Hys. 2 spd.	Belt	50-15K ±3	0.12	50	100	10K	2	Mtrs.	12 x 17 1/2 x 7 deck	37	535.00		4-chan p.b. and 2-chan rec. and p.b. incl. connectors to adapt to 4-chan. recording. Amp 4 3/8 x 1 7/8 x 7 1/4 in.		
	SIMUL-TRAK TCA-42	B	No	7	4	4	3	Hys. 2 spd.	Belt	50-15K ±3	0.12	50	100	10K	4	Mtrs.	12 x 17 1/2 x 7 deck	37	695.00		4-chan rec. and p.b. deck; compatible with 2-chan, 1/4-track stereo rec. and p.b. Amp. as above.		
TELEX (VIKING)	QUAD SONIC 2+2	A	No	7	4	4	3	Ind.	Belt	40-18K ±3	.2	55							16 1/2 x 6 1/4 x 11	30			Playback only compatible 2 or 4 channel.
	QUAD SONIC 230 QS	B	No	7	4	4	3	Ind.	Belt	40-16K ±2	.2	52	60						19 x 6 x 10 1/2	22	550.00 734.00		Playback only. With preamps.
	230 QSRP	B	No	7	4	4	3	Ind.	Belt	40-16K ±2	.2	55	60	High (2)	4	Mtrs.		42	1,647.00		600 ohm bal outputs opt remote control, portable case.		
WOLLENSAK	6154	A	Yes	7	3	4	2	Hys.	Pulley	35-20K ±2	0.12	54	90	2.2	2	Mtrs.			16 1/2 x 13 1/2 x 6 1/2	18	499.95		4-chan preamp deck; also avail as mod. 6364 with built-in amps.

Equipment Profiles

- Sansui 2000A Receiver 42
- Harmon-Kardon Citation Eleven Preamp/Stereo Equalizer 46
- Advent Model 100 Noise Reduction Unit 49

Sansui 2000A
Solid-State AM/FM Stereo Receiver



MANUFACTURER'S SPECIFICATIONS:

TUNER SECTION: FM: **IHF Sensitivity:** 1.8 μ V. S/N: Better than 60 dB. **THD:** Less than 0.8%. **Selectivity:** Better than 40 dB. **IHF Capture Ratio:** 1 dB. **Image Rejection:** Better than 90 dB. **I.f. Rejection:** Better than 95 dB. **Spurious Response Rejection:** Better than 90 dB. **Stereo FM Separation:** Better than 35 dB @ 1 kHz.

AM: **Sensitivity:** 100 μ V/meter. **Image Rejection:** Better than 50 dB. **I.f. Rejection:** Better than 80 dB. **Selectivity:** Better than 20 dB.

AMPLIFIER SECTION: **IHF Music Power:** 120 watts @ 4 ohms, 90 watts @ 8 ohms. **RMS Power:** 43 watts/channel @ 4 ohms; 35 watts/channel @ 8 ohms. **THD:** Less than 0.8% at rated output. **IM Distortion:** Less than 0.8% at rated output. **IHF Power Bandwidth:** 20 to 40,000 Hz at 8 ohms. **Frequency Response:** Power amplifier: 10 to 50,000 Hz \pm 1 dB; Overall, including preamplifier-control section: 20 to 40,000 Hz \pm 1 dB. **IHF Hum and Noise:** Phono 1 & 2: Better than 70 dB; Aux: Better than 75 dB. **Input Sensitivity:** Phono 1 & 2: 2.5 mV; AUX: 150 mV; Tape Monitor: 150 mV. **Damping Factor:** 24 @ 8 ohms. **Speaker Impedance:** 4 to 16 ohms. **Tone Control Range:** Bass: \pm 12 dB @ 50 Hz; Treble: \pm 12 dB @ 10,000 Hz. **GENERAL:** **Dimensions:** 17-7/16" w. \times 4-15/16" h. \times 13-3/16" d. **Weight:** 27.3 lbs. **Suggested retail price:** \$299.95.

It was with a great deal of pleasure and satisfaction that this department examined the Sansui Model 2000A. Pleasure, because this unit is one which meets its performance specifications and then some, and satisfaction because we looked back at some of the suggestions we had made when we reviewed its predecessor (Sansui Model 2000, reviewed in *AUDIO*, Oct. '68, p. 70) and found that just about all our earlier suggestions had been acted upon. The 2000A, however, is more than just a dressed up Model 2000. It is a totally new and updated design, from front panel to rear, and the circuitry has been updated to state-of-the-art technology as well.

The lower portion of the gold and black front panel includes a power push-push switch, phone jack, separate but concentrically-mounted individual-channel bass and treble controls, master volume control, balance control, and signal-source-selector switch. Secondary pushbutton controls at the left include low- and high-frequency filters, while a bank of four such buttons at the right perform the functions of loudness-contour, stereo normal/reverse, mono/stereo selection, and tape monitor. These buttons, too, are of the push-to-make, push-to-break type. The upper portion of the panel is effectively "blacked out" until power is applied. With the selector switch in either the AM or FM position, an expanded dial scale becomes illuminated, as does a peak-reading tuning meter to the left of the dial scale. The meter is usable in both AM and FM service. Noteworthy is the linear FM dial scale which has practically become a trademark in Sansui products. Spacing between every "MHz" on the dial is equal, making the accurate tuning and reading of signal frequencies a simple and repeatable process. In any of the other selector-switch positions, the calibration and meter illumination "black out" and a single illuminated identification, such as PHONO 1 or AUX, appears along the upper edge of the blacked out area. To the right of the dial-scale area are two more push-push controls—one for defeating the FM interstation-muting circuits and one for introducing an MPX (Stereo FM) noise-cancelling circuit, useful when listening to distant stations transmitting stereo programming received somewhat noisily because of weak signals. At the extreme right of the panel is the tuning knob, coupled to a very effective flywheel that permits spanning the entire dial with one good twist of the knob—and with such an expanded dial scale, that's quite a feat. The dial pointer, by the way, is softly illuminated in red, making it visible from across a room for remote identification of frequencies.

Significant improvements over the earlier Model 2000 are in evidence on the rear panel as well. In the cluster of eight input and output jacks at the right, two phono pairs are now

provided (there used to be a single pair for phono and a pair for seldom-used "tape heads"). A heavy grounding terminal is also located in this area. Just below the DIN (European) tape recorder jack, there are now a pair of jumper bars which connect from the preamplifier section to the power amplifier section of each channel. Removal of these jumpers enables the user to install any of the many accessory items, such as reverb units, custom multiple-tone controllers and, conceivably, even "a four-channel stereo decoder," should such an item become the mainstay of conversion to quadraphonic sound. This new convenience is in an area of the rear panel formerly occupied by a user-adjustable stereo FM separation control which we pointed out in the earlier review shouldn't be user controlled at all! Increasingly popular "piano key" speaker terminals (the type which require only pushing down and inserting the stripped speaker lead ends) have replaced conventional barrier terminal strips of the earlier model, and there are provisions for two full pairs of stereo speaker systems. These terminals flank a pair of quick-acting speaker fuses. In the event of failure of these fuses for any reason, a "Protector" light on the front panel becomes illuminated, directing the user to the source of the trouble. As you pivot the AM bar antenna downward, a local/distance switch is disclosed, as well as a rotary control for setting desired FM interstation mute threshold. A pair of convenience AC outlets (one switched, one unswitched), the main line fuse, and FM and AM antenna terminals (also of the "piano key-depress" variety) complete the back panel layout. There are separate pairs of terminals for both 75-ohm and 300-ohm transmission line connection and a second grounding terminal at this end of the back panel.

Circuit Description

Removal of the metal housing and bottom cover of the Sansui 2000A disclosed a well-organized layout of ten modular p.c. boards plus a fully-sealed (except for the AM variable capacitor gangs) front-end section (see Fig. 1). The RF stage of the FM front-end is an FET, while the remaining three devices in this section are bi-polar transistors. The i.f. amplifiers (FM) use four IC devices, each of which contains the equivalent of five transistors. In addition, this section contains a three-transistor-plus-three-diode mute circuit so designed as to afford virtually "no transition" distortion at signal strengths near the mute threshold setting. A completely separate AM section is used, consisting of four more transistors and three diodes and utilizing no parts in common with the FM i.f. section. In all, the active device complement of this new receiver consists of 45 bi-polar devices, 1 FET, 4 IC's, 28 diodes and 2 Zener control diodes. Both high-level and low-level signals are fed through the preamplifier audio stages. While normally we prefer to see the high level inputs by-pass the preamp stages (for better S/N and hum), we must admit that in this instance, high-level input hum was quite acceptable, measuring in excess of the 75 dB claimed. Quality of components used throughout the receiver seemed excellent, with over-rated parts used particularly in capacitors and power transformer, which was cool after nearly four hours of high-power testing. The output coupling capacitors in this "single ended push-pull" amplifier circuit are 2200 μ F, 75 volt units, for example. The total supply voltage is 65 volts and only half of that voltage (approximately 32.5 volts) appears across the output capacitor, since it is at the mid-point of the two series-connected transistors. Still, a 75-volt electrolytic capacitor is used so that in the unlikely event of a total short of the upper transistor (TR-6), the full voltage then appearing across C-1 would still not be sufficient to damage the output capacitor. The reactance of a 2200 μ F capacitor at 20 Hz is a little under 4 ohms, by the way, and at 100 Hz it is less than 0.75 ohms. Thus above 100 Hz, the damping factor of the

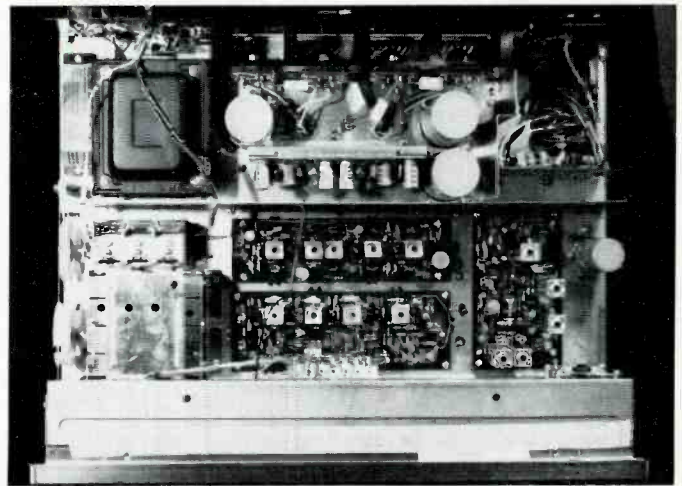


Fig. 1—Showing top view.

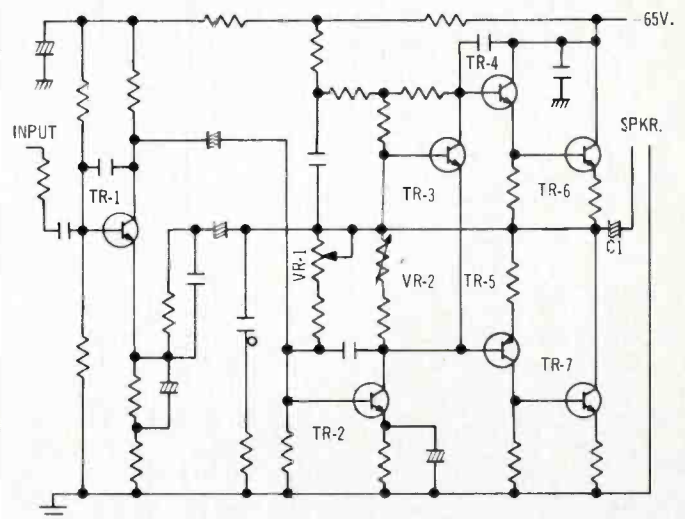


Fig. 2—Schematic of one power amplifier channel. Output capacitor C1 is 2200 μ F, VR1 and VR2 are bias adjustment controls.

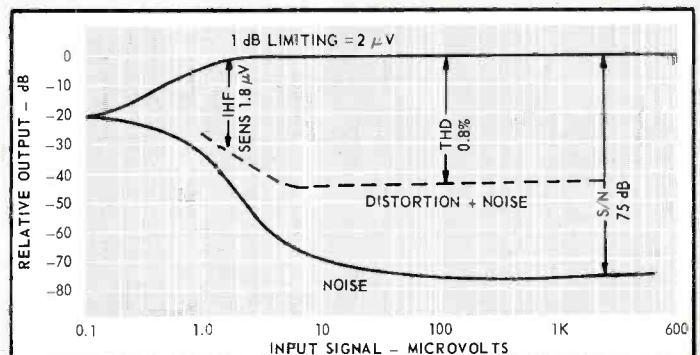


Fig. 3—FM characteristics.

amplifier is just about independent of the output coupling capacitor. The power amplifier section of one channel is shown, schematically, in Fig. 2.

FM performance characteristics of the Sansui Model 2000A are depicted graphically in Fig. 3, and it is interesting to note how the new design has resulted in significant improvements in almost every FM specification concerned, compared with the

earlier Model 2000. For example, the old measured sensitivity was 2.2 μV as opposed to the present 1.8 μV . We are happy to see that the published specifications dropped the old " ± 3 dB" which had been associated with this measurement. Full limiting is at 2 μV (it used to be at 3 μV), and the signal-to-noise ratio is now a very fine 75 dB, whereas the best figure obtainable from the older model was 67 dB. THD, however, remained about the same, at around 0.8%, as claimed.

Detailed measurements of the amplifier portion of the Sansui 2000A disclosed that it, too, has undergone significant improvement compared with the older Model 2000. We measured 38 watts rms per channel at rated distortion of 0.8% this time and were able to produce 40.5 watts before reaching a THD of 1.0%. This is about 5 watts better than the older model (10 watts, if you add up both channels, since both channels were driven during all THD and IM tests).

IM was about 0.6% at rated power (35 watts) and 0.7% at 38 watts, considerably better than the 0.8% claimed by the manufacturer for only 35 watts. At very low power levels, however, there is a slight tendency for both the THD and the IM to increase slightly, a not unfamiliar characteristic of a great many solid-state products. The THD seemed more prone to this effect than the IM, reaching a maximum of about 0.5% at very low listening levels of 100 milliwatts or so. Part of the increase may be attributable to residual hum and noise influence on the distortion meter, but part of it was definitely perceived on the oscilloscope as an increase in THD at these very low levels. Since the maximum never exceeded 0.5%, however, it is unlikely that you would be able to hear this effect under normal listening conditions. Plots of both THD and IM are shown in Fig. 5. Figure 6 confirms the power bandwidth claims of the manufacturer, extending from 20 Hz to 40,000 Hz for the half-power points. Roll off below the 20 Hz point is probably deliberate, in keeping with the design philosophy of many manufacturers who feel that there is no point in producing large amounts of power (usually because of rumble of turntables or other low frequency effects) at frequencies which cannot be heard in any event. Tone control response, shown in Fig. 7, seems to have remained about the same as in the earlier model and is quite adequate in actual use. High frequency filter action is excellent, beginning as it does at 4 kHz and having a 12 dB-per-octave slope. We felt, however, that the low frequency filter still cuts into the program material a bit too obviously, with 10 dB of attenuation at 50 Hz. These characteristics, as well as loudness-contour action at a -30 dB setting of the volume control are also plotted in Fig. 7.

Listening Test

There are some features of the Sansui Model 2000A which haven't changed a bit, compared to the earlier design. In listening to this receiver, we were once again struck by the excellence of the muting action of this (and just about every other) Sansui product in the receiver category. We set up the mute threshold adjustment for about 8 microvolts and were able to pick up 48 noise-free stations with the aid of a directional high-gain outdoor antenna some 17 miles from New York City. Defeating the mute completely raised the number to 53, of which all but about two were still noise-free (or at least sufficiently noise free to make the program listenable). This means that at least four more stations having input-signal strengths of less than 8 microvolts were producing satisfactory quieting (of the order of 45 to 50 dB) which corresponds very nicely with our earlier laboratory measurements. It is difficult to appreciate the nicety of a linear FM dial scale until you've used one. We were able to move from channel to channel by moving the dial pointer exactly one notch on the 0-100 logging

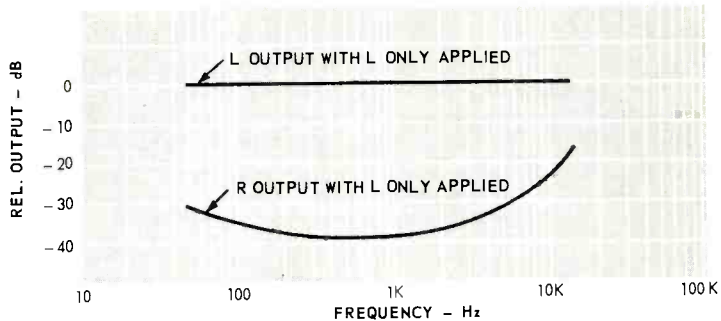


Fig. 4—Stereo separation.

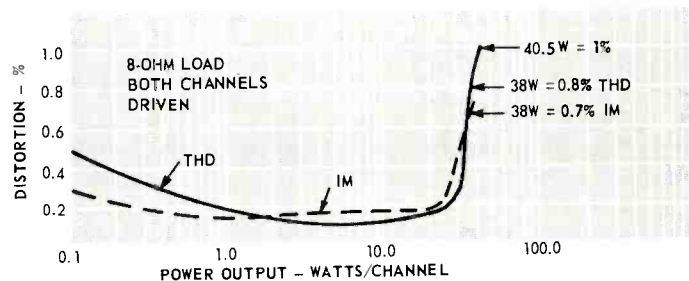


Fig. 5—THD and IM distortion.

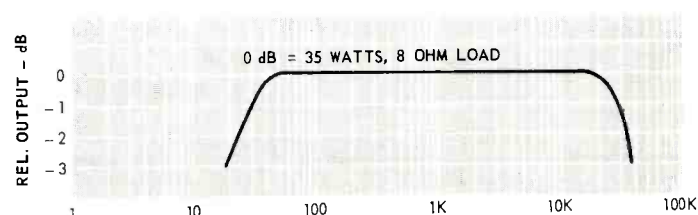


Fig. 6—Power bandwidth.

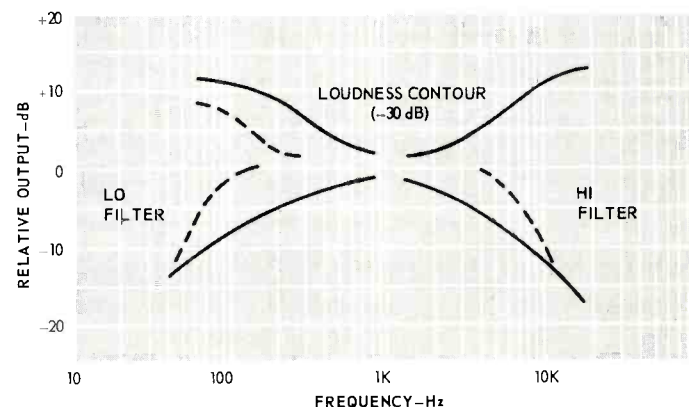


Fig. 7—Tone control, filter, and loudness characteristics.

What Does True Pitch Or Zero Overlap Do For You?

Many years of stagnation in loudspeaker system design had to end. Most present day systems really do not sound any better than speakers produced years ago. With the great strides made in quality of signal source obtainable from today's better amplifiers, receivers, tape decks or cartridges, present day speaker systems leave much to be desired.

It took Fairfax, with their group of true audio zealots, to find a new direction, practically a new basic philosophy of speaker system design. We at Fairfax believe that a speaker system should be thought of as a musical instrument, which by electronic and mechanical means, reproduces the sound of other musical instruments, as well as the sound of a human voice, as realistic as the original source.

This is exactly what we have accomplished in our new series of 1970-71 speaker systems, designed for true pitch with zero overlap of all audible frequencies. This means that you can differentiate between the sound of each of the instruments of a complete orchestra.

The result is really astonishing with respect to the degree of realism that is so remarkably enhanced that you don't have to be an orchestra conductor, recording engineer or an audio technician to hear the difference. All you have to do is to love music and know how it should sound.

If you really want to buy the speaker system of the future insist upon comparative demonstrations of Fairfax speakers against the very best and most costly available on the present day market. The price you will be able to buy Fairfax speaker systems for also will be a most pleasant surprise for you.

Sooner Or Later Someone Had To Do It.

your personal evaluation is requested.

FX-100

Excels in comparison with units priced to \$175.00



2-way duo-harmonic speaker system; heavy duty 8" bass/midrange driver; special 3" tweeter; frequency response 30-20,000 Hz; 30 watt rating; 21" H x 12" W x 7 7/8" D.

Suggested Audophile Net . . . **\$79.50**

5-YEAR GUARANTEE ALL MODELS WEST COAST PRICE ADD 5%

FTA

Excels in comparison with units priced to \$325.00



4 speakers, 3-way system; 1 low bass, 1 mid bass 8" woofers; 1 mid-high 3 1/2" tweeter; 1 ultra-high tweeter; freq. response 24-20,000 Hz; 60 watt input; 25" H x 14" W x 12" D.

Suggested Audophile Net . . . **\$139.50**

FE-8

Excels in comparison with units priced to \$650.00



8 speaker, 5-way system; 2 low bass 2 mid bass 8" woofers; 2 mid-high; 2 uh 4" tweeters; 1" particle board cabinet; frequency response 20-20,000 Hz; 100 watt input; 28 3/4" H x 20" W x 12" D.

Suggested Audophile Net . . . **\$249.50**

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scale regardless of whether we were dealing with the low end or the high end of the band. Calibration, by the way, was excellent, as it should be with such an expanded scale. Automatic stereo switching was positive with no erratic stereo light indications in the presence of interstation noise. A word is in order concerning the MPX NOISE CANCELLER button on the front panel. It **works**—with very little reduction in overall separation (even at the high end). We tried it while listening to a stereo station some 60 miles away (which, admittedly, was noisy in stereo) and found that by depressing the MPX NOISE CANCELLER (it deserves a much better title, by the way) we were able to get rid of a good deal of the background hiss normally associated with fringe stereo FM listening. Don't expect it to help your multipath problems, however. Nothing can do that except a properly oriented and selected FM antenna!

In using the phono inputs, we found that inputs 1 and 2 have the same sensitivity and yet, the results obtained in PHONO 2 seemed to have a more peaked response than PHONO 1 input. Only then did we discover that the PHONO 2 input has a 100-K load resistance—too high for our (and most everyone else's) cartridge. Once you know this, it is easy enough to add another 100K resistor externally, reducing the load resistance across the PHONO 2 input to the more usual 50K or so. We know of no cartridge that requires a load of 100K for flat test response

and would rather see two different sensitivities for the two phono inputs—a much more useful and less confusing feature.

In any case, hum and noise on both phono inputs as well as in the AUX position were remarkably low—in no way detracting from any of our listening experiments' success.

Lest the good people at Sansui become complacent and assume that they have reached perfection (a dangerous assumption for any maker of high fidelity component products), we must end with a minor criticism. The "local-distance" switch, hidden behind the AM bar antenna is really an anachronism in view of the overload-proof FET front end. Should it be inadvertently switched to the "local" position, a user unaware of its presence might well rush the set back to the dealer for servicing, thinking that the receiver is insensitive and defective. Please do away with this switch—it just isn't needed any longer!

It goes without saying that if the old Model 2000 at \$299.95 was excellent value in 1968, the new 2000A, at no increase in price, is doubly so and only further confirms what our industry has maintained for years in the face of rising prices in other manufacturing fields—you get more for your high-fidelity component dollar today than ever before. The Sansui 2000A is one of the sets that proves it!

L.F.

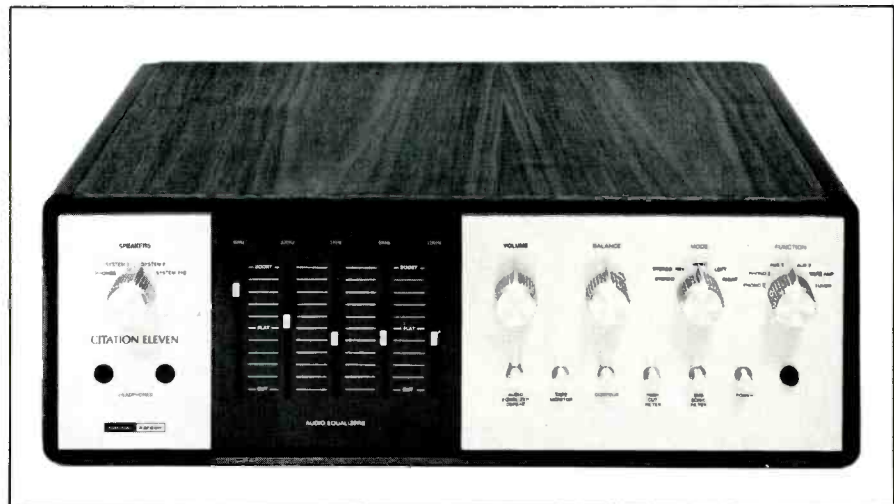
Check No. 46 on Reader Service Card

Harman-Kardon "Citation Eleven" Stereo Preamp/Audio Equalizer

MANUFACTURER'S SPECIFICATIONS:

Audio Output: up to 6V rms into 10k ohms. **Frequency Response:** 5 Hz to 125 kHz ± 0.5 dB; 2 Hz to 250 kHz ± 1.0 dB. **Harmonic Distortion:** 6V output, 10 to 30,000 Hz, less than .05%; 2V output, less than residual of test equipment. **IM Distortion:** equivalent 6V rms, less than .05%. **Sensitivity** (for 2V output); Phono 1 and Phono 2, 1.5 mV; Aux 1 and Aux 2, 150 mV; Aux 3, 300 mV. **Noise** (unweighted); Phono inputs (10 mV reference) 65 dB below 6V out; high level, (vol. at max.) 80 dB below 6V out; residual (vol. at min.) 90 dB below 6V out. **Input Impedance:** phono, 47 k ohms; aux, 20k ohms. **Output Impedance:** 500 ohms. **Recommended Load:** 10k ohms or more. **Phono Overload:** greater than 115 mV. **Audio Equalizers:** ± 12 dB at 60, 320, 1000, 5000, and 12,000 Hz. **Price:** \$295.00.

One of the disadvantages of the separate preamp and power amplifier, as compared to a receiver, for example, is that the user does not have a low-impedance phono jack on the control panel, and he is not able to switch speakers as readily. The Citation Eleven has eliminated this problem by the simple expedient of bringing the speaker leads to the back of the preamp, along



with the outputs from the power amplifier. Thus aside from one six-foot cable for outputs and two shielded cables for inputs, which go between the preamp and the power amplifier, all connections are made at the rear of the preamp. This even includes three switched convenience outlets to accommodate the power amplifier, tuner, and tape recorder, and a fourth unswitched outlet for the phono turntable—a recommended practice to avoid the possibility of developing a flat on the idler if the unit is turned off

at other than its own switching which also retracts the idler.

The front panel is separated into three sections — at the left is the speaker system switch and the two phone jacks; at the center section are the five slide-type equalizer controls; and at the right are four knobs controlling volume, balance, mode, and function. The mode switch provides five positions—stereo, stereo reverse, mono, left, and right. The function switch has positions for phono 1, phono 2, tuner, and three "aux" inputs. Below the knobs are six

metal push-push switch buttons: equalizer defeat, tape monitor 1, tape monitor 2, hi-cut, lo-cut, and power, with a pilot light to the right of the last button indicating when power is on.

The rear panel is just full of connectors. At the right is a five-terminal socket which accepts the plug carrying the power amplifier output leads through the six-foot cable. Below this socket are two vertical terminal strips, one for each of two speaker systems. Each strip has four barrier terminals—left “hot,” left common, right common, and right “hot,” making the connecting of the speaker systems a simple and foolproof operation without much chance of shorting the leads. Internally, this section is separately shielded, with the selector switch way to the back, and the leads to the phone jacks are shielded and run along the chassis base. The dropping resistors for the phones are 330-ohm, 5-watt units. The switch has four positions—phones only, system 1 only, system 2 only, and systems 1 and 2. When the speaker systems are on, the phone jacks are switched off.

Next on the rear panel are four convenience outlets—three are black and are switched, while the fourth one, which is not switched, is white. Below these outlets are the line cord and the fuse holder. Next there are twelve pairs of phono jacks to accommodate the inputs and outputs. Two pairs are required for the low-level phono inputs, and two pairs are provided for the main outputs. Two more pairs are provided for tape recorder outputs, with neither being affected by the equalizer or filter controls on the front panel. Then there are two pairs for tape monitor 1 and 2, and the three pairs for aux 1, 2, and 3, with a twelfth pair accommodating the tuner. Thus it can be seen that considerable flexibility is built into the Citation Eleven.

Circuit Description

The circuitry is fairly simple, using two transistors in each channel for the low-level phono inputs to provide RIAA equalization and enough gain to bring the signal up to the same level as the high-level inputs. Following the tape-monitor switching and the hi- and lo-cut filters, the signal from each channel is fed to the base of a transistor which has equal collector and emitter resistors, and thus is a unity-gain device in the “flat” position of the equalizer controls. The two outputs—collector and emitter—are fed through large capacitors to the opposite ends of the five equalizer controls, each having a value of 50,000 ohms, and with each

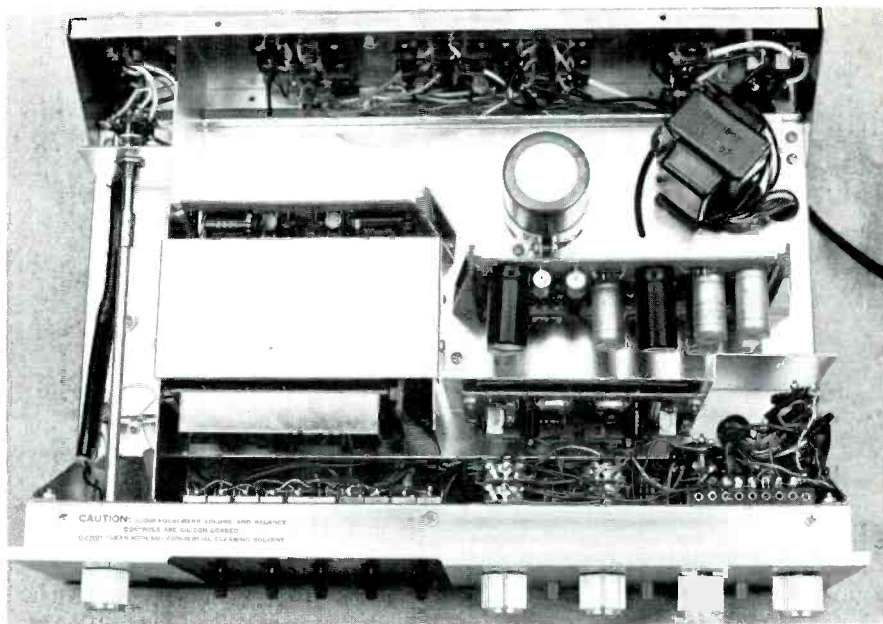


Fig. 1—Showing top view.

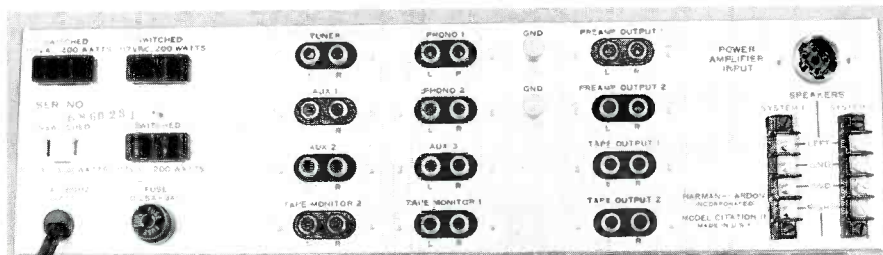


Fig. 2—Rear panel; note the four a.c. outlets.

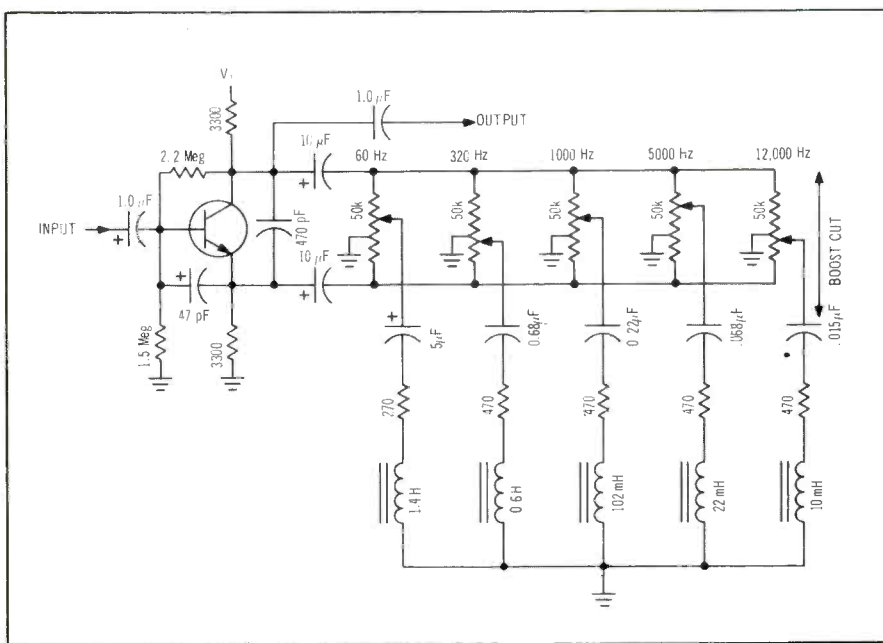


Fig. 3—Showing circuit of the audio equalizer which uses only one transistor per channel. There are five slide controls and five resonant circuits.

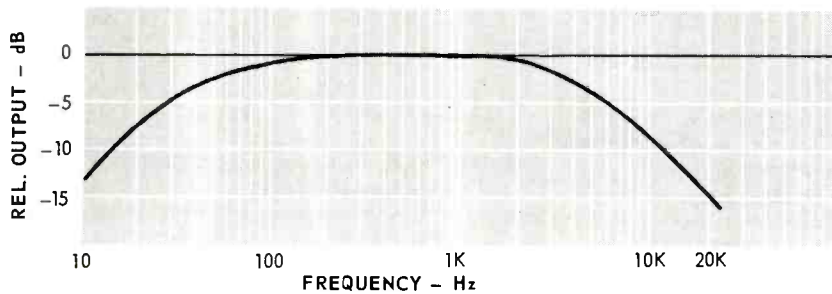


Fig. 4—High- and low-pass filter characteristics.

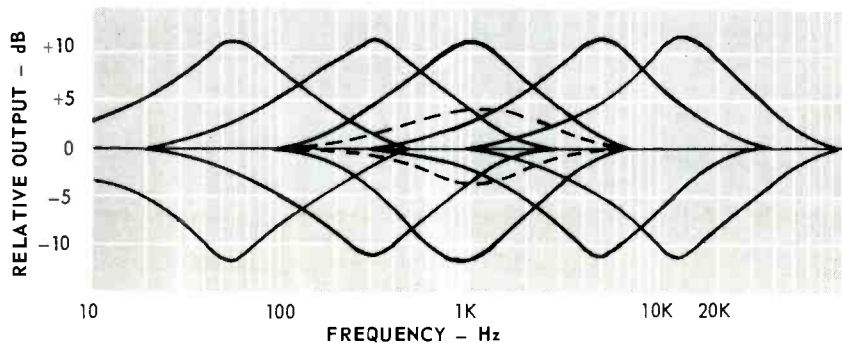


Fig. 5—Characteristics of the Audio Equalizers. The dashed curve shows the 1000-Hz equalizer in mid-position. All others are at maximum boost and cut positions.

center-tapped and connected to ground as shown in Fig. 3. The arms of the five pots are connected through coils and capacitors resonating at the five specified frequencies—60, 320, 1000, 5000, and 12,000 Hz—along with series resistors to control the sharpness. When the arm of any pot is at the collector end, the resonant circuit shunts the signal to ground at its resonant frequency. When the arm is at the emitter end of the pot, the shunting of the resonant circuit across the emitter resistor increases the gain of the stage, and thus boosts the signal at the frequency of resonance. This is a very simple circuit, requiring a minimum of parts, but it does involve inductances, which are naturally susceptible to hum pickup. Consequently, they are doubly shielded to avoid this possibility, and the efficacy of the shielding is shown by the low noise level of the preamp—better than 80 dB below 6 volts out. The equalizer-defeat switch bypasses this circuit, and ensures flat response, also making it possible to compare the effect of control settings instantaneously.

The output section of the preamp consists of a feedback pair in each channel, preceded by a group of three FET's arranged so as to prevent a "thump" whenever the preamp is turned on. The drain and source of one FET are connected across the high-impedance

input to each output amplifier, and when the gate-to-source voltage is zero—as it is when the preamp is off—the resistance between drain and source is of the order of 200 ohms, thus effectively shorting out the signal. When the preamp is turned on, a control voltage is fed to the gate through a time-delay circuit and the drain-to-source resistance rises to several hundred megohms, thus removing the short and allowing the signal to pass unaltered. The time constant of the delay circuit is approximately 20 seconds, so the unit "warms up" slowly, avoiding any clicks or thumps in the output. The third FET serves to feed the control voltages to the first two.

Performance

The Citation Eleven satisfies its specifications excellently. The curves of the audio equalizer section are shown in a composite in Fig. 4. These curves show the effects of each of the five controls separately at both maximum boost and maximum cut positions. An intermediate setting of the control results in the dashed curve shown for the 1000-Hz position, and others are similar. To effect a certain curve, one may boost one of the five frequencies and cut the next, for example, and if every possible

combination were plotted, it would take several pages for the curves alone. Suffice that practically any desired response curve can be obtained with the controls in the various positions. Simply add and subtract the curves and see the possibilities for yourself.

The curves track within ± 1 dB throughout their ranges, and provide a maximum boost or cut of 12 dB at each of the five frequencies. Similarly, the phono circuits follow the RIAA curve within ± 1 dB from 20 to 20,000 Hz, and curves for both phono positions are identical, naturally, as are those for both channels. The lo- and hi-cut curves are shown in Fig. 5. The maximum rated output for the preamp is 6 volts, but clipping does not occur until a 12-volt output is reached. Phono overload is a comfortable 112 mV, which should accommodate the loudest rock records, even when played with a high-output cartridge. At 6 volts output, IM distortion measured a miniscule .04%, and THD was under .05% at 6 volts, and below residual at 2 volts, which means that distortion is essentially not a factor in the output. The signal-to-noise ratio measured 62 dB on phono (referred to a 10-mV signal and a 6-volt output). With the volume control at maximum, S/N was 82 dB, and with the volume control at minimum, S/N was 93 dB. These figures transcend the term "excellent" in every particular. Even the two sections of the volume control track within ± 0.5 dB, which is remarkable.

Having made all the measurements, we were champing at the bit to try it out. We have been using the Citation Twelve as a power amplifier for some months, and from the moment it was put into service, we noted a definite improvement in our sound quality. The Eleven does away with the need for any frequency shaping devices, since it has practically all that anyone could desire. One can change the quality of male voices, for example, and it is likely that you could have all announcers sound almost the same if you wanted to. With music, you can correct for recording miscalibration, if it exists, or you can add your own. You can compensate for room acoustics to a remarkable degree, increasing the bass to make up for speaker deficiencies, and boosting or cutting the highs—extreme or middle—to make up for room furnishings. In short, there is very little that you cannot do with the Citation Eleven. It is a worthy addition to the already distinguished reputation that the name Citation has achieved over the many years since they first made their appearance. C.G. McP.

Check No. 48 on Reader Service Card



**Advent Noise Reduction Unit
Model 100**

MANUFACTURER'S SPECIFICATIONS:

RECORD SECTION:

Input Impedances: Microphone, 1000 ohms, unbal.; line, 50,000 ohms, unbal. **Input Sensitivities:** (after Dolby Level calibration) Mic, 0.5 mV for 0 VU; Line, 60 mV for 0 VU. **MX Filter:** 19- and 38-kHz notch filters. Response with filter down less than 1 dB at 15 kHz. **Outputs:** (to tape recorder input) adjustable; maximum of 0.5 V at 1000 ohms output impedance.

PLAYBACK SECTION:

Input impedances (from tape recorder output): 50,000 ohms. **Input Sensitivity:** Adjustable; minimum of 150 mV required for Dolby Level meter indication. **Bias Filter:** 28-kHz low-pass to eliminate bias noise from output of recorder. **Outputs** (after Dolby Level calibration): Maximum 1.0 V.

GENERAL:

Front panel: 12 $\frac{3}{8}$ × 4 $\frac{7}{8}$ in. **Overall Height with feet:** 5 in. **Chassis size:** 11 $\frac{3}{8}$ × 4 $\frac{1}{8}$ × 7 $\frac{1}{2}$. **Overall Depth with knobs:** 8 $\frac{3}{4}$ in. **Weight:** 10 lbs. **Price:** \$250.00 (slightly higher in some parts of the U.S.).

Audio buffs have been reading about the Dolby System for about two years, mainly relative to the professional A301 units which have gained such wide acceptance throughout recording studios all over the world. Now they can have a Dolby System for use in their own homes at a price well below the professional system, and yet one which will permit making recordings at 3 $\frac{3}{4}$ ips with practically the same quality they previously had at 7 $\frac{1}{2}$ ips, and without the increase in noise which previously had been the hallmark of the slower speeds.

While the "A" system separates the sound spectrum into four individual bands and processes them separately, the "B" system—as exemplified by the Advent Model 100—is much simpler, and processes the entire spectrum. It does this by increasing the high frequency content of the signal progressively as the level is lowered in the recording operation, and by providing a complementary decrease in high-frequency response in the playback operation. When properly adjusted, the complementary equalizations cancel out and result in a played-back signal which is identical with the original in frequency response, but with a reduction of tape hiss of the order of 10 dB.

In addition, the Advent Model 100 provides input mixing facilities so a microphone signal may be added to a high-level signal from tuner, record player, or another tape recorder in any desired degree. Another advantage—and one which is particularly important to the cassette recordist—is that the continual changing of cables and plugs is no longer necessary because the record signal can be plugged into the recorder and the output from the recorder playback jacks can be plugged into the Advent and left permanently. The recordist can thus switch from record to playback without changing cables, and yet still have the facility for monitoring from source while recording on a machine which does not have a separate play head, and then after rewinding he can monitor from the tape by simply throwing a switch on the Advent.

Description

The Advent 100 has a multiplicity of controls on its front panel—nine controls, eight switches, two meters, three

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This two-way system avoids the use of complex crossover networks and the resultant phase distortion. By enabling the majority of the audio spectrum to be radiated by the high frequency unit, we achieve essentially a "single point source". The low frequency driver is then left to do the demanding but uncomplicated job of reproducing the low and basically non-directional portion of the audio spectrum.

The result is an extremely transparent true-to-life bookshelf speaker system you must hear to appreciate.

ADC 450A SPECIFICATIONS

- Type** . . . Full-sized bookshelf.
- Cabinet** . . . Oiled Walnut.
- Dimensions** . . . 25" H x 14" W x 12 $\frac{3}{8}$ " D.
- Weight** . . . 50 lbs. each.
- Frequency Response** . . . 25 Hz to 30 kHz \pm 3 dB (measured in average listening room).
- Speakers (2)** . . . $\frac{3}{4}$ " "point source" wide range tweeter and 12" high compliance woofer.
- Nominal Impedance** . . . 6 ohms (for optimum performance from transistorized amplifiers).
- Power Required** . . . 10 watts RMS minimum.
- Price** . . . \$165 (suggested resale).



**AUDIO FOR
AUDIOPHILES**

Check No. 49 on Reader Service Card

indicator lights, and a headphone jack, as seen above. Those black rectangles are switches—not convenience outlets. All controls are clearly labeled. The rear panel accommodates a pair of phone jacks for microphone inputs, four pairs of phono jacks—high-level input, output to tape recorder, input from tape recorder, and output to amplifier. In addition, there are three holes for access to internal calibration adjustments, a meter test switch, a level-test point, two record calibration pots, and an unswitched convenience outlet.

Internally, the various sections are assembled on six circuit boards which plug onto connector pins in the chassis to facilitate servicing whenever necessary, with the power supply—regulated to supply 15 volts to the circuits—occupying the right end of the chassis. The three indicator lights tell you when power is on, and when either channel is switched to “Dolby” operation. The layout is shown in Fig. 1. To get at all the controls and switches, both front and rear panels swing out, as shown in Fig. 2, making every component instantly accessible.

The Circuit

The microphone preamplifiers employ a single Motorola MC1303L to boost the level up to the equivalent of the high-level inputs, and both have separate controls to provide for mixing. This IC is followed by a pair of bipolar transistors in each channel for additional gain, and these are followed by the multiplex filters, each having resonant circuits for 19- and 38-kHz suppression, both individually adjustable. All of this circuitry is on the first circuit board on the left as seen in Fig. 1.

The two record amplifier/processors occupy the next two circuit-board positions. Each of these contains six bipolar transistors, six diodes, and one FET. The circuit itself is reminiscent of early noise-reduction devices, except for the fact that the record amplifier does the reverse of what a noise-reduction circuit does. When the signal level is low, it *boosts* the high frequencies. The two playback amplifier/processors are next, and these react much the same as the usual noise-reduction devices do—that is, they cut the high frequencies when the signal levels are low. Their complement of transistors and diodes is similar to the record boards with the addition of one more transistor. The trick is, of course, to have the two processes track accurately, so the resultant is a flat signal. The final circuit board contains the output amplifiers and the meter amplifiers, each with two transistors per channel. In addition,

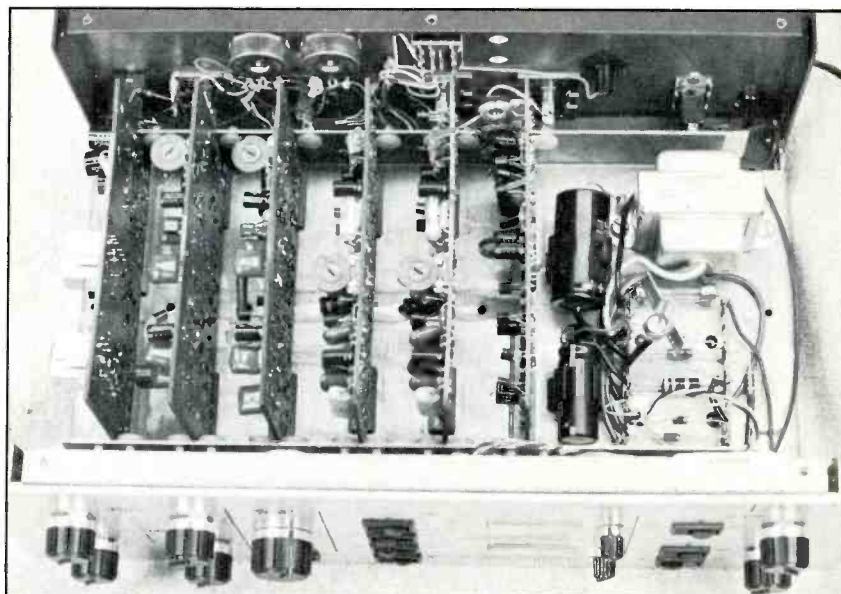


Fig. 1—Showing top view of the Advent Model 100 chassis.

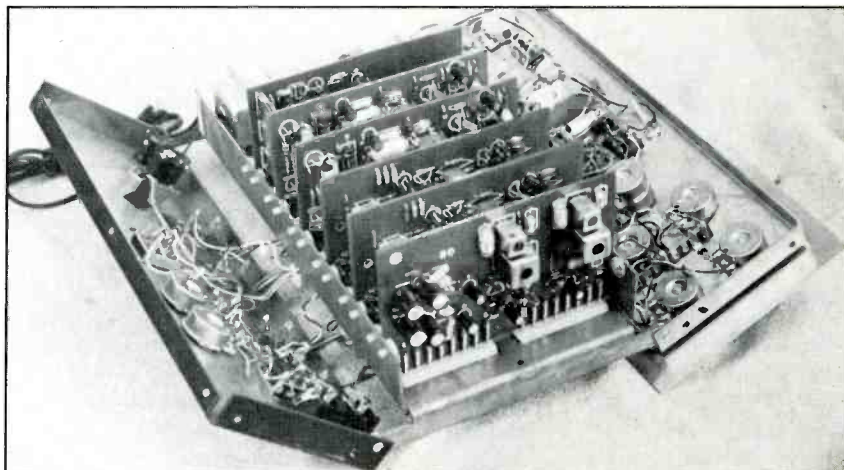


Fig. 2—Showing Advent chassis with back and front swung out.

this board has a calibration oscillator which provides a 400-Hz tone to adjust the various controls to the proper positions to ensure the complementary operation of the processing amplifiers, each of which has its own factory-set control for the “law” that the circuit will follow. Power supply regulation is accomplished by a single transistor with a Zener reference diode controlling the output voltage to the amplifiers.

Performance Measurements

How does one measure the performance of a device which has so many variables? We felt that to describe the Advent 100 properly, it would be necessary to provide some curves—not only as proof of how well it works, but to show *how* it works. Therefore, we first ran a

series of curves, using a graphic recorder and the output from the CBS STR-100 record fed at the normal recording level, and at 10, 20, 30, and 40 dB below normal recording level. Then we made a second set of runs through the playback section with first the normal level signal, and then with signals 10, 20, 30, and 40 dB *below* the normal level. Then, of course, we repeated this performance through the second channel. The results are shown in Figs. 4 and 5. Note that at normal signal levels, the responses are essentially flat. If you plot the record curve for the -20 condition, and then plot the playback curve for the -20 condition upside down over the first, you will find that they are quite similar—in fact, almost identical. The fact that they are not identical is due to lack of calibration before starting the process, but the idea is to show how

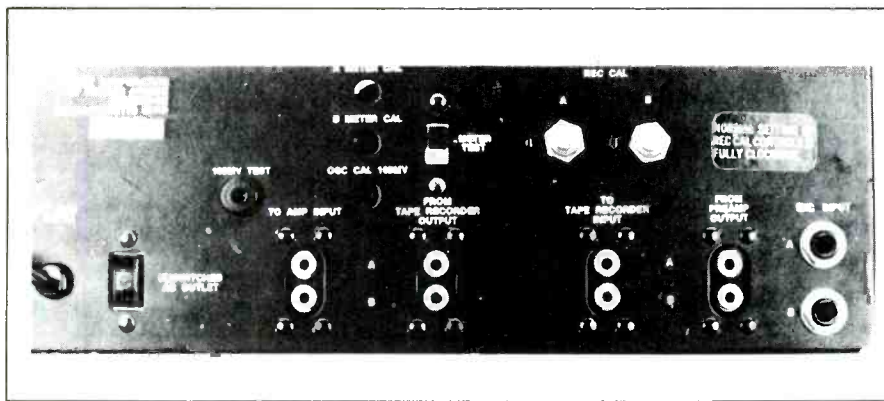


Fig. 3—Showing backside of Advent Model 100.

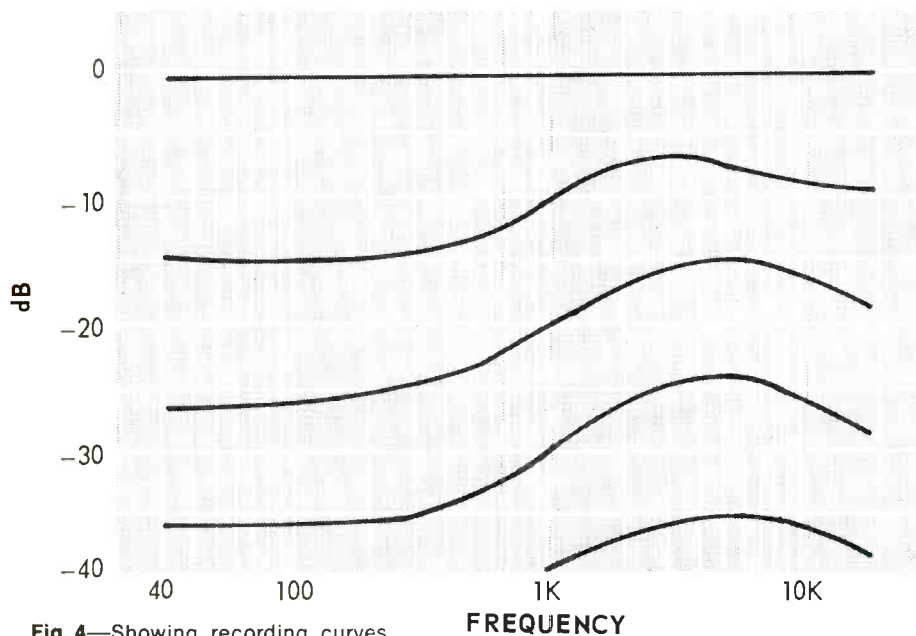


Fig. 4—Showing recording curves.

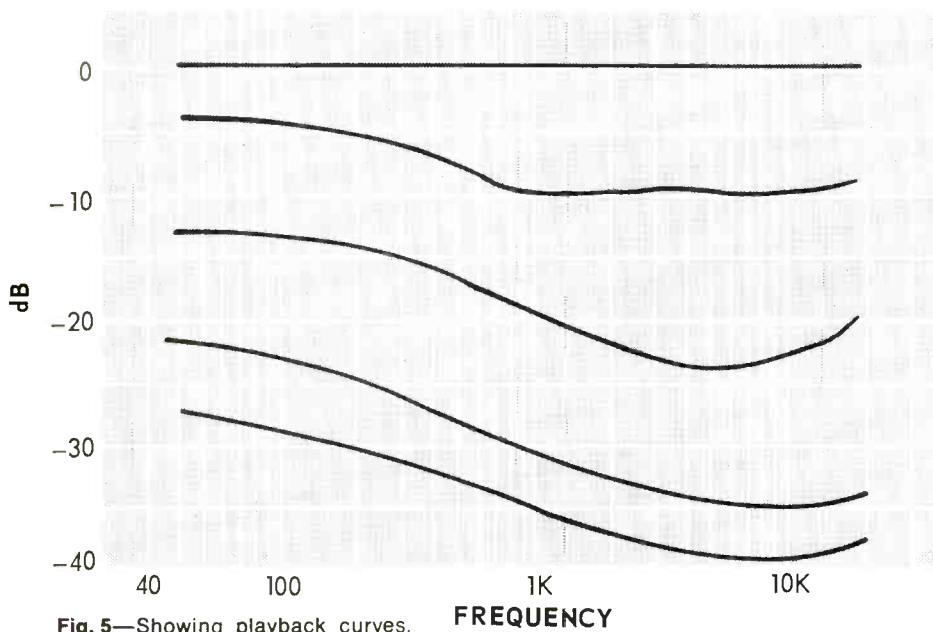


Fig. 5—Showing playback curves.

the response curve varies with signal level in each section, and how they are essentially complementary, as they should be. In actual use, after calibration, we again ran the sweep signal through the unit onto a tape, and then recorded the output from the recorded signal as it played back from the tape, and we found a line straight within ± 2 dB from 40 to 15,000 Hz. That is the proof of how well the system works.

Next, we measured distortion at a number of levels, and we found that THD was around 0.16% at normal signal levels, increasing to 0.28% at 30 dB below normal in the record amplifier. This is to be expected, upon inspection of the recording curve, in which the high frequencies—which contain the harmonics we were measuring—are increased. The reverse of this condition was observed in the playback amplifier, with normal-level signals showing a THD of 0.25%, and low-level signals indicating a reduction of THD to 0.12%—all with a test frequency of 1000 Hz.

The measured signal-to-noise ratio on the playback amplifier was 70 dB re 1.0 volts output, and on the record amplifier it was 65 dB re 0.5 volts output—these references being the maximum rated outputs for the two sections. No change in S/N was noted when the in/out switches were thrown, indicating that the processing circuitry made no difference in the noise output.

Operation

Setting up the Advent 100 is a fairly complicated process, but the accompanying instructions are clear and concise. In fact, instructions for setting the record level are provided for those machines which have separate record and play heads, and for those without separate heads and with or without separate record and playback level controls. This accommodates practically any machine. "Dolby Level" tapes are furnished with the unit—one on a cassette and one on a reel—so that either type of machine can be used with the Advent. To calibrate the unit, one puts the Dolby Level tape on the recorder and plays it, at the same time adjusting the PLAY CAL controls so the meters indicate the "Dolby Level." Then, without touching the PLAY CAL knobs on the Advent, one actuates the REC CAL TONE switch and adjusts the recording level controls on the tape recorder to the "0" level, then plays back the newly recorded tape to determine if the playback level reaches the "Dolby Level" mark on the meters. If not, one repeats the process, setting the record level con-

(Continued on page 63)



Classical Record Reviews

EDWARD TATNALL CANBY

Wagner: *Gotterdammerung*. Von Karajan. (Soloists, Berlin Philharmonic.) **Deutsche Grammophon 2716.001** (6 discs) stereo (\$35.88.)

I can swim full length in Wagner, given the occasion—I have never got over the great Met shows of the 1930's that I attended as a youngster, complete with Melchior, Flagstad, et al. Those were the days. Since then, Wagner has declined in spite of much modernization at Bayreuth. My samplings of recorded Wagnerian singing over the years have sort of shocked me—such feeble stuff!

I'm here to say that Von K., not my favorite conductor in general, has really done it. There's no question about it at all—the big flow, the grand line, the hypnotic, all-out musical soul-drenching, is back. And superbly adapted to records, if one discounts the jolting side breaks, which in big Wagner are as bad as they used to be in shorter 78 rpm

recordings. (There just isn't *anywhere* to stop in Wagner, short of an Act.) It has been a good thirty years since I've heard such white-hot, glowing Wagner from an orchestra. The orchestra is best here. Von K. chases after the orchestra every second. The orchestra is his power-instrument. It incandesces.

But the man has chosen excellent soloists. And he lets them sing—which few conductors as dynamic as himself are able to do. They sing beautifully, intelligently, in tune. And though they are a gentler breed than the old heroes and heroines, in a way they get more out of the music in terms of subtlety, if not the grand impact. An excellent set of big basses. Some superb contralti and soprani and a tenor Siegfried who at least sounds a bit like Melchior—he has that *Heldentenor* brass so necessary to the Wagnerian music, though not really of Melchior's steely temper. (But so much better than the milky, weak-kneed tenors of a dozen years ago who had the gall to sing such parts!)

An entirely matured and perfected stereo technique weds the sound to the action and the voices to the orchestra in what strikes me as a near-ideal fashion, the singers limpidly clear and undistorted, at a safe distance so that the orchestra comes through full strength, the motions spare (stereo movement is pretty clumsy at best) and the directionality precise but casual and wholly subordinate—as it should be. No ping-pong Wagner, please. Splendid job! And I assume it applies to the other Von K. Ring recordings already out. I haven't swum in them yet—I've been bogged down in Baroque.

WHO ARE THE SINGERS? (I knew you'd ask me that). I was about to say, if you're interested, go to your record store and find out. A lot of them—Brillioth, Stewart, Kelemen, Ridderbusch, for the men, Dernesch, Janowitz, Ludwig, Chookasian, Ligendza, Rehmman, Moser, Reynolds for the ladies, covering the trio of Rhine Maidens and the trio of Norns along with the principal characters: Dernesch as Brünnhilde and Janowitz as Guttrune, both stalwart musicians of fine sensitivity. The uncouth trio who conspire against Siegfried are splendid in their basshood, real characters as well as musicians; the fated Siegfried, dizzy fair-haired boy-hero, is perhaps more real in Brillioth's brassy but slightly uncertain voice than it ever was in the Melchior days of total tenor power. I liked him. After all, Siegfried is a ninny when you come down to it. He's no Joe Namath.

Performance: A- *Sound:* A-

Bernstein conducts Strauss *Don Quixote*. New York Philharmonic. **Columbia M 30067 stereo** (\$5.98.)

There are many right and useful ways to interpret the big scores; Bernstein has his and it riles some people. Take him or leave him is best—for the Bernstein way has a lot to recommend it.

I'd call it musical loving kindness. He positively fawns over a work like this, savoring each sentimental detail, as though to say, now listen to *that*—isn't it lovely? True, it goes on and on, this one, and he fawns and fawns..... But is a tougher approach really any better? Or a slicker one? For the former, try RCA's old Reiner version with the Chicago (LSS 2384); for slickness there's always Ormandy at Philadelphia, out of the Columbian era (MS 6515).

Strauss, indeed, is often tough, more often than tender, especially in these huge early tone poems. "*Don Quixote*" is somehow a hard-toned work in spite of the gentle Don—I never could feel that young Strauss liked him very much. The work, moreover, really sprawls. In 1897 they didn't expect conciseness; what went over as modern was realism—the baaing of sheep, for instance, so gratingly portrayed here. And so the Don moves from adventure to adventure and the "script" tells you exactly what is going on from moment to moment—if you can find your way. I never can. I get bored.

"The Don spies an empty boat lying oarless on the river bank." Hmmm. Now just what should I listen for *there*? Oars? An empty boat? "The Don and his servant are blindfolded and persuaded to mount a wooden horse." Ah—so. Velly intresting. "An army approaches slowly....." Ah yes, a march. But what about this: ".....in a vast cloud of dust." Musical *dust*? OK, you go look for it! And so it continues.

The tough-minded conductors try desperately to pull all this musical claptrap together into a coherent whole, like a Beethoven symphony. They plug the Themes, accentuate the Significances, work up the tension, look for the grand sweep. All to no purpose, I say. Just makes the music more banal and even more dated.

Bernstein, you see, is all soft and his Strauss is warm and colorful. Everything gets its musical chance, and the gorgeous orchestration really comes through. The solo instruments surrounding the chief cello play their hearts out (and are very nicely balanced with the orchestra); the Don, via his cello, turns out even more sentimental than you thought, even *simpatico*. So it all ends happily, hours and hours later.

The excellent cellist is Lorne Monore, the viola and violin are William Lincer and David Nadien.

Performance: B+ Sound: B+

Ravel: Daphnis et Chloe—complete ballet. L'Orch. de la Suisse Romande, Ansermet. Everest 3278 sim. stereo (\$4.98.)

Debussy: Jeux; Poeme Danse; Six Epigraphes Antiques. Ernest Ansermet, L'Orch. de la Suisse Romande. Everest 3285 sim. stereo (\$4.98.)

Rachmaninov: Rhapsody on a Theme of Paganini. Dohnanyi: Vars. on a Nursery Theme. Julius Katchen, piano; London Philharmonic Orch., Boult. Everest 3280 stereo (\$4.98.)

It isn't certain whether the classical record biz is going *kaput*—it has threatened to die many times before—but one thing *is* sure: this is the age of the reissue. Records, as these columns often note, are timeless and spaceless. Here's the new slant to that! Everest has somehow got hold of the whole great early London catalogue, of just renown, in the era just before and just after the stereo revolution. Here are a few of the offerings, including two of the incomparably well performed Ansermet recordings with his own orchestra, more or less developed for him by British Decca in the postwar days. (Decca is, of course, London over here.)

These aren't bottom-priced discs, at least as of the list price, but they do undercut, necessarily, the new ones. How London came to dispense with its own great early recordings, instead of applying them as other companies do to its own "Legacy"-type label, I do not know. Nor, particularly, do I wish to find out. Politics, politics! Suffice it to say that, some extremely curious phasing problems aside, Everest is doing a reasonably proficient job with the reissuing, and thus a musically notable series of older first-line recordings is once more available. (Ansermet did some of the items again—no matter. His earlier recordings for London are musically his very best.)

The pre-stereo recordings are given the stereo simulation treatment here in what seems to my ear to be a new and different format, most curious. No longer the simple roll-off of highs on one side and bass on the other—not too bad an idea, at that, for many older recordings. This is more subtle and seems to involve a species of reverse phasing in the high end, if not the all-over.

(Continued on page 54)

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(Continued from page 53)

When the two channels are combined into mono (as per switching on preamp) the entire high end vanishes! Weird. Those who plan to play these discs in mono—not many of us—would do best to try one first before investing in a batch.

The pre-stereo 1950 Londons in this reissue are somewhat bright and scratchy in the stereo playback; I remember them as a bit that way in the first place. The stereo jobs, the earliest London stereo releases back around 1960 or before, are smoother and more oily in the sound.

Katchen, by the way, is casually listed as “an exclusive London artist” on the back of his record, though London is nowhere else mentioned on any of the discs, as far as I can see. Everest, as always, merely prints off the original notes without change!

Assuming that this is a legitimate authorized release of the London material, I find it odd that Everest has omitted the great name. Maybe London wouldn't let them.....

Performances: B to A- *Sound:* B- to C+

Scriabin: Eight Etudes, Op.42; Sonatas Nos 5, 7, 9. Ruth Laredo, piano. **Connoisseur Society CS 2032 stereo** (\$5.98.)

Crash, Wham, bang, sock!!! As I listened to the wild, impassioned noises of these late-Scriabin sonatas, 1907 to 1913, I was once more impressed with the strange nature of those years and how their deepest levels of unease, in the face of coming World War I, so often emerged in this kind of Messianic, super-passionate ultra-Romantic music. Not merely Scriabin. Look at early Schoenberg—“Transfigured Night”—and Strauss, the operas *Salomé* and *Elektra*. And Mahler in his immensities of cosmic inspiration, and early Bartók (refined in his much more economical later violence). Yes, an age is expressed in the individuals it throws out of its turmoil. In ours, is it John Cage? Maybe the rap goes elsewhere—Angela Davis, perhaps.

The eight middle-period Etudes are relatively mild and sophisticated; you'll hear them as good old fashioned late-Romantic pieces in comfortable keys, like a good Etude should. (They were more radical than that in their day.) But the three Sonatas, including the “White Mass,” No. 7, and the “Black Mass,” No. 9, are something else again. To absorb these, I think, you will have to be turned on to cosmic inner forces and you should be far into astrology and mysticism. Otherwise it's going to sound like the ravings of

a far-out madman—and Scriabin was pretty far out by that time. He was already the “translator” for cosmic messages of superhuman import; he went out in a rowboat on Lake Geneva and preached to fishermen, who must have been slightly surprised. Cosmic, and yet very much of that period in the involved but dated harmonies and the ultra-Romanticism, so passionate that the piano almost busts itself. Full of “Scriabin chords,” vaguely related to early-Stravinsky chords and early Schoenberg, too, though much more wild-eyed.

Connoisseur's piano recording and the pianist herself make for a technically superb sound, if one that is not exactly dulcet on the ears. Here, there is extreme percussion and an enormous dynamic range; the piano is ugly as often as lovely, and perhaps by intention. It is an uncompromisingly close, dry sound but there isn't a trace of distortion, even in the loudest passages, and the background is quiet to an uncanny degree. One of those ultra-up-to-date records where you flounder trying to find a reasonable volume setting: start at the beginning as you would for an average piano disc and about thirty seconds later the roof falls in.

Frankly, I can't stand the stuff. No matter—it's impressive.

Performance: B+ *Sound:* A-

Weber/Dusik. (Weber: Trio in G Minor, Op.63. Dusik: Trio in F Minor, Op.65.) Bernard Goldberg, flute; Theo Salzman, cello; Harry Franklin, piano. **Turnabout TV-S 34329 stereo** (\$2.98.)

.....Now here is the way a classic trio should play on records. Three performers, playing chamber music and making it *sound* like chamber music in spite of big liveness and lots of space in the recorded product. Good. All three instruments, in fact, are almost more than real, very flutey, cello-ish, pianistic. Quite an uncanny sense of their actual presence. No distortion whatever and fully Dolbyized for that velvety background. (The cello is strangely wiry, but this could be the actual sound of the particular instrument.) This record doesn't sound like a recording. And that's a compliment!

Weber is, of course, the famed opera and overture composer of the turn of the 19th century. Dusick is better known in the Germanized spelling, Dussek (“Doo-shek” I think is the Czech sound of it). He was very well known in his day, if a second-line composer in our later view.

You guessed it. Or maybe you didn't. Dusik wins, hands, bows, and fingers

down. A really splendid, heartfelt, rich piece, out of the Beethoven era but full of a Dvorakian charm and grace. We sense that in this music we are hearing Dusik at his all-out best—this is no quickie work but a real labor of musical love. You'll like it.

Weber, potentially a much bigger man, is just as clearly turning out what Dr. William B. Ober in his engaging program notes barely manages to avoid calling a potboiler. (He couldn't say *that*, after all.) Weber was an opera man, a big-drama man, apt with a clarinet, an orchestra, a virtuoso piano. This chamber-music stuff did indeed cramp his style. There are fine flashes of Weber melody and a lot of sheer originality. But half the time one hears Weber somehow saying, now what'll I do next?

Performance: B+ *Sound:* B+

The Classic Trio
Beethoven: The Complete Piano Trios. Istomin-Stern-Rose. **Columbia M5 30065** (5 discs) stereo (\$29.98.)

This praiseworthy Bicentennial product is almost all good; but any buyer would naturally want to know its main characteristics before investing in so much of the same thing. I herewith oblige.

Three seasoned professionals, not elder statesmen of their art yet, but all of them veterans of a million big concerts, travelers on the jet circuit, soloists. Their association, like many another including the once-famed “Million-Dollar Trio” over at RCA, is that of three soloists coming together as equals to form a sort of super-trio. They began, in fact, almost ten years ago and have “concertized,” as the phrase goes, ever since. Thus—much hoopla in the accompanying verbiage. And a definite kind of performance as a trio.

You can guess. Three big men, accustomed to the big-time concert and festival, regularly playing for large audiences. Dedicated, intense, perfectly rehearsed, apt at projecting their music “live” before vast seas of faces. What happens in a close-up recording situation?

Eugene Istomin comes out best in this somewhat cramped environment—perhaps because Columbia has put him well in the sonic background, at a fair distance. (Shades of old-fashioned 78 rpm days!) The piano part indeed is the leading part and he plays with verve, excitement, perfect phrasing, always on the tip of his toes, if I may so speak of his fingers. Superb. Beethoven's violin and cello still hang on surprisingly to

the older tradition in which they were mere added parts to decorate a piano piece. Beethoven was, after all, a pianist.

But why, oh why, does Columbia insist on placing the big-toned Stern violin so close to a nearby mike, and the solid-toned Rose cello similarly, where its bottom sound is exaggerated? Rose is OK, but Stern's playing—as we hear it in this form—is always verging on the strident and at best is metallic, edgy, scratchy. I kept praying for *more space*, just a bit more distance, to turn a wiry sound into a beautiful one! Only in the



suave slow movements does Stern really come through at his best. I'd call it an astonishingly injudicious microphone placement, considering Columbia's very long experience with this sort of thing.

The basic fault, however, is larger—it is the very bigness of the Trio's concept of the music. Here we are listening to a large-scale concert performance at small-scale range and we cannot forget it for a moment. Out there, behind us, is always that sea of faces. Up here, close-up, is the sweat, the energy, the projection, the drive. They can't help it.

It's exciting. It's splendid Beethoven. But it isn't *living room* music. That, in modern terms, is what chamber music should be.

A prolific album, generously including such extras as one of the early "WoO" works (with two remarkably fine movements out of three) and the charming late-period "Kakadu" Variations.

Performance: B+ Sound: B-

Carl Maria von Weber: Piano Sonatas No.2, Op.39, No.3, Op.49. Dino Ciani. Deutsche Grammophon 2530 026 stereo (\$5.98.)

Some record companies really know how to record the piano. D-G does! Also, often enough, our own RCA. Others incomprehensibly miss out, even the biggest companies. "Nuff said. *Why?* Even the tiniest outfits can do it right and often do, right alongside D-G, et al.

What you must at all costs avoid is (a) a tubby, bottom-heavy sound (mike close to the sound board) and (b) *percussiveness*, the kind that makes weak pickups buzz and sets off the china-ware on the mantelpiece. For fifty

years we've had that kind of recorded piano and we still get it. Not on this record. And what a velvety silence in the background!

Carl Maria may have been a big-drama man and hence not much of a chamber music composer but the piano was his own instrument and, in his day, it was beginning to turn heroic (though there was still a surprising amount of harpsichord twang in its bass strings). So the piano sonatas, somewhat erratic and wandering, manage nevertheless to achieve the big, dashing effect that is his best idiom and a good deal of that delicious melody and harmony which we associate with the large-scale works. That's what you hear in these sonatas.

As for young Dino Ciani, I keep fumbling over names from another age when I hear his. Dino Grandi, Count Ciano. Remember? That was long before this one was born. He is a sensitive young pianist with the new flair for warmly Romantic playing of today's young, a bit episodic in his approach, minus the grand line of the older Romantic players, but very well suited to this somewhat episodic music. Nice. And such a superb piano sound! Thanks, D-G.

Performance: B+ Sound: A

Max Reger: Vocal Works. Max Van Egmond, bar., Junge Kantorei, Berlin Symphony Orch., Joachim Martini. Telefunken SLT 43114-B stereo (\$5.95.)

The German Late Romanticists—if you can call them that—are beginning to make a mild foray in our direction these days. Awhile back, I found Pfitzner surprisingly interesting. Max Reger, a big man in his day in his own territory, was nine years younger than Richard Strauss and now seems both more "modern" and yet infinitely more dated. To be sure, Reger died in 1916; whereas old Strauss went on ineffably composing right through WW II.

A batch of choral works here plus music with baritone solo, rather splendidly performed by a good soloist and one of those highly disciplined German youth choirs, plus the Berlin Philharmonic. The choir was founded, the quaint English notes say, by the Lutheran Church in order to get away from too much "baroque" (i.e. Baroque) yet to avoid the "new song"—that's what it says—which was then coming into vogue. Now I wonder whether that could mean rock music?? Whatever it was, they avoided it all right, for the kids do seem to like Reger and really whale into him. Bet they listen to rock on the side.

Performance: A- Sound: B-



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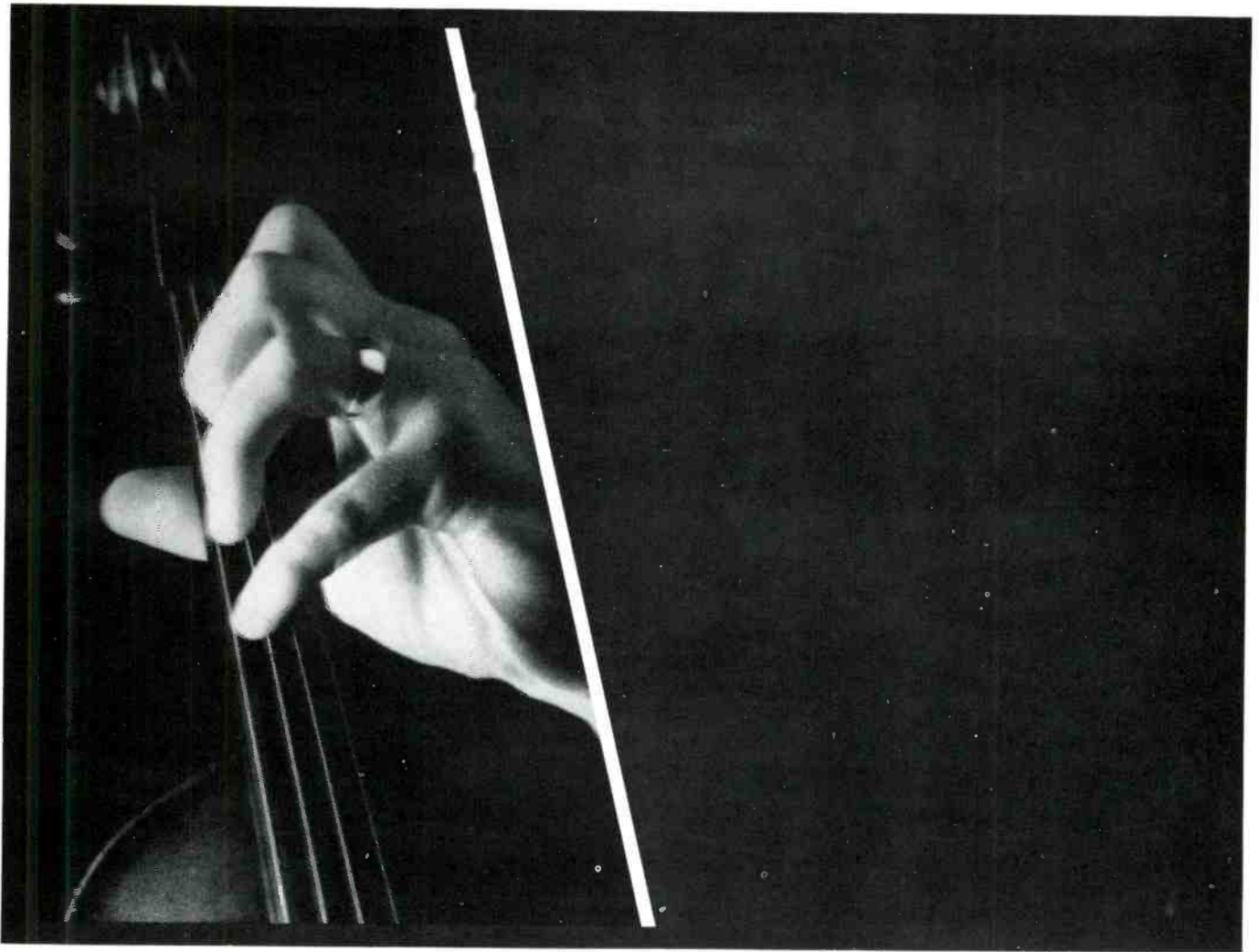
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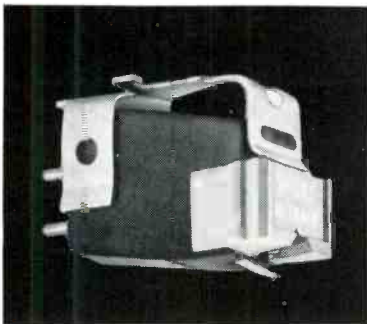
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Canby's Capsules...

TITLE	CONTENT	SOUND
<p>The Stoned Guest. A Half-Act Opera by P.D.Q. Bach. Hoopla Heavy Opera Co., Nelson; dir. Peter Schickele. Vanguard VSD 6536 stereo (\$4.98). Soloists: Marlene Kleinman (<i>Donna Ribalda</i>); Lorna Haywood (<i>Carmen Ghia</i>); John Ferrante (<i>Don Octave</i>); P. Schickele (<i>Il Commendatore</i>).</p>	<p>Really had to laff! Peter S. has been corny in the past with his P.D.Q. stuff, but less and less—each one gets better. This is meaty take-off of (a) Baroque opera, with overtones of Carmen and Don Giovanni; (b) the Met.; (c) opera broadcasts. Much ham but lots of skillful and pleasant music, splendid, lively singing. Some acidly-telling fake madrigals too—My Bonnie Lass She Smelleth.</p>	<p>“Modern recording techniques” are modestly used—can’t tell where they leave off. Like two ladies stuck on a joint cadenza through whole intermission without new breath! Nice use of stereo, both spread-out and pingpong. The cross, Milton J. Host, is excellent. Also the St. Bernard. Expertly recorded recitatives, arias with orch.</p>
<p>Short Circuits. Ruth White, Moog. Angel S-35042 stereo (\$5.98).</p>	<p>Everybody does Moog classics since “Switched-On”—but this is a really good one. Dryly humorous (note the Bumblebee), far-out and varied in “orchestration,” thoroughly musical—she is well trained in classical music. It’ll shock the stuffy.</p>	<p>Typical Moog sound—one gets to recognize it, including the slightly-shaky pitch (due, I’m told, to uneven heating of transistor complexes)—like an oldish upright piano. Nice! She tends to quick, nervous sounds, never schlock-heavy.</p>
<p>In the Shadow of the Mountain. Bulgarian Folk Music. Prod. Ethel Raim, Martin Koenig. Nonesuch H-72038 stereo (\$2.98).</p>	<p>If you own the State-sponsored type of folk music—from numerous East-bloc countries—just try this, collected direct by U.S. team! Weird, a nasal-drone singing, half oriental, instruments the same. Adequately long excerpts.</p>	<p>Done on-the-spot in stereo—why not? (Hard not to, these days.) Loud, raucous sound, a bit edgy but super-communicative; the music itself is raucous.</p>
<p>Light Heavyweights Fiedler’s Choice. Boston Pops, Arthur Fiedler. RCA LSC-3130 stereo (\$5.98). A Christmas Festival. Boston Pops, Fiedler. Polydor 24-5004 stereo (\$5.98). Fabulous Broadway (Hair, Fiedler, Man of La M.) Boston Pops, Fiedler. Polydor 24-5003 stereo (\$5.98).</p>	<p>End of an era! Imagine—the Boston Pops on a foreign label. Here it is. (Both labels will continue if RCA does the usual, keeps on re-releasing oldies.) RCA’s “Choice” offers cross section of long-familiar Pops sound: a sonic bathtub—vast washes of mellow orchestra in enormous space. Polydor’s new all-German sonics (they flew over usual “tons” of equipment) is gratifyingly similar—same old Pops, same old location. A sharper edge, though, closer in accent, and new, wider dynamic range. RCA offers longish semi-classics (Shostakovich, Gazounov, “Porgy” Synthesis). You can save Polydor Christmas mishmash for next year. “Fab. B’way” explains itself.</p>	
<p>The Lotte Lenya Album. (a) Orch, Roger Bean (Hamburg) (b) Orch., Chorus, Maurice Levine (New York). Columbia MG 30087 (2 discs) mono (\$10.96).</p>	<p>There’s lots more Lenya on records, but this makes good cross section of two phases. First disc (ex-ML 5056) is the Berlin music, sung in German (with bits of pigdin English); second disc is New York. the American shows (ex-ML 5229). Wow—what a diff! Notes say 1955 and 1957 but German recording sounds like early 30s, dry, edgy, colorful, a younger Lenya, barely pronouncing the English, the music picture-esquely dated. The USA recording, all in English, is all suave B’way—music, performance, acoustics, an older-sounding Lenya. Good. Nice to hear “Jenny” again.</p>	



Second fiddle? Hardly.



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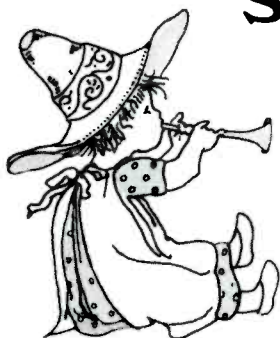


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SHERWOOD L. WEINGARTEN LOOKS AT

Music for Children



JANUARY. A new year. A time to reflect on the past and to hope for a better future. And one of the best ways to do just that is to look at the present. Look at it through the eyes of our offspring, through the beauty of their naiveté, their undeveloped prejudices, their purity of ideas and unscathed souls.

A look at recent recordings for children also might be in order, for they not only convey how far we have come since we were youngsters, but how the world has developed.

A note of warning, however: Most discs aimed at a young audience apparently assume the users are destructive, or careless, uncaring about sound quality, or that the discs will be played on a cheap phonograph. Most vinyls for tots are monaural, and surface noise could be intolerable for an adult. In addition, the performers tend to be, for the most part, undistinguished. But the emphasis, as it should be, is on content—what the child *expects* to hear (with the price, which parents seem to care about equally as much about half that of the ordinary LP).

On the other hand, there are *message* discs, couched in entertainment (usually a coupling of stories, songs and games) with much that might be *unexpected* by the low-age listener (especially the moral or other knowledge gained). Case in point: **HOW TO THINK** (Golden, LP 255), a recording with story, music, and lyrics by Steve Allen, with the comedian-writer-composer-political activist narrating as well.

The disc, with the Golden Orchestra conducted by Paul Smith, also showcases the voices of Allen's wife, Jayne Meadows, and son Bill. The notion, a

commendable one, is that the child can have fun while listening—but learn too.

Is your infant a “picky eater”? You might try **EAT YOUR SPINACH** (Golden, LP 259), which relates the story of Annie Applegate, a mealtime problem-child at six. The tale—punctuated with songs about things not working because of no fuel, what growing up is all about, rain, energy—ends happily, both for the young listener and for Mommy, as Annie finds an appetite after finding an interest in work (in this case, gardening). And if the moral is insufficient, the learning made possible by the flip side, musically, certainly is not, for there's a four-segmented listing of fruits and vegetables.

How about American history—want your youngster to learn the easy way? Perhaps, then, you should buy **THE LEGEND OF THE TWELVE MOONS** (Golden, LP 240), with Richard Kiley narrating a portion of the story of the Indian. Book, music and lyrics, not incidentally, are by Ruth Roberts, who has created many projects for the recording firm.

And what the company terms a “unique children's version” of **FIDDLER ON THE ROOF, COMPLETE STORY AND SONGS** (LP 260) uses a tale of the past to depict the evils of prejudice. The story line—about Jews living in a Tsarist Russian ghetto-like existence—is summed up neatly by Paul Lipson, narrator who also portrays Tevey, the leading character; the songs (lyrics by Sheldon Harnick and music by Jerry Bock) are self-explanatory.

At this point, the astute reader will question if there is only one company

aiming at the children's market. Obviously not. But Golden is one of two giants in the field, the other being the legacy of Walt Disney.

Disneyland recordings, of late, have been geared for a slightly older audience, relying heavily on classical music and ever-green stories, plus, it could be expected, tie-ins with other media (mainly film) in which the firm is involved.

One traditional tale, **ALADDIN AND HIS WONDERFUL LAMP** (ST 3989) for instance, is revisited by Camarata, musical supervisor for most Disney discs, via selections from Rimsky-Korsakov's “Scheherazade Suite.” The package, more attractive (and more expensive) than the Golden vinyls, includes an 11-page full-color book of drawings and text. The sound, partially because the record is in stereo, is acceptable on quality equipment, without distortion, as well as on less costly children's items.

SELECTIONS FROM WALT DISNEY'S FANTASIA (Vista, STER-4031), a tie-in with what is probably my favorite movie, features music by the Philadelphia Orchestra under the baton of Leopold Stokowski. The film, which utilized classical music and a variety of visual images (including, 30 years ahead of its time, the first cinematic light show), continues to draw large audiences each time it is re-released (it first was shown in 1940). The disc, likewise, was an acoustical innovation—the first time around (the original album was released in 1957).

The LP, recorded via 33 microphones and nine channels, by today's standards is heavily flawed. In fact, the dust-jacket recommends the volume be kept

at a moderate level (at high, the deficiencies—surface noise, in particular—are easily discerned). But the historical value of the disc—not to mention the pure enjoyment of the music (my children listen again and again, recalling each time the animation that accompanied the melodies on the screen)—alone makes it a worthwhile addition to a record library.

The seven cuts, for those who are not aware, include Bach's "Toccatina and Fugue in D Minor," Tchaikovsky's "Waltz of the Flowers" from "The Nutcracker Suite," Dukas' "The Sorcerer's Apprentice," an excerpt from the first movement of Beethoven's "Pastoral" symphony, the premiere part of Stravinsky's "Rite of Spring," Ponchielli's "Dance of the Hours," and Mussorgsky's "Night on Bald Mountain."

Another label, Affinity, a distribution of Stereo Dimension Records, provides a more traditional type of children's entertainment (but in a modern setting) via BOB McGRATH FROM SESAME STREET (A-1001S). The video show's star, immediately recognizable by anyone under the age of eight (and most parents as well), offers 10 tunes that are equally recognizable. Witness, for example, "Good Good Morning Day," "Me," "Groovin' on the Sunshine," "Best Friend," and "I Can Do It!!" All the vitality of Sesame Street is present, and the only trouble is that the grooves of the disc tend to become worn from over-use (at least in my house, where the kids seem to play it incessantly).

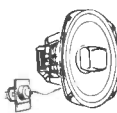
But if none of those recordings fit your offsprings' mood, there's always HIGHLIGHTS FROM SCHEHERAZADE (Disneyland, 3987), a mono disc also showcasing Camarata (with the Symphonie-Orchester Graunke); THE BOATNIKS (Disneyland, ST 3999), with a booklet illustrating the tie-in to the zany flick; WOODY GUTHRIE'S CHILDRENS SONGS (Golden, LP 238), with 14 tunes sung by Bob and Louise deCormier; SESAME STREET (Golden, LP256), highlighted by the chartbuster "Rubber Duckie" and featuring the Golden Orchestra and Chorus (conducted by Vic Flick) on soulful, up-tempo arrangements of new-old favorites; ANIMAL ALPHABET (Golden, LP244), with music by Leroy Holmes and lyrics by Al Stillman being performed under the baton of "Alvin Q. Snowshovel IV," or MAY THERE ALWAYS BE SUNSHINE (Golden LP257), global folk songs for youngsters sung by the deCormiers.

Surely, there must be something to satisfy your brood!

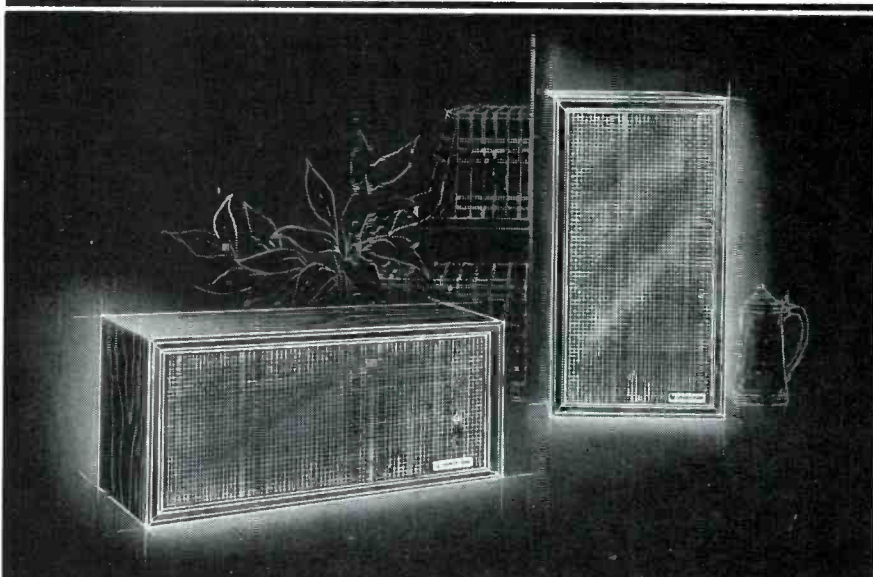
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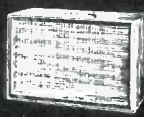


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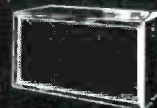
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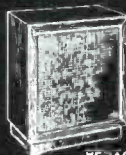
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BERT WHYTE

Recorded Tape Reviews

Rachmaninoff—Concerto #2 in C Minor, Van Cliburn, piano; Fritz Reiner conducting the Chicago Symphony Orch. RCA TR31018, **open reel**, 3¾ ips, \$7.95

RCA has been going through its catalog and picking out suitable material to issue on 3¾ ips open reel tapes. Much of what they choose has been previously available on 7½ ips,

therefore no new ground is really broken. However, I must admit in decrying the reduction in tape speed, there have been significant advances in oxide formulation and duping techniques, which in some instances represent some improvements in overall quality. This is frequently true of signal-to-noise ratio and in reduction of crosstalk. This fine taping of the Rachmaninoff staple is a case in point. This is as good a quality 3¾ ips tape as I have heard, in spite of the age of the original master. Van Cliburn was not far removed from his Moscow triumphs and Reiner had honed the Chicago Symphony into one of the great orchestras of our time. In spite of Reiner's usually truculent attitude, young Cliburn managed to establish a rapport with the maestro, which is borne out by this excellent performance which was generally well received by most critics. Overall sound is clean and richly sonorous, and has that typically "open" stereo perspective which lends so much realism to almost anything recorded in the acoustic marvel that was the old Orchestra Hall. Piano and orchestra nicely balanced, neither too close-up nor too diffuse. You know, the signal-to-noise ratio on the original three-channel half-inch master was close to or slightly better than 60 dB. Now wouldn't it be nice if RCA made a Dolby copy of the master, processed it through a Dolby 320 "B" Type generator, and then issued an open reel tape in the Dolby compressed mode, so that we could expand it through our "B" Type units at home and enjoy the low noise of the master? If we keep nudging them enough.....who knows?

Here Come The Hits—Ronnie Aldrich and his two pianos, the London Festival Orchestra London/Ampex L74143, **open reel**, 7½ ips, \$6.95

Here is a typical Phase Four rouser, this time spotlighting Ronnie Aldrich and his pianos, who is gathering quite a bit of popularity in this country on the strength of his previous albums. This is pretty much in the same groove as the others.....a passle of hit tunes, dressed up in rather overstated arrangements, and played with considerable brilliance by Mr. Aldrich. This tape boasts such recent hits as "Raindrops Keep Fallin' On My Head," the theme from "Airport," "Bridge Over Troubled Water," and nine others of similar caliber. Bright, rather clangorous piano sound, recorded close-up in typical Phase Four fashion, with pronounced separation and clinically detailed orchestral sound.

Reflections—The Lettermen Capitol/Ampex, M496, **open reel**, 7½ ips, \$7.95

Ampex has acquired the duping of Capitol open reel tapes, and it has an interesting side to the processing. Capitol tapes were originally issued at 7½ ips, and remained this way for years. Then the tape speed was dropped to 3¾ ips to conform with the speed of the associate Angel tapes. Now on Ampex, the speed has been upped to 7½ ips, one of the few instances where the 7½ ips enthusiast gets a break. The Lettermen have acquired a large following over the last few years for their brand of smooth mellifluous singing. But like a lot of other groups, I guess someone told them they weren't "getting to the kids." This can be interpreted as, "let us have some rock-type numbers." That is just what has happened on this album and I think it is a turn for the worse. These excellent vocalists just are not suited for the rock style. There are one or two numbers on the tape that harken back to the Lettermen we knew, but not enough to sustain interest. Maybe some will like the boys in their new guise. I hope they get it out of their system and give us the fine entertainment they have in the past. In spite of my attitude, good overall sound and excellent tape processing.

The Naked Carmen—Electric Rock Opera Mercury/Ampex, M604, **open reel**, 7½ ips, \$7.95

Somewhere on this production they should state, "with profound apologies to Bizet." This is the doggondest thing I have run across in years. Loosely, and I mean loosely, based on the original Carmen, this is an incredible potpourri, hodgepodge, whatever you want to call "of many diverse elements." Would you believe for example Paul Paray and the Detroit Symphony cheek by jowl with Moog synthesizers, rock instruments and singers, etc. It is all there, an unquestioned feat of technical gymnastics, but as far as I am concerned a musical nightmare. I'm not being merely stuffy at the treatment suffered by "Carmen." I like a good parody as well as the next guy, but this is outlandish in the extreme. If you try to accept it even as a "put-on," it doesn't work. Nonetheless I have seen this production highly praised in certain critical circles. Which proves something I suppose, but don't ask me for details. According to your inclinations, you'll either hate this or love it. One thing certain is that you won't remain neutral.

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(Continued on page 66)

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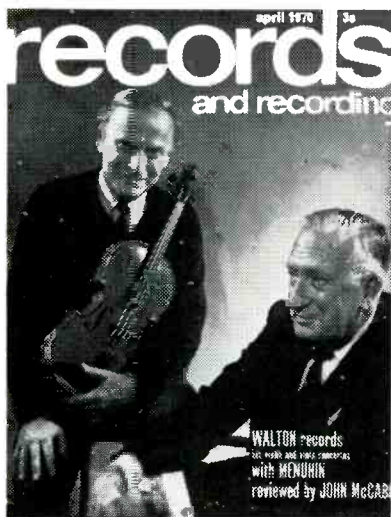
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Behind The Scenes

(Continued from page 12)

acoustics in the rooms when you removed one front window drape. In spite of our fears of excessive transmission through the modern thin-walled construction, sound was well isolated. The service in the Inn verges on the unbelievable in this day and age. They even had mini-skirted girls frequently emptying ashtrays **during the show!** The crowd in Newton was also predominantly under thirty, but here the hip-types were not so far-out, and for the most part the kids were clean, college types. Better representation in Newton of the traditional "banker, doctor, lawyer" type of hi-fi fan. Had a nice visit from maestro Arthur Fiedler, who, while interested in four-channel stereo, stated that he thought high quality two-channel stereo was hard to beat. Len Feldman and I lectured once again at the seminar on quadrasonic stereo, and by this time I had almost no voice. So went the fine Newton Show. Afterwards, most exhibitors returned home, but for myself and a hardy group from TDK, Sansui, Astrocom and several others, it was on to the Canadian Electron Hi-Fi Show at the Royal York Hotel in Toronto, opening just two days after the close of the Newton Show.

The Royal York with 1700 rooms is the largest hotel in the British Commonwealth. It is one of those "grande dame" hotels, once the epitome of luxury (still is, as far as Canadians are concerned) but to me a bit dowdy now and ragged around the edges. This was a big show with over 75 exhibitors, although not all of them were in the legitimate hi-fi category. All the familiar Japanese and American firms were represented, along with less well-known British manufacturers. At Boston, old friend Woody Herman shared the flight with me, and darned if he wasn't going to the Royal York to open a twelve-day stand with his orchestra. My wife and I attended the opening show and his orchestra is just as wild and woolly a swinging bunch as when I recorded him years ago. At this Canadian Show it was like stepping back in time. Although there were about seven or eight four-channel demonstrations (all except two were rather badly done), things seemed to be as they were in our country about six or seven years ago. The crowd was far older, with "Establishment" types predominating. They were very serious minded about their hi-fi hobby. Many carried favorite demo records under their arms. Classical music was prominently demonstrated, in contrast to Westbury and Newton, where classical music was almost non-existent. Probably a good reason for the

large turnout of "oldsters" is they are most likely those who can afford the staggering prices of hi-fi equipment in Canada. What with import duty, excise taxes, and federal and provincial sales taxes, equipment is nearly out of sight. Example.....Crown DC300 amplifier, \$1060; Bose speakers, over \$750 a pair. Other items similarly priced. One smart move is company called Radio Speakers, based in Toronto, who build Bozak speakers under license, therefore avoiding all those taxes. I heard these Canadian Bozaks, all the way up to the huge Concert Grand model, and they sound just as fine as their American counterparts. There were several items of interest at the Show. One was a smartly-styled speaker by Bowers and Wilkins of England, with a wide array of electrostatic tweeters on top of what appeared to be a woofer in a fairly large infinite-baffle enclosure. A very nice sounding speaker, one of the best of that type. Another firm had two huge panels about 3 by 4.5 feet, each containing eight electrostatic drivers. It was described as a "full range" system, so I asked to hear a recording with some organ pedal. They seemed to think it performed very well, but as seems to be common with most "full-range" speakers of this type, I didn't hear any real fundamental bass frequencies, and in fact, there seemed to be very little energy below 50 Hertz. I was rather amazed at the seeming indifference many of the exhibitor personnel seemed to display towards good-quality demonstration records. Many of them had perfectly respectable hi-fi equipment, but were using the most miserable sounding records imaginable. Big exception to this rule was Fred Towler's Tannoy exhibit where you could count on hearing top quality classical music at all times. One prominent American tape recorder manufacturer had a four-channel stereo demonstration with the channels in the wrong array and hopelessly unbalanced. He had the left front at your right rear, and the right front at your left front! Rather than disappoint the people who would visit his exhibit, I corrected it for him. One final note on the Canadian Show.....the people who attended were about the most polite, well-behaved, and tolerant I have encountered at these affairs. It was a genuine pleasure to talk to these avid hi-fi buffs.

That is the show roundup for this year, and as expected the main topics of interest were four-channel stereo and Dolby noise reduction. By the time of the Washington, D.C. Show in February '71, we will see considerable progress in these new frontiers of audio.

Advent Model 100
Continued from page 51)

trof higher or lower as required, and plays it back again. This process is repeated until the playback levels coincide. After that, one sets the record level *only* with the controls on the Advent, and similarly sets the playback levels *only* with the controls on the Advent. We would be inclined to suggest that the PLAY CAL controls be changed to screwdriver-adjust types to avoid the possibility of inadvertent changing after once being set for the correct playback "Dolby Level." If they are changed, the calibration procedure must be repeated.

Performance

Once the unit is correctly connected and calibrated, the only controls on the recorder that need be touched are those that serve to start and stop the tape and that change the operation from record to playback. This simplifies the recording operation considerably, as long as the recordist remembers this point. We first tried the Advent 100 with a Harman-Kardon CAD-4, a good cassette performer. After calibration, we recorded off the air from a good classical music station in stereo FM. On playback, the response was directly comparable to the original except for the tape hiss—it just wasn't there. Then we set the tuner to mono and recorded again with the "A" channel "Dolbyized" and the "B" channel normal. This would give a direct A-B comparison of the same material, instantly switchable from normal to noise-reduced operation. The difference was astounding. In the "B" channel, we heard the usual hiss that we all expect from cassettes, while on the Dolbyized "A" channel, the hiss was practically inaudible. Advent claims a 10-dB reduction in noise, and that is about what we heard.

Next we hooked the Advent up to a ReVox A-77 and recalibrated, using the Dolby-Level tape on the 5-inch reel furnished. At 3¼ ips there was about the same reduction in hiss, but the response and freedom from noise were just about what we have learned to expect from the ReVox at 7½. But when we tried the ReVox at 7½, wow! That was a revelation. We have often maintained that every once in a while, every audio buff should find a place where he could hear a 15-ips tape, just to keep his reference as to just how good a fine original tape can sound. But the ReVox at 7½ ips with the Advent 100 should give any 15-ips machine a good run for its money. More than that, what can anybody say?
C.G. McP.

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JANUARY 1971 ISSUE

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5			20			35			50			65			80			95			110			125		
6			21			36			51			66			81			96			111			126		
7			22			37			52			67			82			97			112			127		
8			23			38			53			68			83			98			113			128		
9			24			39			54			69			84			99			114			129		
10			25			40			55			70			85			100			115			130		
11			26			41			56			71			86			101			116			131		
12			27			42			57			72			87			102			117			132		
13			28			43			58			73			88			103			118			133		
14			29			44			59			74			89			104			119			134		
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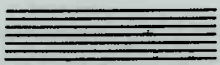
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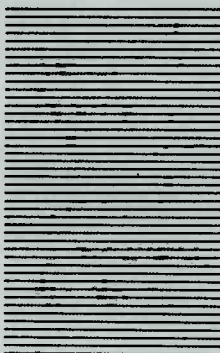
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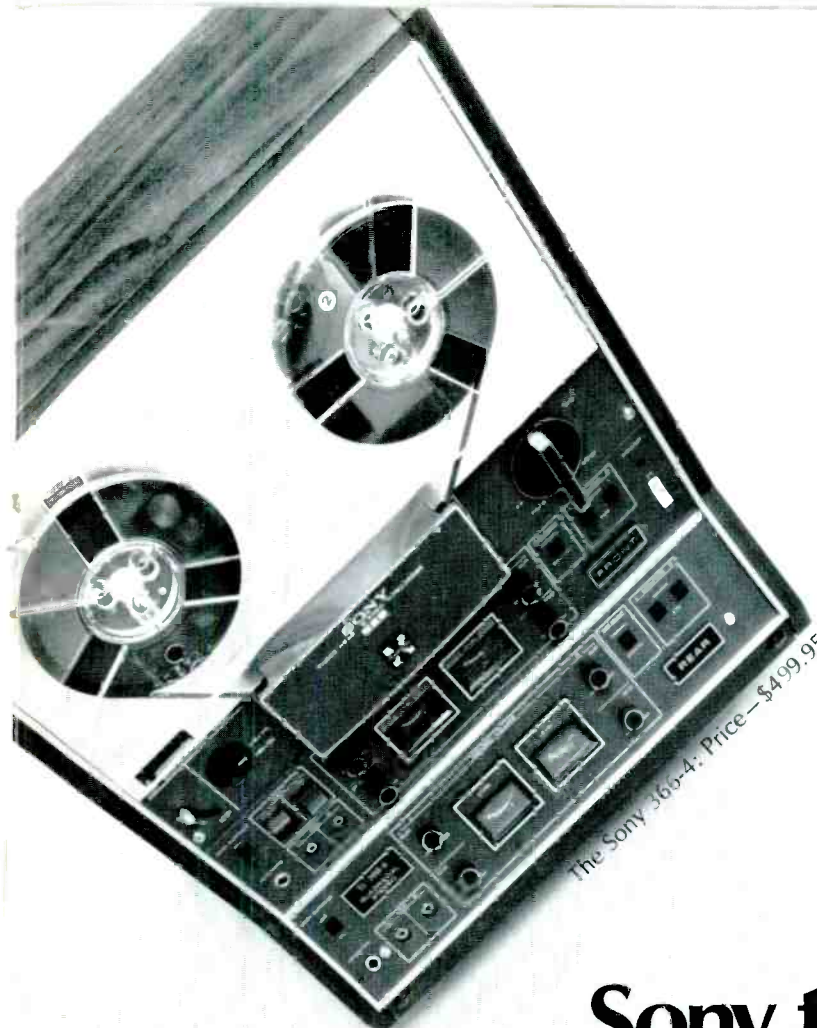
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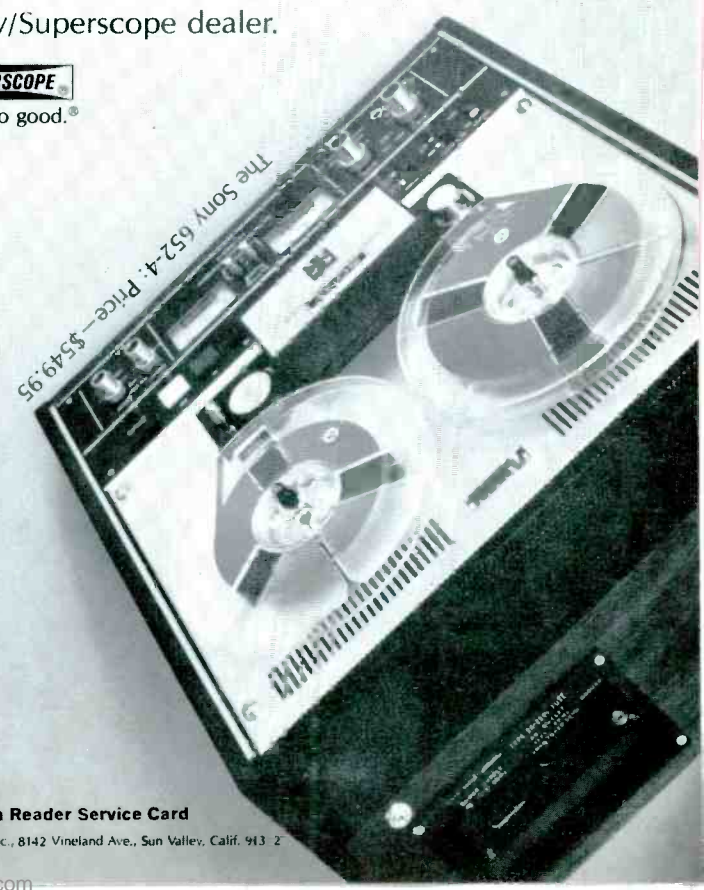
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