

The Authoritative Magazine About High Fidelity

AUDIO

DECEMBER
1970
60¢



Christmas
Buying Guide

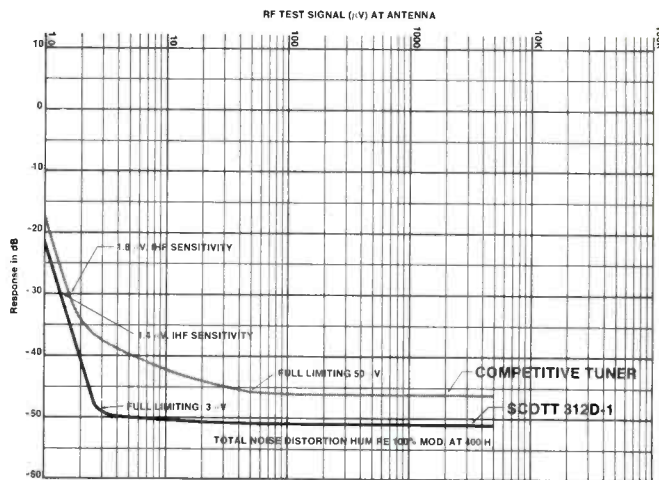


A Special Headphone Issue

When professionals need a tuner, they choose Scott

"Your tuner means that for the first time we have been able to monitor and rebroadcast stereo signals from WFCR in Amherst, a distance of over 110 miles. The signal quality is as clear as if it had originated locally . . . certainly a vast improvement over our earlier rebroadcast efforts."

William Busick (Shown below)
 FM Engineering Supervisor
 Lowell Institute Cooperative Broadcasting Council
 Educational TV Channel 2 and WGBH-FM
 Braintree, Massachusetts



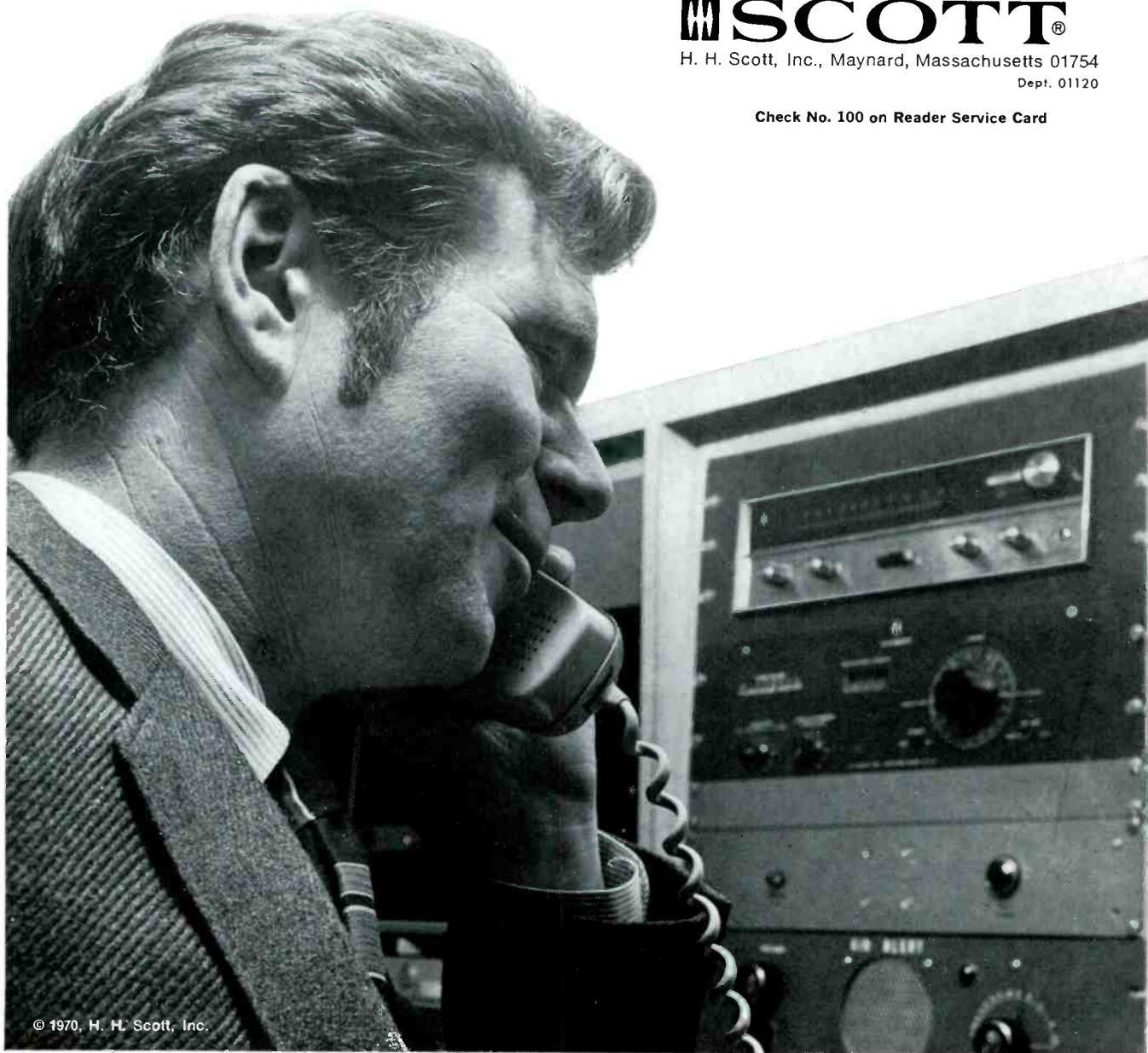
(Tuner sensitivity curve)

A Scott tuner reaches full limiting at a much lower signal strength than competitive high quality tuners and receivers. Professionals agree, a Scott receives more listenable stations with minimum noise... in other words, more stations more clearly.

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A-24

This is what happens when a big name thinks small. It's the TEAC A-24, and it's making cassette history. This deck is powered by a unique hysteresis synchronous outer rotor motor for compact convenience, powerhouse performance. And it comes complete with all the craftsmanship it takes to make a TEAC.

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TEAC

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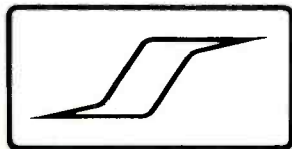
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sound of
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AUDIO

Successor to **RADIO**, Est. 1917

DECEMBER 1970

Vol. 54, No. 12

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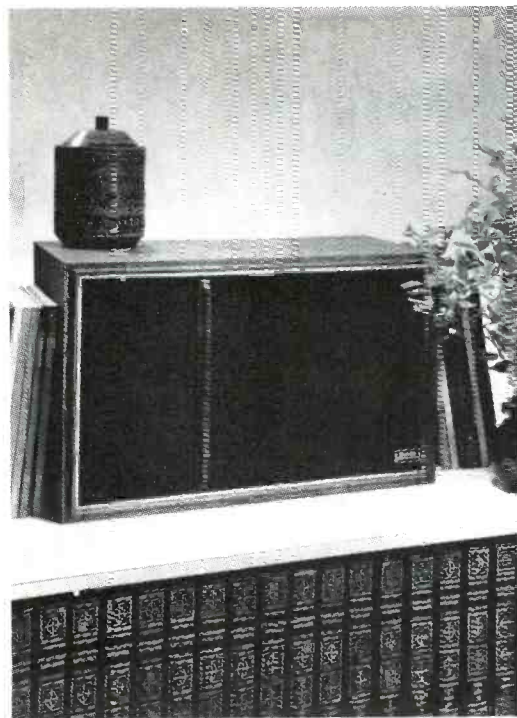


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Who can deny the majestic beauty of the concert grand piano and the fulfillment of its promise as commanded by the articulate fingers of a truly accomplished artist? So it is with the Wharfedale W60E, the latest and finest version of a loudspeaker system with a reputation for excellence and a heritage of consummate pleasure going back over 20 years.

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About the cover:

Santa has apparently been tempted by the warm fire and he could not resist trying the Koss stereophones. Talking about temptation, the attractive girl above—also wearing Koss phones—is one of the Bunnies aboard Hugh Hefner's private airplane . . .

Audioclinic

JOSEPH GIOVANELLI

Driving two speakers From Two Stereo Amps

Q. I have two amplifiers. I would like to feed both of these stereo amplifiers into two common speakers. How can I make this connection and, at the same time, eliminate the possibility of damage to the components if both of these amplifiers are turned on at the same time?

I would like to make this connection without using switches.—1st Lt. James M. Rose, Peekskill, New York.

A. I see no way by which you can have two amplifiers connected to a single set of speakers without switching unless you are willing to sacrifice some power which otherwise would be available from the amplifiers as a possible reserve margin. You could isolate the speakers from either amplifier by connecting them to the amplifiers through 8- or even better, 16-ohm resistors. Power will be lost across these resistors and some additional power will be lost across the amplifier which is not in use.

I recommend switching, even if the switching is accomplished by a relay system. By using a relay connected to the convenience outlet on each power amplifier, you can arrange matters so that, when one amplifier is turned on, the other amplifier is disconnected from the circuit. If wiring has been done correctly, simultaneously turning on the two amplifiers will result in neither amplifier being connected to the speakers. No damage can result. (I could not have said that when vacuum-tube amplifier circuits were king.)

The relay for amplifier No. 1 will, when energized, connect the speakers. However, it will interrupt a possible connection to amplifier two. If amplifier two is turned on and amplifier one is off, a relay associated with amplifier two will connect the speakers to it, but will disconnect the speakers from amplifier one. If both amplifiers are turned on, each relay will attempt to connect the speakers to their respective amplifiers, but contacts will interrupt the opposite circuit. Thus, no amplifier will be connected. This would call for two double-throw, four-pole relays with 120-V a.c. fields.

Additional switch contacts might need to be provided in the event that one or both amplifiers do not use ground as one of their output terminals.

Dubbing Rented Tapes

Q. I am planning to purchase a stereo dubbing deck. But before investing my money I would like to know if it is legal to rent tapes and copy them for home use. What is your opinion concerning the renting of tapes and then copying them for one's own tape library? (Name withheld)

A. So long as one confines the use of a tape copy to oneself, the legality of copying a rented tape or rented phono disk tends to be academic. It is when you try to make commercial use of the copy or start passing the copy among friends that the trouble is apt to start. The above statements are based on some articles on the subject that I have read in the past, and in no way constitute a guide to your actions. For such a guide I urge that you consult an attorney. My opinion about renting tapes or disks and copying them is that this is unethical, even if not illegal.

Using VU meters with Disc-Cutting Systems

Q. I plan to install a VU meter across the 16-ohm output of my power amplifier, to be used in conjunction with my disc-cutting system. I would like to know if there is any objection to using the circuit shown in Fig. 1, to drive the vu meter.

Would installing a matching transformer between the output of the voltage amplifier and the meter help the performance of the meter? See Fig. 2.

Walter Marion, Evergreen Park, Illinois

A. The circuit you have shown in Fig. 1 should work reasonably well. However, I do not like connecting a meter directly

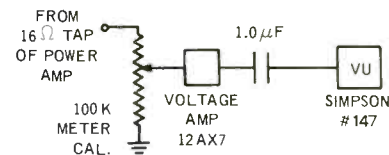


Fig. 1

in the plate circuit of an amplifier. The coupling capacitor will assume a sudden charge when the amplifier is first turned on, pinning the meter. Meters are, of course, capable of handling a certain amount of overload. However, there is no reason to tempt fate. Rather than using

How crazy are you about stereo?

No matter how deep your stereo psychosis, there's a Panasonic to bring you soothing relief. Because we start with a receiver for the stereo nut. And end up with one for the nut who's completely out of his mind about stereo.

Start with our Model SA-40 and you're not bringing home a beginner's model. You're into FM/AM and FM stereo. With FET, four sensitive IF circuits, built-in Ferrite antenna in AM,

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When you finally reach our SA-4000, it's the end. Absolutely. Because it contains every recent development in transistor and microcircuit design. And then some.

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Approximate list prices shown.

\$220
SA-40

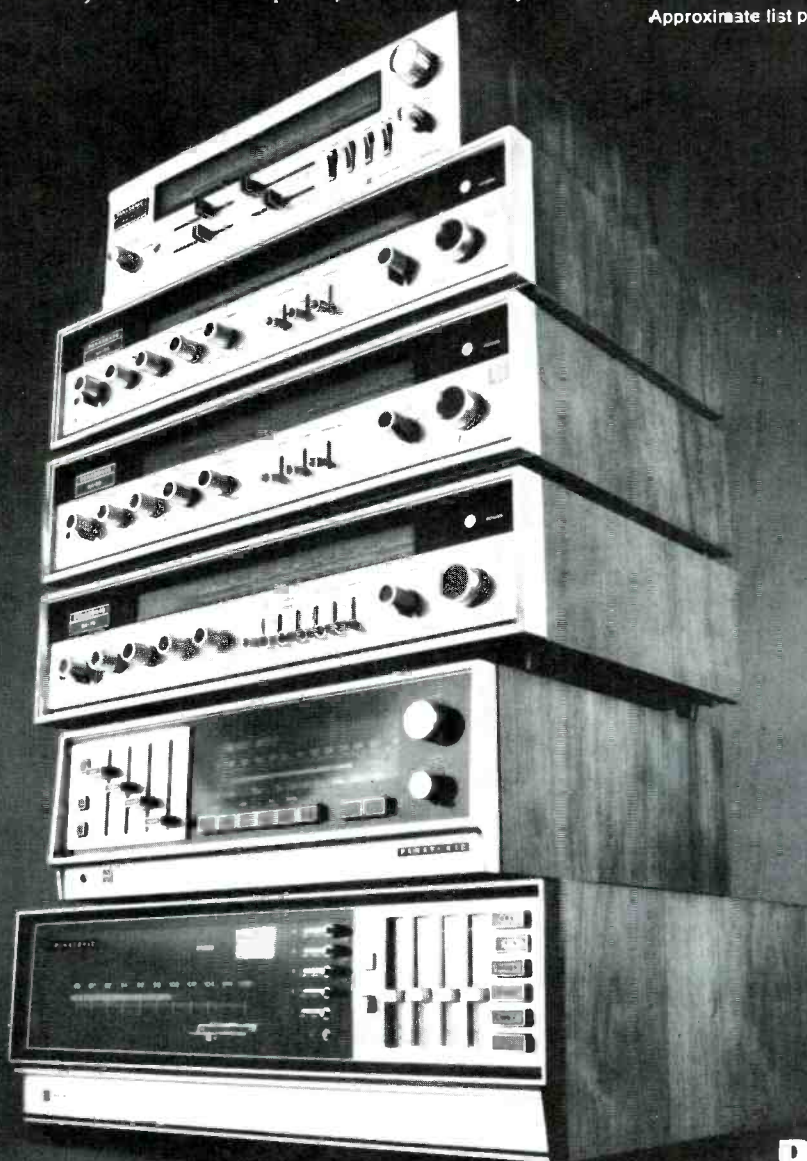
\$250
SA-50

\$280
SA-60

\$350
SA-70

\$400
SA-6500

\$1000
SA-4000



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THE ABSOLUTELY UNVARYING CONSTANT SPEED FACTOR

Of all the parameters affecting tape recorder performance, few are as important as constant speed.

Considering the havoc even comparatively small speed variations play with recorded

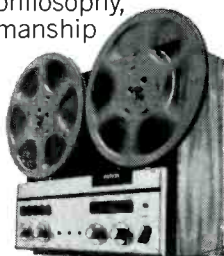
sound, it's rather surprising that most tape recorder manufacturers seem to give short shrift to this vital, performance affecting feature. On the other hand, the manufacturers of professional recording equipment go to great lengths and expense to insure both short and long term speed stability and constancy. And so do the people who make the Revox A77.

The Revox A77 is the only machine in its price class that incorporates a servo-controlled capstan motor that automatically adjusts and corrects itself so as to guarantee a maximum speed deviation of less than .2%.

According to Audio Magazine, "The electronic speed control held the speed exactly 'on the nose' at all input voltages from 135 down to 92... and at all frequencies from 40 to 70 Hz". Stated simply, this means the Revox is unaffected by those all too common fluctuations that occur in both line voltage and frequency.

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Audioclinic, cont.

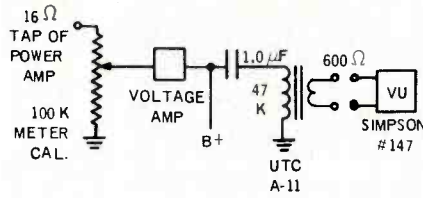


Fig. 2

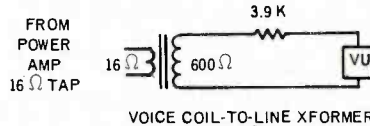


Fig. 4

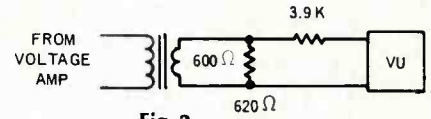


Fig. 3

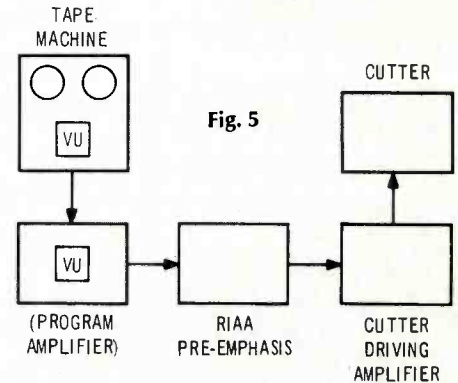


Fig. 5

both halves of the 12AX7 to provide gain, why not use the second half of this tube as a cathode follower? The meter is coupled via a capacitor to the cathode of this circuit. The capacitor feeding signal to the meter would charge very slowly during the tube's warmup, as the electron emission from its cathode slowly builds up.

As an alternative you could use a matching transformer in the plate circuit as mentioned in your question. The meter should be connected in series with a 3.9-k ohm, 1-per cent resistor, with this series combination being connected to the 600-ohm winding of this matching transformer. This transformer should be shunted by a 600-ohm resistor. See Fig. 3. The use of this resistor provides for proper damping characteristics of your VU meter. This is extremely important when a number of meters are used, and where they must all read alike when a given signal is impressed on them. This factor is not particularly important for your application.

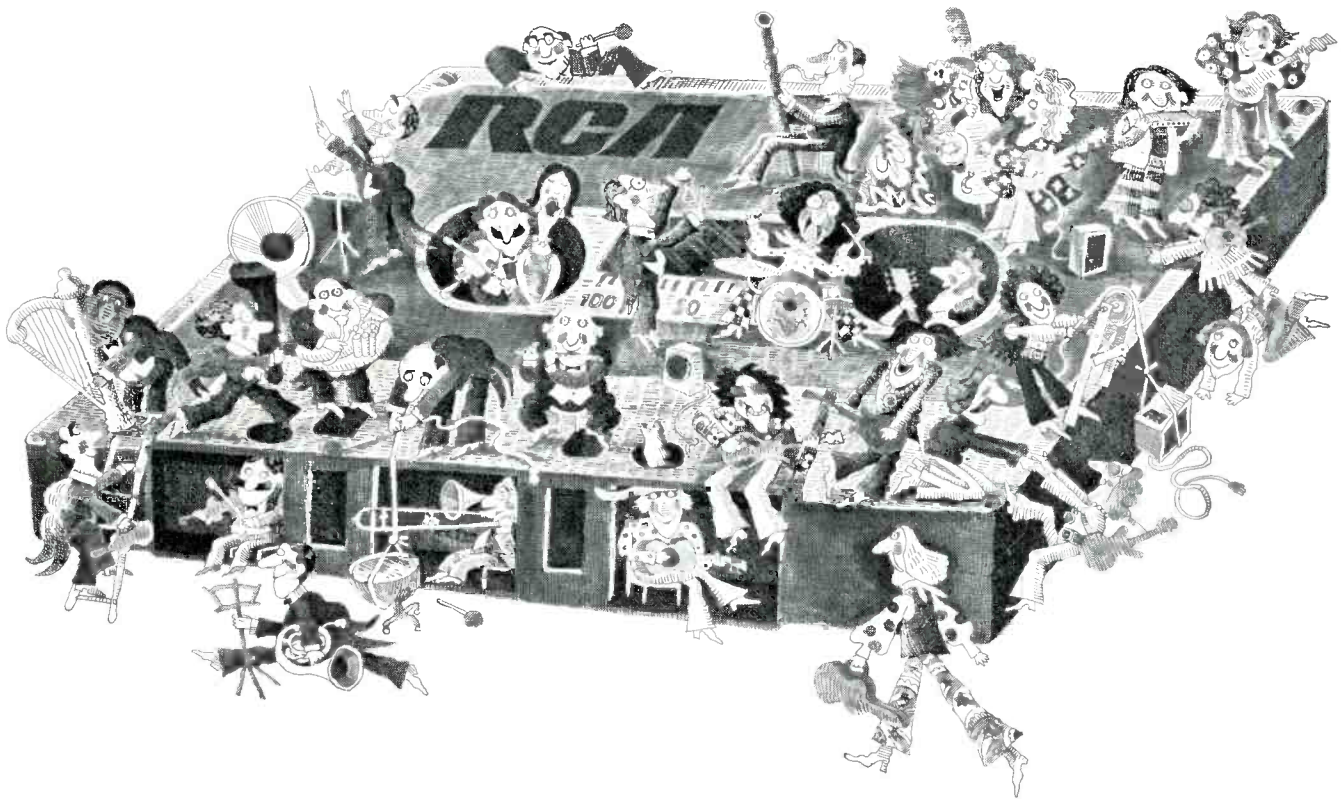
As I have said, a voltage amplifier can be used to drive a VU meter. However, it is possible to drive the VU meter directly from the output of the power amplifier. Use a line-to-voice-coil transformer as shown in Fig. 4. Notice once again that we are using the 3.9-k ohm resistor. This improves meter damping, but also isolates the meter from the power-amplifier circuitry, thereby minimizing distortion. What we have here is a basic circuit, not calibrated to your needs. You will have to devise an attenuator network

which can be used to calibrate the meter. The amount of signal provided from the line-to-voice-coil transformer will be far too much when the cutting head is operated at normal recording level. When using the circuits described thus far, the VU meter "sees" the signal supplied to the disc recording head. This signal is pre-emphasized for proper RIAA treble compensation. Some people do not use a VU meter in this way. I, myself, have the VU meters in the output of a program amplifier, which, in turn, feeds the RIAA equalizer, whose output feeds the input of the disc recording power amplifiers. See block diagram, Fig. 5. Under these conditions the VU meter will "see" the same kind of signal as read on the VU meter in the tape recording chain. You can see that this makes comparisons between tape playback and disc recorder feed more meaningful.

In the arrangement where the VU meter is driven by the pre-emphasized signal, the meter will often read higher than it will with the arrangement shown in Fig. 5. With practice, either system can be used to advantage. The main thing to remember is that good disc recordings can be made best when you observe the VU meter in relation to the sound you hear from your monitor speaker. This implies that you must be totally familiar with the characteristics of your meter and those of your monitor speaker. Further, you must understand the relationship that these two factors have upon the cutting process.

(Continued on page 89)

Music doesn't have to be dead just because it isn't live.



RCA tapes put life in your recordings.

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Low noise mastering tape for the pros. In 1/4-, 1/2-, 1- and 2-inch widths.

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RCA
Recording Tape

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What's New in Audio

Ampex 362 tape cassette

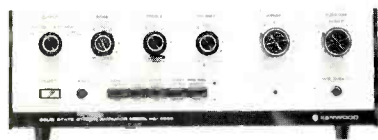


A new blank cassette having an extended frequency response is now available from Ampex. Response is said to be virtually flat up to 10 kHz. Price: C60, \$2.95. A "library caddy" is given free to purchasers of six cassettes.

Check No. 135 on Reader Service Card

Kenwood KA-4002

This is a very inexpensive amplifier with many of the facilities of larger models. Power output is said to be 95 watts (IHF) with a harmonic and IM distortion of less than 0.5%. Features include terminals for two pairs of stereo speakers,



center channel, two phonos, tape deck, and two auxiliary inputs. Step-type tone controls are used, and push-buttons select high and low filters, tape monitor, and loudness control. Price: \$139; walnut cabinet, \$15.

Check No. 134 on Reader Service Card

Marantz 26 receiver

Marantz says this is their first budget-priced AM-FM receiver, but it incorporates many of the sophisticated features of



the top-of-the-line receivers, such as Gyro-Touch tuning, individual controls for bass and treble, three stereo inputs, and the same type of advanced circuitry. FM sensitivity is quoted at 3 μ v, and power output is 10 watts (rms) per channel. Price: \$219.00, including cabinet.

Check No. 133 on Reader Service Card

BHK F-1 flutter meter

This meter uses a new circuit which allows measurements to be made over a 2-4 kHz range of carrier frequencies.



Bandwidth is 0.5-6.0 Hz, 6.0-250 Hz, and 0.5-250 Hz with meter ranges of 0.3% and 1.0% FSD. Price: \$340; F-1A, with built-in 3-kHz oscillator, \$350.

Check No. 132 on Reader Service Card

Hartley loudspeakers

Two super woofers are now available from Hartley—an 18-in. and a 24-in. model. Both use 14-lb. Alcomax magnets, laminated fiberglass spiders, double voice coils, heat sinks, and magnetic suspension.



These new speakers are ideal for music groups, electronic organs, or other applications needing high acoustic power. Price: 218 HS, \$250; 224 HS, \$300.

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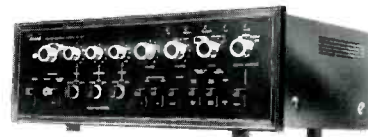
Tapes for sound effects

Radio Shack have just introduced a sound effect tape which includes a ping-pong game, a DC-7 take-off, thunder and rain storm, birds, fireworks, foghorns, ocean sounds, a carillon and bagpipes. Ask for 51-4777 (Cassette) 51-5777 (Cartridge) or 51-7777 (7½" reel-to-reel). Price, \$3.95.

Check No. 130 on Reader Service Card

Sansui AU 999 stereo amplifier

This new Sansui amplifier is a versatile, integrated unit suitable for professional use. It has a number of interesting innovations including independent control of preamplifier and amplifier sections. This permits the insertion of electronic cross-



overs or the facility of separate programs. Three step-type tone controls are provided for each channel, and they can be removed from the circuit completely if required. Power output is rated at 70 watts per channel (rms), and signal-to-noise is claimed at better than 80 dB for phono inputs. An unusual refinement is the provision of a variable-resistance load for one of the two phono inputs thus allowing optimum matching. Another useful feature is the presetting of controls to adjust phono and auxiliary input levels. Price: \$299.95.

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Catalogs

Telex has issued a new catalog, BI-2166-2, covering more than 30 general communication and dictation headphones and other private listening devices and accessories.

Check No. 128 on Reader Service Card

Stanford International offers "Microphones—How to Choose and Use," a free booklet giving the fundamentals of microphones and the characteristics of each type. Other information included covers microphone placement, feedback, limiting factors, impedances, techniques and applications.

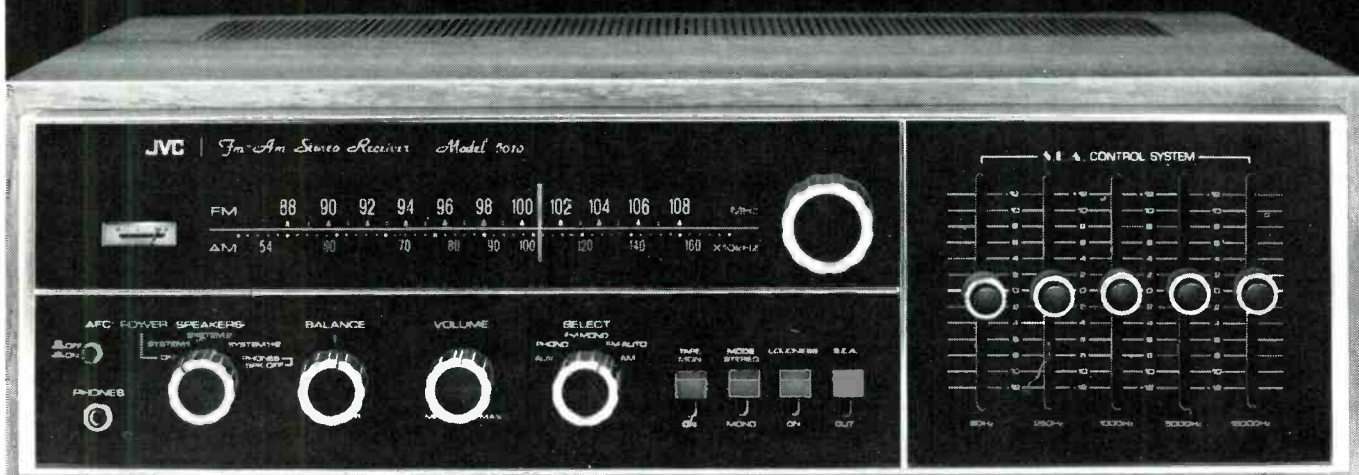
Check No. 127 on Reader Service Card

Allied Radio Shack has a new 460-page catalog which gives information on Knight-Kit products, including amplifiers, tuners, receivers, and test equipment. Available for \$1.00 from Allied Radio Shack, 100 N. Western Rve., Chicago, Ill. 60680.

Rek-O-Kut parts

A complete line of replacement and spare parts for Rek-O-Kut turntables and tonearms is now available from two company warehouses: 1568 N. Sierra, Fresno, Calif. and 716 Jersey Ave., Gloucester City, N.J. The parts are available from either warehouse in individual or bulk quantities.

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.

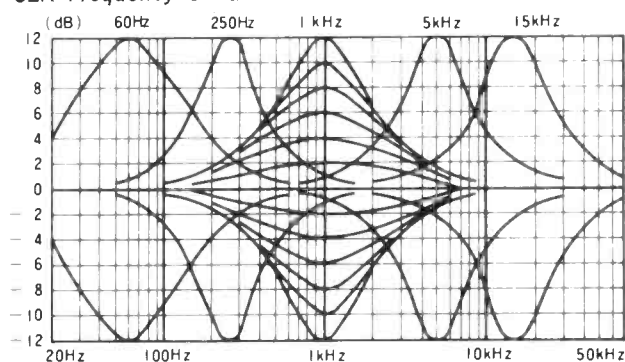
Whichever you choose, you will be choosing the finest. See them all at your nearest JVC dealer, or write us direct for his name, address and color brochure.

*Suggested list price \$229.95

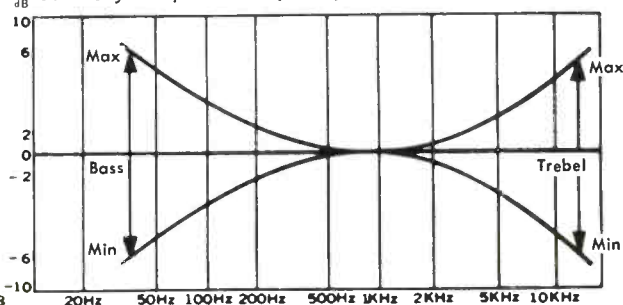
JVC Catching On Fast

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



Various business training and communications video recording applications are possible with video cartridge recorders, such as the Ampex Instavision system. Here a skilled keypunch operator demonstrates correct procedures which are recorded for later viewing.

About a year ago I reported on the introduction of the Columbia "EVR" television cartridge system. You may recall that this is basically a playback only system, in which Columbia-processed pre-recorded material will be sold to the owners of the cartridge playback unit. Much was made of the impact this kind of system would have in the industrial and educational markets, where specially recorded material on almost any conceivable subject would be offered. Columbia even had a "tie-in" service with the New York Times set up to cover the educational aspects of the system. The biggest market envisioned of course, was John Q. Public. Here again the variety of subject material that could be offered was endless, but there was a distinct emphasis on

the possibilities of obtaining a library of major company movies. Like many new developments, things have not moved as fast as Columbia had envisioned. However, the EVR concept got a good boost with the recent announcement by 20th Century Pictures that they would make available to the EVR library their feature films that were older than five years from original release date. This automatically provides a vast backlog of films that could be offered on EVR cartridges.

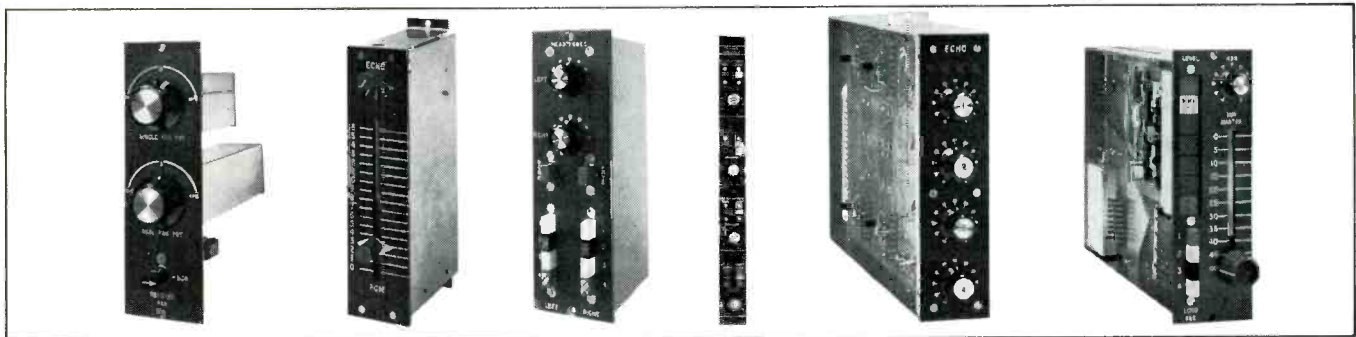
Not to be outdone by Columbia, RCA recently announced their "SelectaVision" system, which is also a playback only concept offering pre-recorded material to the public and specialized markets. The RCA system is one of the most technologically sophisticated devices ever contem-

plated as a consumer product. It is too complex to go into detail here, involving as it does such "far out" concepts as holograms and laser beams. The playback unit employs a low-power gas laser to "read" the pictures, and there has been comment in some quarters about some possible hazards of having such a device in the home. Nothing has been proven about this, one way or the other, and it probably can be placed in the same category as radiation from TV sets. In any case, in "laboratory format," the SelectaVision system works as advertised. It faces the same problems as the EVR system in respect to movie libraries and other specialized material for pre-recorded release.

(Continued on next page)

Altec introduces a 4-foot control console with up to 28 inputs and 16 outputs.

It's built to your specs...delivered ready to use.



It's the all-new, all-solid-state Altec 9300A control console. Only 51½ inches long, it features direct-plug-in modular construction that lets you custom tailor your own board by simply selecting the specific modules you need.

The new Altec 9300A gives you up to 28 inputs and up to 16 outputs. And any input may be connected to any output by means of a switching matrix on each input channel.

Here are some exclusive features designed into the new Altec 9300A.

- Channel Check provides an individual instant check of all input lines without interrupting the program.
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Mail this coupon for all the details on the new Altec 9300A console.

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Please send me all the details on the all-new Altec 9300A control console—including information on how its unique modular design will let me simply plug in different modules as I need them.

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The new Instavision recorder-player uses standard half-inch wide video tape enclosed in a circular plastic cartridge 4.6 inches in diameter by 0.7 inches thick.

Several months ago, Audio reported on the Teldec video disc system, and as I write this, it has had its first demonstration in this country at the Audio Engineering Convention in New York. Apart from the technical triumph of a video disc, and its commercial advantages, there exists the distinct possibility of a discrete four channel stereo disc. With 70kHz capability at 33 $\frac{1}{3}$ rpm bandwidth is certainly not a problem. From the strictly video aspects, we have here too a playback only system, and just because it is a disc rather than a cartridge doesn't lessen the ramifications of this concept.

The latest entry into the video cartridge sweepstakes is the Ampex Corp. with their "Instavision" system, and after seeing it demonstrated I must say that I am very impressed. In my opinion the Instavision system has several clear-cut advantages over competing systems, but quite apart from that, this also appears to be a system *ready for production*. There is nothing ephemeral about this development! Target date for the Instavision system is mid-1971 and there would seem to be no obstacles to its introduction at that time.

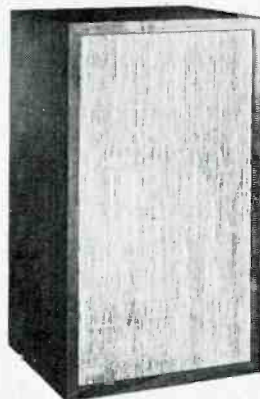
The big point of departure between the Instavision system and competing cartridge units is that *it can record* and playback video information. This is possible because the Instavision system uses conventional half-inch magnetic tape. The tape is housed in a 4.6 inch diameter by .7 inch cartridge, which is self-threading on Instavision recorder/players. The complete Instavision system consists of a miniature videotape recorder 11 x 13 x 4.5 inches that weighs less than 16 pounds complete with common flashlight or re-

chargeable batteries, a hand-held monochrome camera with zoom lens that weighs less than 5 pounds and has a electronic viewfinder which actually is a tiny television receiver so that one can frame scenes precisely and view what is being recorded, and of course, the video cartridge. Standard with each recorder or player is a separate power pack that houses an A/C power converter for plug-in operation, a battery recharger and optional electronics for color record or playback. The power pack is designed as a base for the recorder during any of these operations and probably would sit on top of the TV set in use. The recorder is detached from the base for portable use. The Instavision system is to be sold in several formats. A monochrome playback only unit is expected to cost \$800, a monochrome recorder/player or color player will be \$900 and a color recorder/player is ticketed at an even thousand dollars.

The Instavision recorder/player operates on the helical scan basis and conforms to "Type One" standards for half-inch tape. The Type One standards have purportedly been adopted by such manufacturers of half-inch magnetic tape equipment as Sony, Phillips, and Grundig. As such, the Instavision cartridge is compatible with conventional reel-to-reel recorders embodying the Type One standards. The cartridge will permit 30 minutes recording time at the 7.5 ips Type One standard, or 60 minutes in extended mode, which is 3 $\frac{3}{4}$ ips. Blank cartridges are expected to sell for less than \$13.00. The cartridges permit fast forward or rewind operation with the

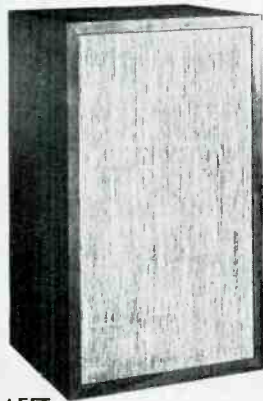
(Continued on page 87)

4-Dimensional Stereo



FRONT

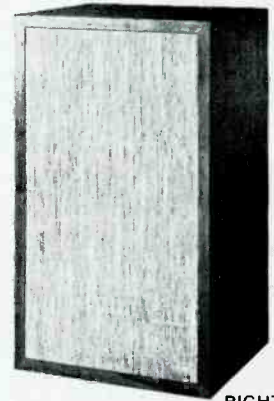
with the Dynaco SCA-80.



LEFT



SCA-80 (\$169.95 kit, \$249.95 assembled)



RIGHT

The Dynaco SCA-80 is a high quality two-channel stereo control amplifier incorporating patented circuitry* so you can enjoy the Dynaco system of four dimensional stereo (front and back as well as the usual left and right) by adding just two more loudspeakers . . . just **two** more speakers.

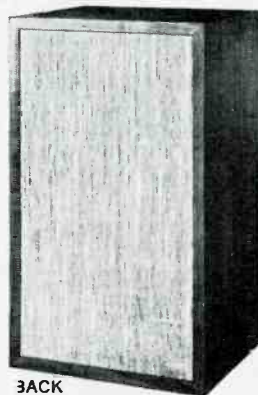
In addition to recordings made specifically for the Dynaco system, many of your **existing** stereo recordings (disc and tape) already include the phase relationships required for four dimensional playback. You can use **present** stereo phonograph cartridges or tape recorders without any modifications. Four dimensional programs are **now** being received by **existing** FM stereo tuners.

*U. S. patent #3,417,203

The Dynaco four-dimensional system fully utilizes material **already** on stereo recordings. It faithfully reproduces in your own listening room the acoustical environment in which the recording was made.

Dynaco four-dimensional sound can be played back through the SCA-80 (or the PAT-4 or PAS-3x preamplifier and any stereo power amplifier) with a total of four loudspeakers, connected as Dynaco specifies. This configuration is completely compatible with playback of all stereophonic and monophonic recordings, and enhances virtually all stereophonic material.

Write for full details on how you can connect four speakers to enjoy Dynaco four-dimensional stereo.



BACK

Dynaco A-25 speakers (\$79.95 each—**assembled only**)

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Check No. 13 on Reader Service Card

Dear Editor,

Dear Sir,

I am offering below a few comments on the subject of Doppler effect in loudspeakers. I have studied this effect for several years in a casual manner and have made a number of actual measurements on the sound field of long throw loudspeakers.

First we should note that it is relatively easy, if one uses Massas charts, to see that the total distortion due to Doppler effect depends not only on the amplitude of the modulating signal but on the frequency difference as well. Thus, very approximately

$$\text{Distortion} = A \frac{f_2}{f_1} \text{ percent}$$

Where A is about .33, f_2 is the modulated, i.e. higher, frequency and f_1 is the modulating, i.e. lower, frequency.

If the ratio of the higher to the lower frequency is 10, e.g.: 50 Hz and 500 Hz, which is not unreasonable, we get the following levels of distortion.

Frequencies	Acoustic Output	12" cone	15" cone
30 - 300	0.1 watt	.3 %	.62 %
50 - 500	0.1 watt	.5 %	.22 %
100 - 1000	0.1 watt	.12%	.056%
30 - 300	1.0 watt	.6 %	1.9 %
50 - 500	1.0 watt	1.5 %	.66 %
100 - 1000	1.0 watt	.4 %	.17 %

Or if we hold the upper frequency at 800 Hz and 1000 Hz but vary the lower frequency, we get

Acoustic Output for 10" cone	800 cps	1000 cps
0.1 watt at 30 Hz	3.5 %	4.4 %
0.1 watt at 50 Hz	.79%	.99%
0.1 watt at 100 Hz	.10%	.12%
1.0 watt at 30 Hz	10.5 %	13 %
1.0 watt at 50 Hz	2.5 %	3.1 %
1.0 watt at 100 Hz	.32%	.4 %

Some of the figures in the above tables seem rather large. However, be assured, that they *have been measured* and agree reasonably well with theory. Also, we may note at this point that the distortion, or modulation phenomenon, if you prefer, is *clearly* audible.

One must conclude that this form of distortion is real and of significance now that we have extended bass response, small but long throw cones, and substantial acoustic output demands. There are two approaches we can use to minimize this type of distortion. One is to use larger cones or several small cones to make up the equivalent area. The second is to reproduce a limited frequency range with each cone. These rather obvious solutions have been used by many high quality systems such as Bozak and others for over 25 years.

If we limit the low frequency cone to 200 cps maximum, we find the following distortion figures.

Acoustic Output	Distortion for 10" cone
0.1 watt at 30 Hz	0.88 %
0.1 watt at 50 Hz	0.2 %
0.1 watt at 100 Hz	0.025%
1.0 watt at 30 Hz	2.7 %
1.0 watt at 50 Hz	0.62 %
1.0 watt at 100 Hz	0.08 %

These latter figures look much more acceptable since distortion (Continued on page 93)

BEND AN EAR...

toward the newest shape in sound





Possibly some one has been bending your ear about the newest shape in sound. It's called CELESTA! This speaker has a cast chassis, functionally-formed under extremely high pressure for lasting precision. A baked-on lacquer finish and slim profile (8" model is only 3 1/8" total depth) are distinguishing features of all SIX CELESTA models. Vibration-free, rugged CELESTA frames assure added years of listening pleasure. So go on... bend some one else's ear about the newest shape in sound... CELESTA. Incidentally, free cabinet plans included with speaker.

See your dealer, or write UTAH for complete information



HUNTINGTON, INDIANA

Check No. 14 on Reader Service Card


The voltage supply in your city can vary as much as 10%. And even the slightest variation such as that caused by a toaster or an air conditioner will change tape speed significantly. To deal effectively with this situation, the Concord Mark III is equipped with a hysteresis motordrive which does not rely on line voltage but rather on the 60 cycle power line frequency. It maintains constant speed regardless of voltage variation.

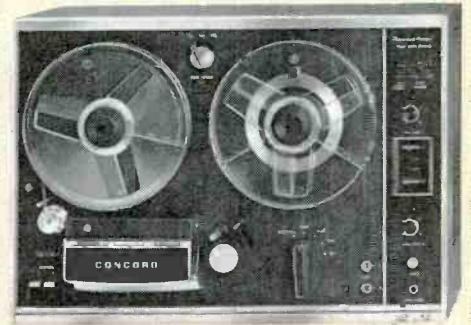
And the Concord Mark III offers far more than just hysteresis-drive. 3 quality heads: the record and playback heads are made of a newly developed, pressure-sintered ferrite. Their diamond-hard characteristics make it possible for Concord to offer a 25-year guarantee. These heads

maintain their original high standard of performance for many, many years — no significant head wear, no deterioration in frequency response or signal-to-noise ratio.

Other features: the tape transport mechanism assures a fast start-up; two tension arms stamp out burble; a special filter eliminates flutter due to tape scrape or cogging action; a cue control; flip-up head cover for professional editing; tape monitoring; three speeds; sound-on-sound; variable echo control for reverb; calibrated VU meters; stereo headphone jack. Concord Mark III, a lot of value for under \$250.

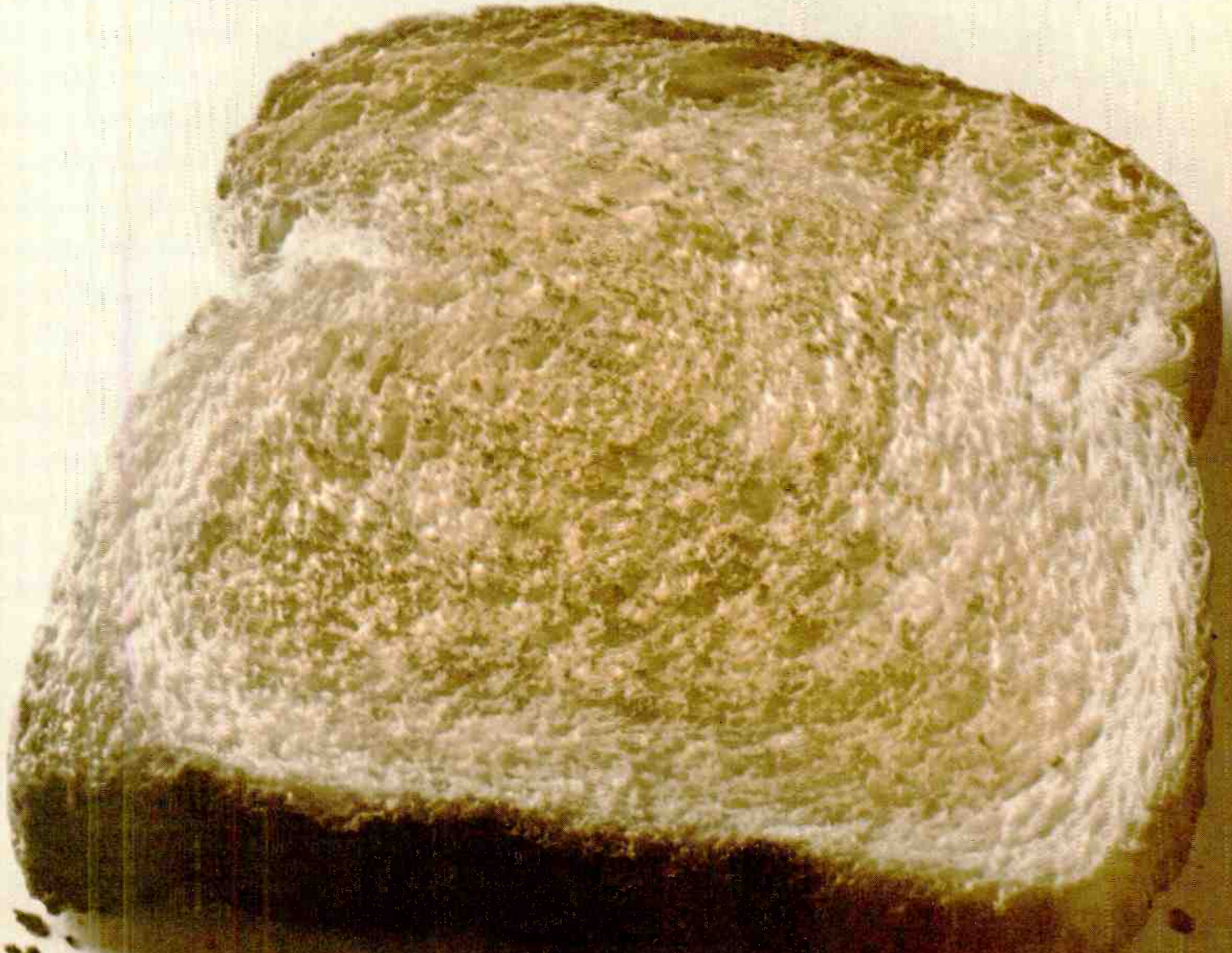
Concord Mark Series decks start at under \$200. For free comparison chart

write: Concord Electronics Corporation, 1935 Armacost Ave. Los Angeles, Calif. 90025, a subsidiary of Ehrenreich Photo-Optical Industries, Incorporated. 



Concord[®] Mark III with hysteresis motordrive

It could turn an allegretto into an andante



Check No. 15 on Reader Service Card

Tape Guide

HERMAN BURSTEIN

Tape Speed vs. Quality

Q. Can you please tell me the difference in quality between operating at 7½ and at 3¾ ips? (Joseph Tomeo Jr., Scranton, Pa.)

A. If you are using the finest tape machines that today's state of the art can produce, and top quality tape, there tends to be very little audible difference between results at these two speeds. Perhaps there will be a little less noise and a little more "transparency" at 7½ ips. Also, you have more "headroom" at 7½ ips: there is less chance of running into distortion at high frequencies because less treble boost is applied in recording at this speed. The differences in general tend to be more obvious to measuring instruments than to the ear—provided you are using a top-notch machine and tape.

"Sour" Notes

Q. My problem is distortion in the form of "sour" notes, most noticeably in the high frequencies. I am unable to remedy the problem despite the fact that I regularly clean and demagnetize the heads. I would greatly appreciate your advice. (D. V. Turner, Los Angeles, California)

A. The difficulty you describe appears due to wow in your tape transport. And this could be due to an out-of-round idler wheel, belt slippage, oil or other lubricant on the capstan or pressure roller, and so on. I suggest that you clean the capstan and pressure roller thoroughly with whatever fluid is recommended by the manufacturer of your tape machine. Also clean all other parts, such as guides, contacted by the tape. If this doesn't help, I am afraid the problem must be referred to an authorized service center suggested by the manufacturer.

Microphone Selection

Q. I'm shopping for a new microphone and I'm completely in the dark about the rating of sensitivity and output. I have a good tape recorder and a good microphone, but for voice and lecture recording the microphone is too sensitive. If it is touched or moved while recording, the recording sounds as though a train went by. One evaluator of this microphone said that it was great except that the output

was low. The manufacturer's literature gives a sensitivity figure of about -50 dB. What gives?

Specifically, what specifications do I look for to obtain a microphone which can be placed several feet, maybe as many as 15, from the person speaking and still get adequate pickup for recording? (Rex H. Shudde, Philadelphia, Pa.)

A. Rather than risk confusing you all the more by trying to explain in limited space the various methods of rating microphone sensitivity, let me state that the figure you cited indicates that yours is a highly sensitive microphone; that is, it has relatively high output. The lower the figure given (disregarding the minus sign), the higher the sensitivity. Thus a microphone rated at -50 dB has greater sensitivity than one rated at -55 dB. Incidentally, a rating of -55 dB is about average for high-quality microphones.

As for picking up low-frequency noises, this is a problem of mounting the microphone so that it is insulated from such sounds. A boom type of mounting or other shock mounting may be necessary in your circumstances. A microphone should not be moved or touched when in use. Some microphones are available with a switch that reduces bass response, and this might help with your problem. If you plan to use a microphone with no more than about 15 feet of cable (low-capacitance cable), a high-impedance microphone is ordinarily satisfactory. For longer cables, a low-impedance microphone is advisable; otherwise treble frequencies are attenuated by the cable capacitance.

Azimuth Alignment

Q. What is the proper procedure for azimuth alignment of a 4-track recorder with a full-track test tape. Should the alignment method recommended by the machine's manufacturer be followed with the two channels strapped together, or is it necessary to repeat the procedure using first one channel and then the other for playback of the azimuth test tone while adjusting the head for a maximum indication on a VTVM? (Robert Pearson, Chicago, Illinois)

A. I think that the best procedure is one which deals with each channel separately. If a single head position does not

maximize output on both tracks, then it is necessary to find a compromise position which results in about equal performance on the two tracks.

Lack of Bias

Q. My tape deck is giving me some difficulty; perhaps you can suggest some corrective measures. The most annoying and bewildering problem is the intermittent loss of the erasing and recording functions on both channels. In attempting to record during such losses, the input signal does get far enough through the record amplifier to drive the VU meters to full level, and the RECORD indicators light up when the RECORD buttons are pushed. However, on playback the tape is found to contain no signal unless the input while recording was turned up to a level which would register well above the 0 point on the VU meters, and under such circumstances the recording which does result is of course severely distorted. Previously recorded material is not erased if a used tape is being employed in the recording process. This difficulty comes and goes unpredictably, disappearing for weeks at a time, only to reappear suddenly and remain for similar lengthy periods. (Theodore L. Purnell, Hammononton, New Jersey)

A. It appears that your difficulty lies in the bias oscillator circuit. Loss of oscillator current would make the erase head inoperative, and it would cause the recorded signal on the tape to be very low and distorted. The trouble may be as simple as a faulty oscillator component (transistor, capacitor, or the like). It may lie in an intermittent connection. Or it may lie in a component, such as a resistor or capacitor, leading from the oscillator circuit to the heads. If you have a service manual that gives operating voltages in the record mode, you might check these voltages in the oscillator and related circuits. AE

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.

The Sony Model 850 is something to compete with, and our competition is really finding it tough.

The Sony 850 is a Professional Quality Stereo Tape Deck that offers features the competitor has never even dreamed about.

True, the 850 features professional 10½ inch reels for the maximum in uninterrupted recording time—so do the others. But the Sony 850 has three speeds, including 15 inches per second, unique "logic controlled" push buttons which make it impossible to break or damage tape and provide flawless tape handling. And a special APS Program Scanner that automatically locates and plays your musical selections and eliminates rethreading.

The Sony 850 comes in two-track and quarter-track record versions, each with a fourth head for playback of both two-track and quarter-track tapes. Each can also be converted from two-track to quarter-track record in seconds with Sony's optional plug-in head block.

Stop running around in circles. Make the comparison yourself. The Sony Model 850 Professional Quality Tape Deck is available at your nearest Sony/Superscope dealer.

Also available: the Model 854-4 Quadradiol 4-channel tape deck for recording and playing 4-channel Quadradiol sound.

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Editor's Review

The AES convention attracts more and more people every year and this year's attendance was at least fifty per cent up on last year's. There were sixty-seven exhibitors at the Hotel New Yorker and although there were some complaints regarding the choice of venue, I imagine everyone was well satisfied with the results. Seventy-five technical papers were presented—the most popular being the Teldec video record demonstration, the recording session given by the New York AES section, and John Chownings "Simulation of Moving Sound Sources" using computer techniques. The 'panning' of various electronic and other sounds round the room was most effective. I myself was particularly interested in Percy Wilson's talk on British contributions to audio during the past years, as I had known many of the people so well. John Eargle's talk and demonstration of quadraphonic sound derived from existing two and three-track master tapes was also worthy of mention.

Sound quality as a whole was very much better than we have heard on previous years. (A lot of truth in the old story of the shoemaker's children!) The four large loudspeakers systems in the hall were designed by Rectilinear and they used some new Becker speaker units. Bernie Beck of the latter company was in charge of the Public Address system, a duty he performed most efficiently. Upstairs in the smaller rooms, the quadraphonic demonstrations by JVC, Electro-Voice and Scheiber proved very popular.

At the annual banquet, several awards were given out. The John H. Potts Memorial Medallion went to Rudy Bozak, and Dr. Beranek in making the presentation cited his "outstanding achievements in the field of audio engineering." Arthur Haddy of the British Decca company received the Berliner Award, and Citations were given to Marvin Camras and John D. Colvin.

The Recording Industry of America (RIAA) has just issued an estimate of 1970 record and tape sales. Here they are compared with the 1969 figures:

	1969 (millions)	1970 (millions)
Records (billions)	\$1.17	\$1.2
8-track cartridges	\$300	\$400
4-track cartridges	\$21	\$8
Cassettes	\$75	\$105
Reel-to-reel	\$21	\$21

Records and eight-track cartridges show a healthy gain—so do cassettes, with reel-to-reel just holding their own and four-track declining. Next year will undoubtedly see a further increase in cassette sales due to the Dolby and Crolyn innovations, but whether the demand for reel-to-reel tape will go up or remain static is anybody's guess.

We must be doing something right!

Circulation of Audio increased from 47,966 in 1968 to this year's figure of 87,497 (average monthly sale). This is very gratifying and we hope to show a similar increase next year. The larger the circulation, the more advertisers, and more advertisers mean we can have a larger magazine. As I have said before, we want to print more articles for beginners as well as sophisticated technical articles for the knowledgeable. More space would also allow us to publish even better equipment evaluations and reviews.

Opera lovers will be pleased to learn that the opera record reviews by Richard Freed will become a regular feature. Another recent innovation, the "London Letter" by Donald Aldous, was well received and will appear from time to time.

* * *

It used to be fairly easy to make predictions about the future—videophones, space travel and all that. But now? Just look at what has happened during the past thirty years or so with the development of atomic science, the invention of lasers, transistors, computers and the vast complex technology of the Space Age. . . . In just 29 years' time, it will be the year 2000—but I will not attempt to make any prophecies. As the year 1971 is just around the corner, we at Audio will content ourselves by wishing you all a Merry Christmas and a Happy New Year. Especially to R. F. of Washington, D.C., who meticulously annotates all our typographical errors; to J. C. of Silver Springs, Md., who is distressed when we use Latin-Greek hybrid words, and to Robert Walker of Los Angeles (where else?) who believes the moon is shaped like a turtle and has written a book to prove it!

G.W.T.

IN MAKING RECORDS STANTON IS THE STANDARD



Photographed at Capitol Records.

Whatever your requirements for recording and playback, Stanton's Series 681 cartridges are the calibration standard. And there is a 681 model engineered specifically for each of these critical applications.

The Stanton 681A—For Cutting Head Calibration

With Stanton's Model 681A, cutting heads can be accurately calibrated with the cartridge, for it has been primarily designed as a calibration standard in recording system checkouts for linearity and equalization. Frequency response is factory calibrated to the most rigid tolerances and the flattest possible response is assured for precise alignment of recording channels. Implicit in this kind of stability and constancy is a reliability factor unmatched by any other cartridge for this application.

The Stanton 681EE—For Critical Listening

In critical playback auditioning, whether a pre-production disc sample sounds too "dead" or "bright" is largely a matter of cartridge selection. Here too, Stanton provides the evaluation standard in its model 681EE. In this application, the Stanton 681EE offers the highest obtainable audio quality in

the present state of the art. It is designed for low-distortion tracking with minimum stylus force, regardless of the recorded velocity or the distance of the groove from the disc center. High compliance, low mass and low pressure assure perfect safety even on irreplaceable records.

All Stanton Calibration Standard cartridges are guaranteed to meet the specifications with exacting limits. Their warranty comes packed with each unit—the calibration test results for that individual cartridge.

For complete information and specifications write Stanton Magnetics, Inc., Terminal Drive, Plainview, L.I., New York.



Check No. 19 on Reader Service Card

Stereo Headphone Review

C. G. McPROUD

STEREO HEADPHONES as we know them today apparently made their appearance in 1959, and while there was only one manufacturer that year, now there are many. John Koss introduced the idea of "Stereophones" and has made a successful business of phones ever since.

Earphones are not new, of course. They have been used by radio "hams" for at least fifty years, and before that they were used for any listening that was necessary. They were necessary then because the signals were low in level, and there were no amplifiers to make them audible over loudspeakers—even if we had loudspeakers. And the first loudspeakers were simply a single phone coupled to a horn. This arrangement gave way in the 20's to the first dynamic horn driver, introduced by Magnavox and still coupled to a horn. Even though the cone loudspeaker had been invented in about 1877, it did not become popular enough—or good enough—to enjoy general use until late in the 20's.

The first earphone was similar to the telephone receiver, from which it derived, purely as a means to provide a smaller device which could be worn on a band over the head instead of being held in the hand as one did the old telephone receiver. It consisted of a magnet, a coil of wire, and a diaphragm. The minute currents through the coil varied the attraction of its core to the iron diaphragm, resulting in movement of the diaphragm which moved the air in contact with it to create sound waves. The field created by the coil alone would attract the diaphragm on each half cycle of the signal, so the magnet was necessary to provide a "bias" to the diaphragm. Then the diaphragm would be attracted more on one half cycle and less on the next half cycle, rather than equally on both half cycles. Without the magnet, the reproduced signal would be twice the frequency of the applied current; with it, the sound would be equivalent to the signal current.

Somewhat improved phones were made with an armature inside a coil and a small linkage between one end of the armature and the center of a diaphragm.

This was the principle of the original "Baldwin" phones, which were somewhat more sensitive than the earlier types, and which could have better quality. Another type was the ribbon phone of RCA manufacture. This was one of the first really high quality headphones. It consisted of a thin ribbon imbedded into a diaphragm in such a way as to be held between the poles of the coil, together with the permanent magnet. These phones were called "High Fidelity Headphones," and carried the designation MI-3453 by RCA.

Dynamic headphones made their appearance in the 30's, and one excellent type was provided by Western Electric. They were used by mixers for location recording in the early days of sound movies. Later types consisted of tiny hearing-aid devices which were worn with molded plastic earpieces which effectively eliminated air leakage and provided excellent low-frequency response.

"Stereophones"

With the advent of stereophonic recording, the first listening was always done with phones—hence the name "binaural" became a part of the vocabulary of any knowledgeable audiophile. In fact, it took some doing to eliminate the word from our lexicon, and we still haven't succeeded in eliminating "monaural" which is often used when monophonic is meant.

John Koss introduced his "Stereophones" during the 50's, employing a 3½-in. dynamic speaker in each of the two earpieces. They created quite a sensation—so much so that many other manufacturers began to get into the market with their products so that today there must be upward of a hundred separate models available. Koss alone lists nine models, ranging in price from \$150 for the ESP-9 Studio Monitor down to a lowest price of \$19.95, which is simply an improved model of his first Stereophones. Our September issue listed 35 separate models, and two more are listed in the November issue. And for the Product Preview issue, we limited each manufacturer so that not every model could



Fig. 1—Koss artificial ear. Dark portion is molded rubber and provides the requisite 6 cm³ cavity.

be listed. Furthermore, not every manufacturer was included in the listings.

Because of the many makes and models, we planned to cover the subject as thoroughly as possible in this issue, giving more details of the models selected by the manufacturer, providing response curves and comparing sensitivities and the sound isolation effect of many of the popular headphones on the market.

As a starter, we requested samples from a number of manufacturers, and soon we had an office full of headphones—fifteen in all. And still not every manufacturer was included, and certainly not every model they produce.

Performance Measurements

The measurement of headphone performance is relatively complicated. The phones must be coupled to a microphone by means of an "artificial ear" of specific characteristics—and here there is a considerable difference of opinion. There are U.S. standards, International Electrotechnical Commission standards, and the British National Physical Laboratory standards—and they do not all coincide. The basic artificial ear coupler consists of a 6-cu. cm. volume between the phone and the microphone diaphragm, while a 2.5 cu. cm. volume is used for hearing-aid measurements. Various types are available commercially, and at relatively high

costs, so we borrowed the one used by Koss, together with a Bruel and Kjaer ½-in. condenser microphone, its cathode follower and power supply. These we used as standard, since they were used by Koss in measurements on their ESP-9 Studio Monitor Stereophones, which are in the category of highest quality. Then to make sure that we could continue headphone measurements after we returned the artificial ear and the B & K microphone to Koss, we built our own artificial ear, using an AKG C-451E condenser microphone. Our model consists of a 5½ maple body, 6½ in. long with a ¾-in. hole through the center for the microphone. The 6-cu. cm. volume was retained as in the Koss model. The C-451E microphone is a ¾-in. condenser, complete with an FET "follower" and a bi-polar transistor as an amplifier driving an output transformer. In addition, another transistor serves as an oscillator which generates a high-voltage signal which is rectified to supply 60 volts as a polarizing potential for the condenser cartridge. The FET and the two transistors are fed by simplexing a direct current through the input transformer of the following amplifier—as used for recording, for example—and the output transformer of the microphone. Any voltage from 7½ to 52 can be used with suitable current limiting resistors. With this microphone, only two wires and the shield are required, and when used in the usual fashion with a transformer at the input of a recording amplifier, it is possible to interchange microphones so that condensers or dynamics can be used as the need dictates. A simple modification makes it possible to use this microphone for measurements without an input transformer, and this model is priced within the range of most users' budgets. The calibration shows it to be flat to 15,000 Hz, and reasonably flat to over 20,000.

For a sound source, we used a CBS STR-100 record, which has a swept signal from 40 to 20,000 Hz for both right and left channels. The left sweep only was used, and the output of the ADC 25 cartridge was fed to a preamplifier equalized to produce a signal flat within ±1 dB over the range. This was then fed to the tuner input of a Dynaco SCA 80, with the speaker output terminated in 8 ohms, and the phones were plugged into the front-panel jack, which had the usual 100 ohms in series with each lead for the phones. The signal was adjusted for 4 volts across the 8 ohms—a 2-watt signal.

The Koss ESP-6 phones require a different connection. The 4-wire lead from the E-9 Energizer is connected direct to the speaker terminals of the amplifier, and the speakers are connected to the Energizer. The phones are plugged into

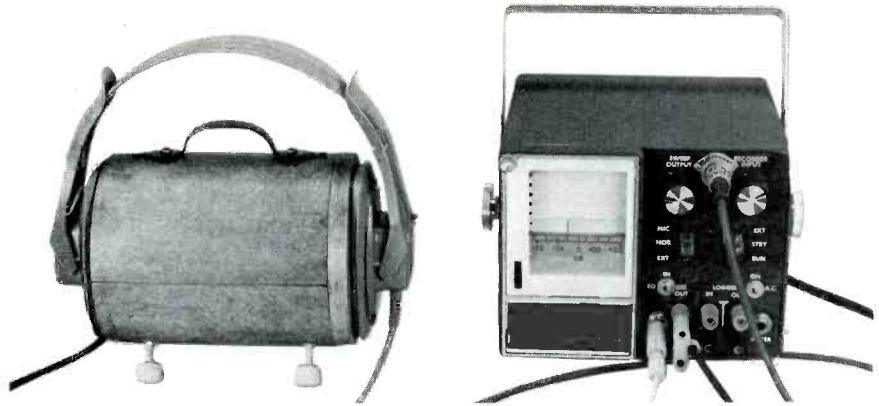


Fig. 2—Artificial ear made for our tests. It consists of a maple block with a ¾-in. hole through the center to accommodate the AKG C-451E condenser microphone used for the measurements.

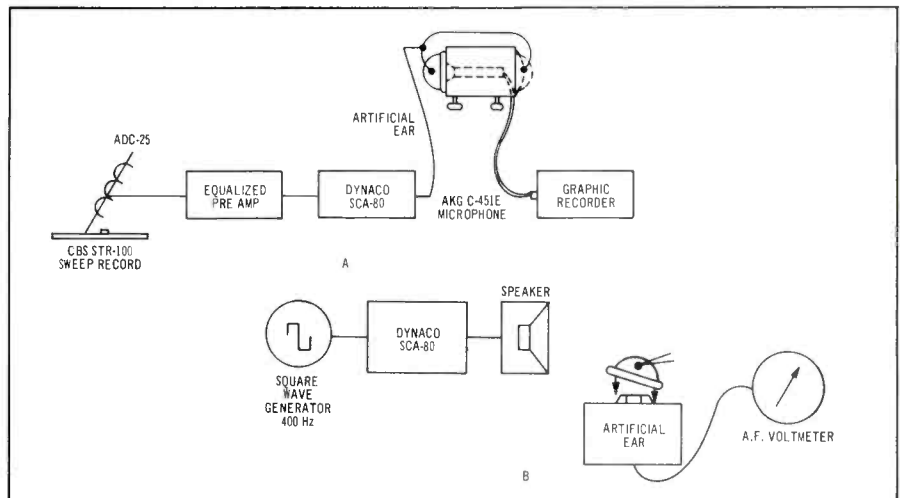


Fig. 3—(A) Setup of equipment for making response curves on the headphones. (B) Setup of equipment for making isolation tests.

the socket on the Energizer, which in turn is plugged into an a.c. outlet. This provides both signal and polarizing potential for the electrostatic phones. The polarizing voltage can be provided by the rectified a.c. line voltage or by the signal itself which is stepped up in voltage and rectified by a voltage tripler to provide for self-energization. The two methods are selectable by a switch on the front panel of the Energizer. In addition, another switch turns the speakers on or off as desired.

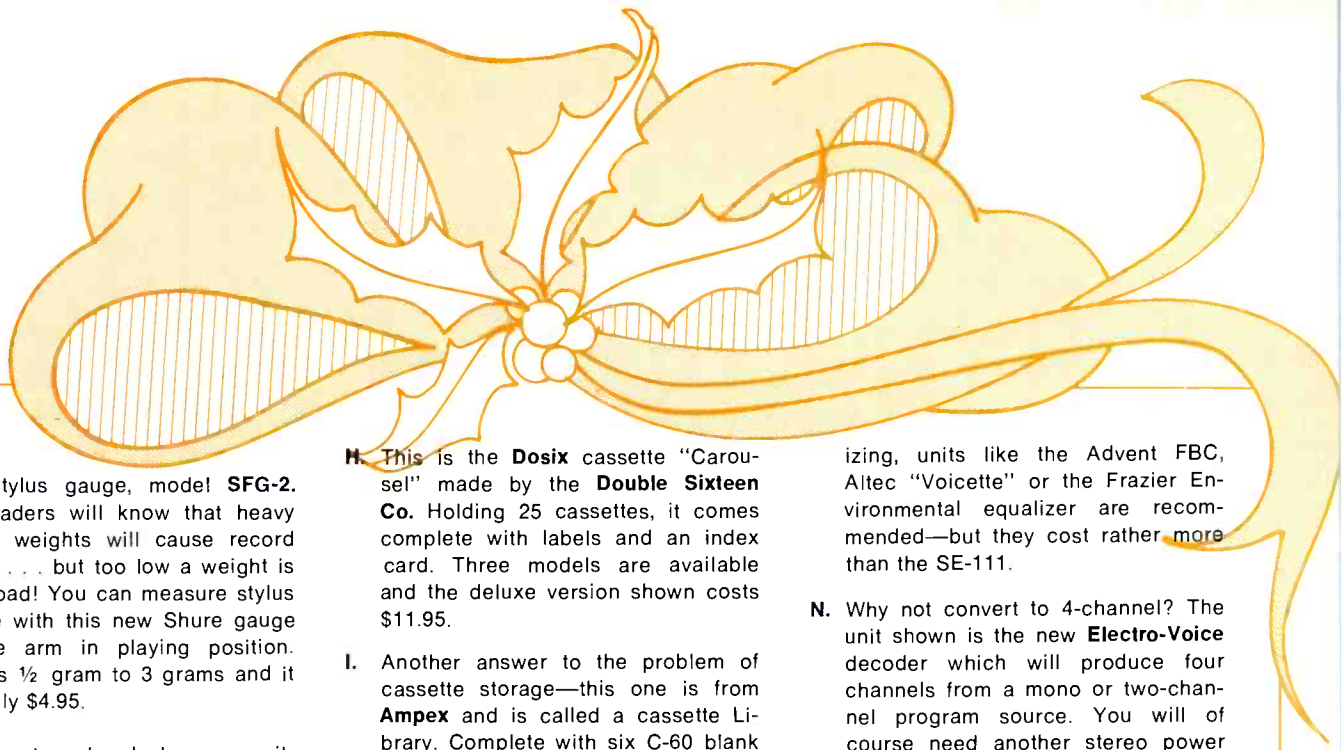
Using the ESP-9's connected properly, we first ran several curves with the Bruel and Kjaer microphone and the Koss artificial ear, recording the output on the prototype instrument shown in Fig. 2. After satisfying ourselves that these measurements were consistent, we next made the same runs with our own version of the artificial ear using the AKG C-451E microphone with an omnidirectional capsule. Thus we had a comparison between a standard measuring device and our own version. Then we proceeded to make curves on all the other headphones we had accumulated.

Our next measurement was to determine the sensitivity of the various

phones. We fed a 1000-Hz signal into the SCA-80 and adjusted the level to an output of 3 volts, which was held constant for the measurement of all the headphones in our collection. Having a known level for the ESP-9's, we could readily compare the sensitivities of all the phones.

Next we placed a loudspeaker near the artificial ear and played a 400-Hz square wave through it, setting the level to get a readable signal from the microphone in the artificial ear. Then we placed each pair of phones consecutively on the ear, settled it for a minimum signal output, and measured the difference. This "isolation" figure is listed for each of the models tested, and represents the reduction of external noise when the phones are on the head. It may or may not be important, depending on the use to which you plan to put the phones. If you are recording in a location where you can hear the natural sound directly, you will want good isolation so that all you really hear is that picked up by the microphone. If it is for listening in your home so you do not disturb others, the isolation is not so important.

(Continued on page 24)



Under \$5

A. Shure stylus gauge, model **SFG-2**. Most readers will know that heavy tracking weights will cause record damage . . . but too low a weight is just as bad! You can measure stylus pressure with this new Shure gauge with the arm in playing position. Range is ½ gram to 3 grams and it costs only \$4.95.

B. Nortronics tape head cleaner, available in both liquid and spray forms. Don't risk head damage by using unsuitable chemicals! Price \$2.75 spray can. 8 oz. liquid \$2.25.

C. Robins THC-9 Cleaner Cartridge. Here is a different type of cleaner—one that talks! Well, almost . . . The tape has four pre-recorded 'beep' tones that indicate when the heads are well and truly cleaned. For eight-track machines only, price \$2.50.

D. These new **TDK** blank tape cassettes use a special type of ferric oxide coating giving a response up to 20 kHz. Price C.90, \$3.59.

E. Here is a reel which will save frayed tape and nerves. It features an ingenious automatic locking device called the **Autothread** that really works! Price 79¢ for 5 inch, 99¢ for 7-inch reels. (**Radio-Shack**).

Under \$20

F. The periodic use of a tape head demagnetizer will often improve signal-to-noise and reduce distortion. This unit is made by **Duotone** and is intended for cassette players. Price \$7.95 (model S.A. 75).

G. You probably wondered what this gadget is—well, it is a microphone desk stand and it is made by **Shure**. It is unusually versatile and will accept microphones with both swivel adaptors and connectors. Thread size is 27, ⅝ inch. Price \$9.00.

H. This is the **Dosix** cassette "Carousel" made by the **Double Sixteen Co.** Holding 25 cassettes, it comes complete with labels and an index card. Three models are available and the deluxe version shown costs \$11.95.

I. Another answer to the problem of cassette storage—this one is from **Ampex** and is called a cassette Library. Complete with six C-60 blank cassettes the **Ampex** Library costs \$13.50.

Under \$120

J. Sony-Superscope MX-12 Mixer. This is a six-channel stereo/mono unit with provision for high and low level outputs, center channel switch, and many other features. Powered by internal batteries or AC adaptor the **MX-12** costs \$99.50.

K.L. How about reviving the system with a new phono cartridge? The **Pickering XV-15** is shown with the 'snap-in' mounting assembly which greatly simplifies cartridge replacements. One of Pickering's engineers says it is "the greatest thing since the invention of the wheel or the zipper or drip-dry shirts." We wouldn't go **that** far but it certainly does save a lot of time and cuss words . . . Another excellent cartridge is the **ADC 25** which comes complete with three different styli—if you want the best results from those difficult records, it might be worth the extra cost. Price of the top-of-the line Pickering XV-15 is \$65 and the ADC 25 will set you back \$100. Alternatively, model 26 with one stylus costs \$75.

M. Elektra-Amplidyne Speaker Equalizer. Reviewed in our June issue, this unit was developed primarily to compensate for certain speaker deficiencies but it can improve room acoustics to some extent. It costs \$149.50 but it may well make your system sound \$500 better! For room equal-

izing, units like the Advent FBC, Altec "Voicette" or the Frazier Environmental equalizer are recommended—but they cost rather more than the SE-111.

N. Why not convert to 4-channel? The unit shown is the new **Electro-Voice** decoder which will produce four channels from a mono or two-channel program source. You will of course need another stereo power amplifier and a pair of speakers but you will then be able to play quadraphonic tapes with the appropriate deck. Price of the decoder is \$50.

O. About those speakers for the rear channels: Ideally, they should be similar to the front pair but for reasons of cost and space it might be necessary to compromise a little. In practice, the sound degradation is quite small—especially if the rear two "come from the same stables" so to speak. In other words, two AR.5's will match up pretty well with AR.3's and Rectilinear 10's will work quite happily with Rectilinear III's . . . Shown is the **Wharfedale W-25** which measures 15½ by 10 by 8 inches and costs \$58.75.

P. Another small speaker with above-average performance is the \$55 **EPI 50** which measures only 13 x 10 x 8 inches. Also consider the **ADC 404** at the same price or the larger **Dynaco A-25's** at \$79.95. You might also try the effect of a single rear speaker connected between the other two channels as suggested by David Hafler (Audio July, 1970). You may like it or you may not—but it certainly does not cost much to find out . . .

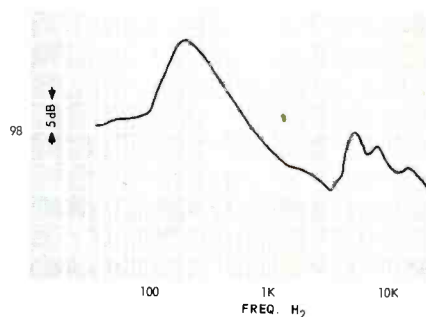
Q. Original heading for this section was "under \$100" but we increased it to \$120 so we could include the **Advent 101** Dolby Noise Reduction System. It can be used with any good-quality home tape recorder—reel to reel or cassette and effect a dramatic improvement.

Christmas Buying Guide



HEADPHONES — Continued

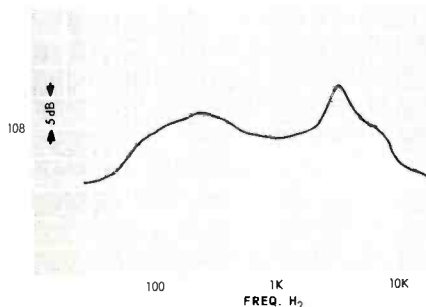
AKG K-60



Gray plastic shells; d.c. resistance, 550 ohms per phone; for 600-ohm circuits, although usable with typical receiver headphone jacks. Removable silver-colored vinyl pads $3\frac{3}{4} \times 4\frac{1}{2}$ in., foam filled. Double flat steel headband, plastic covered. Right and left phones identified by colored dots on band—yellow for left, red for right. Gray plastic cord, split to phones, 7 ft. long, detachable plug. Sensitivity: 95 dB SPL; isolation 19 dB. Weight, 11 oz. Price \$39.50.

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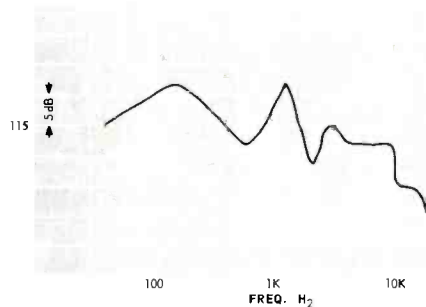
Beyer DT-48s



Aluminum shells, marked L and R; d.c. resistance, 5 ohms per phone. Foam filled vinyl pads $3 \times 4\frac{1}{2}$ in. Adjustable steel band with plastic top, two vinyl-covered foam pads. Cord 10 ft. long, split to each phone, with yellow and red bands to indicate left and right. Metal-shell plug, detachable. Furnished with leather-like vinyl zippered case. Sensitivity: 106 dB SPL; isolation 21 dB. Weight, 16 oz. Price: \$98.00. Available with 50-ohm impedance for use with Nagra and Stellovox recorders as Model DT-48N, \$98.00.

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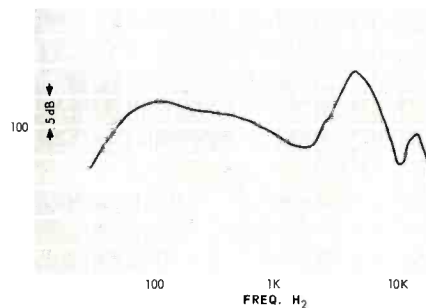
Bogen EP-10



Olive plastic shells; d.c. resistance, 8 ohms per phone. Removable leather-like black vinyl pads, foam filled, $3\frac{3}{4} \times 4\frac{3}{4}$ in. Plastic headband, foam rubber head pad. Coiled black cord to left phone, extends to 6 ft., permanent molded plug. Sensitivity, 115 dB SPL; isolation, 6 dB. Weight, 20 oz. Price: \$29.95.

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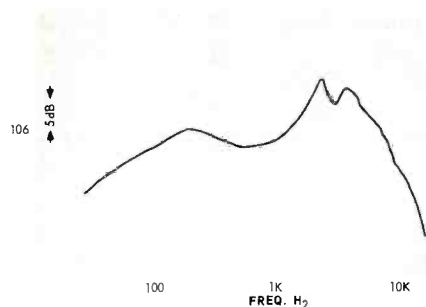
Clark/100A



Gray plastic shells; d.c. resistance, 20 ohms each phone. (Also available in 300 and 600 ohms.) Removable molded foam pads $3\frac{3}{4} \times 4$ in., adjustable flat steel band with molded foam pad. Black coiled cord extends to 10 ft., permanent molded plug. Sensitivity, 98 dB SPL, isolation 10 dB. Weight, 16 oz. Price \$50.00.

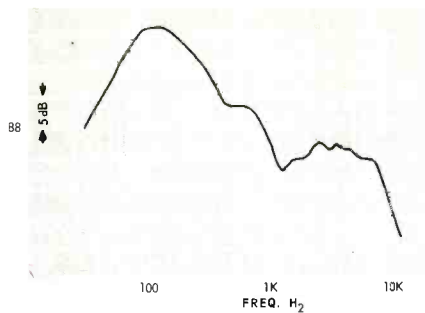
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Fisher HP-100



Light gray plastic shells with molded frame for flat foam pads over ears; d.c. resistance, 50 ohms each phone. Plastic covered wire headband. Gray cord split to each phone, 8 ft. long, with permanent molded plug. Red plastic indicator on right phone, yellow on left. Sensitivity, 104 dB SPL; isolation, 2 dB. Weight, 15 oz. Price \$39.95.

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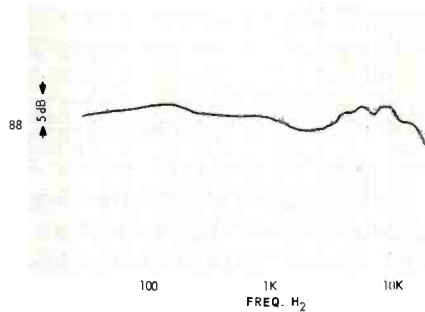


White plastic shells; d.c. resistance 4 ohms per phone. Pads of $\frac{3}{8}$ -in. foam, $3\frac{1}{4} \times 4\frac{1}{4}$ in., circumaural, dark gray in color. Adjustable two-wire headband, plastic top and foam head pad. Cord to left phone, 8 ft. long, and fitted with permanent plug. No identification as to which phone is intended for which ear. Sensitivity, 104 dB SPL; isolation, 2 dB. Weight, 15 oz. Price \$39.95.

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Koss PRO-4AA

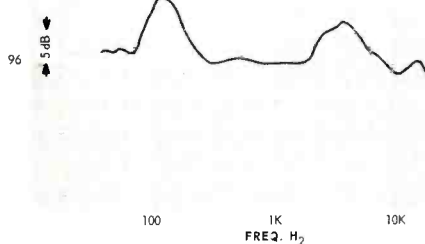
Koss ESP-9 →



Only electrostatic phones in group. Black plastic shell, with removable vinyl liquid-filled pads $3\frac{3}{4} \times 4\frac{1}{4}$. Single wide steel band, adjustable, with plastic cover and foam head pad. Cord connected to left phone, 6 ft. long, and fitted with 5-prong plug which mates with socket on E-9 Energizer, which plugs into a.c. socket, and connected to speaker terminals by 4-wire cable with spade tips. Switch on energizer permits selection of a.c. or signal-powered polarizing circuit, and a second switch turns on speakers which are connected to terminal strip on rear of Energizer. Sensitivity, 88 dB SPL; isolation, 11 dB. Weight, 19 oz. exclusive of Energizer. Price, \$150.00, including Energizer.

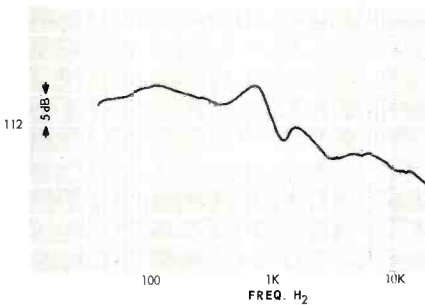
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Koss PRO-4AA



Tan plastic shells; d.c. resistance, 8 ohms per phone. Removable liquid-filled pads $3\frac{3}{4} \times 4\frac{1}{4}$. Wide steel band, adjustable, with plastic cover, foam head pad. Coiled 4-conductor cord, extendable to 10 ft., removable plug. Sensitivity, 96 dB SPL; isolation 10 dB. Weight, 19 oz. Price, \$60.00. **Check No. 119 on Reader Service Card**

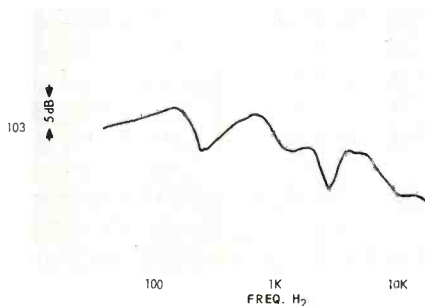
Lafayette F-990



White plastic shells, 8 ohms d.c. resistance per phone. Round foam-filled vinyl pads, brown adjustable plastic band, foam filled vinyl head pad. Cord attached to one phone, 7 ft. in length, and fitted with removable plug. Sensitivity, 112 dB SPL; isolation, 9 dB. Weight, 20 oz. Price, \$29.95.

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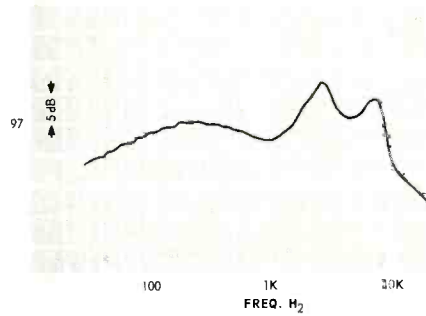
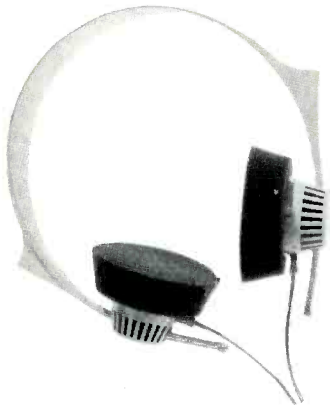
Pioneer SE-50



Plastic shells, white vinyl covered; d.c. resistance, 8 ohms per phone. Each phone fitted with level control for total signal and a second control for highs. Phones consist of 3-in. cone low-frequency unit and horn-type high-frequency unit, with capacitor dividing network. Leather covered adjustable steel band, leather foam-filled head pad. Leather foam-filled pads $4 \times 4\frac{1}{2}$ in., removable. Coiled black cord extends to 16 ft., fitted with permanent plug. Furnished in attractive black vinyl-covered case with red and white lining. Sensitivity, 103 dB SPL; isolation, 15 dB. Weight, 20 oz. Price, \$49.95.

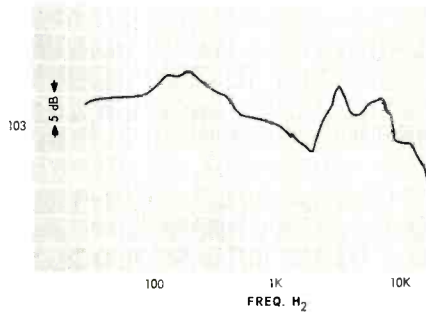
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Sennheiser HD-414



Gray plastic shells, 2000 ohms d.c. resistance per phone. "Open-Aire" ear pads of fine foam, 2 3/4 inches in diameter, 3/4 in. thick. Gray plastic band with no head pads, unnecessary because of light weight. Cord 15 ft. long, split to the two phones. Left phone identified by yellow plastic band on cord, right by red band. Cord furnished with removable black plug, and plastic "reel" furnished with wind cord on. Sensitivity, 97 dB SPL; isolation, 2 dB. High impedance permits direct use with preamp output and with tape recorder monitor jacks designed for high-Z phones. Weight 5 oz. Price, \$29.95. **Check No. 122 on Reader Service Card**

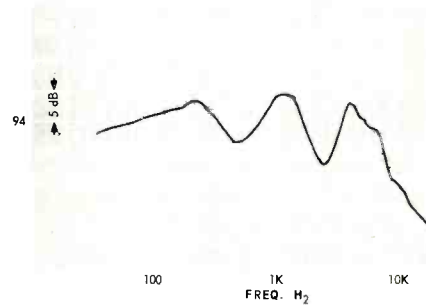
Sharpe 7



Green plastic shells, d.c. resistance 16 ohms per phone. Removable plastic pads 3 1/2 x 5 in., liquid-filled. Green plastic adjustable band with plastic head pad. Green coiled cord extendable to 15 ft., fitted with permanent plug. Sensitivity, 103 dB SPL; isolation, 8 dB. Weight, 18 oz. Price, \$19.95.

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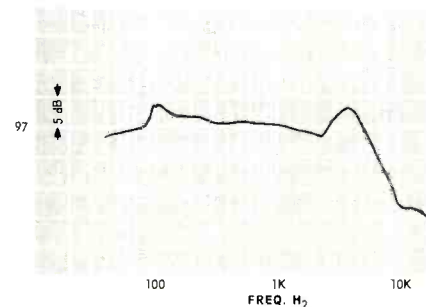
Sony DR-6A



Plastic and aluminum shells, d.c. resistance 8 ohms per phone. Removable foam-filled vinyl pads 3 1/2 x 4 1/4 in. Adjustable single steel band plastic covered. Cloth covered 7-ft. cable, removable plug. Sensitivity, 94 dB SPL; isolation, 12 dB. Weight, 13 1/2 oz. Price, \$27.50.

Check No. 124 on Reader Service Card

Suprex PRO-4-B-V



Dynamic cone woofer, ceramic tweeter; d.c. resistance, 8 ohms per phone. Available with impedances of 60, 2000, and 15,000 ohms. Dual steel band, adjustable, plastic covered, with vinyl head pad. Green plastic shells. Removable foam-filled vinyl pads 3 1/2 x 4 in. Black 4-wire coiled cord extendable to 15 ft., detachable plastic plug. Sensitivity, 111 dB SPL; isolation, 20 dB. Weight, 23 oz. Price, \$59.95.

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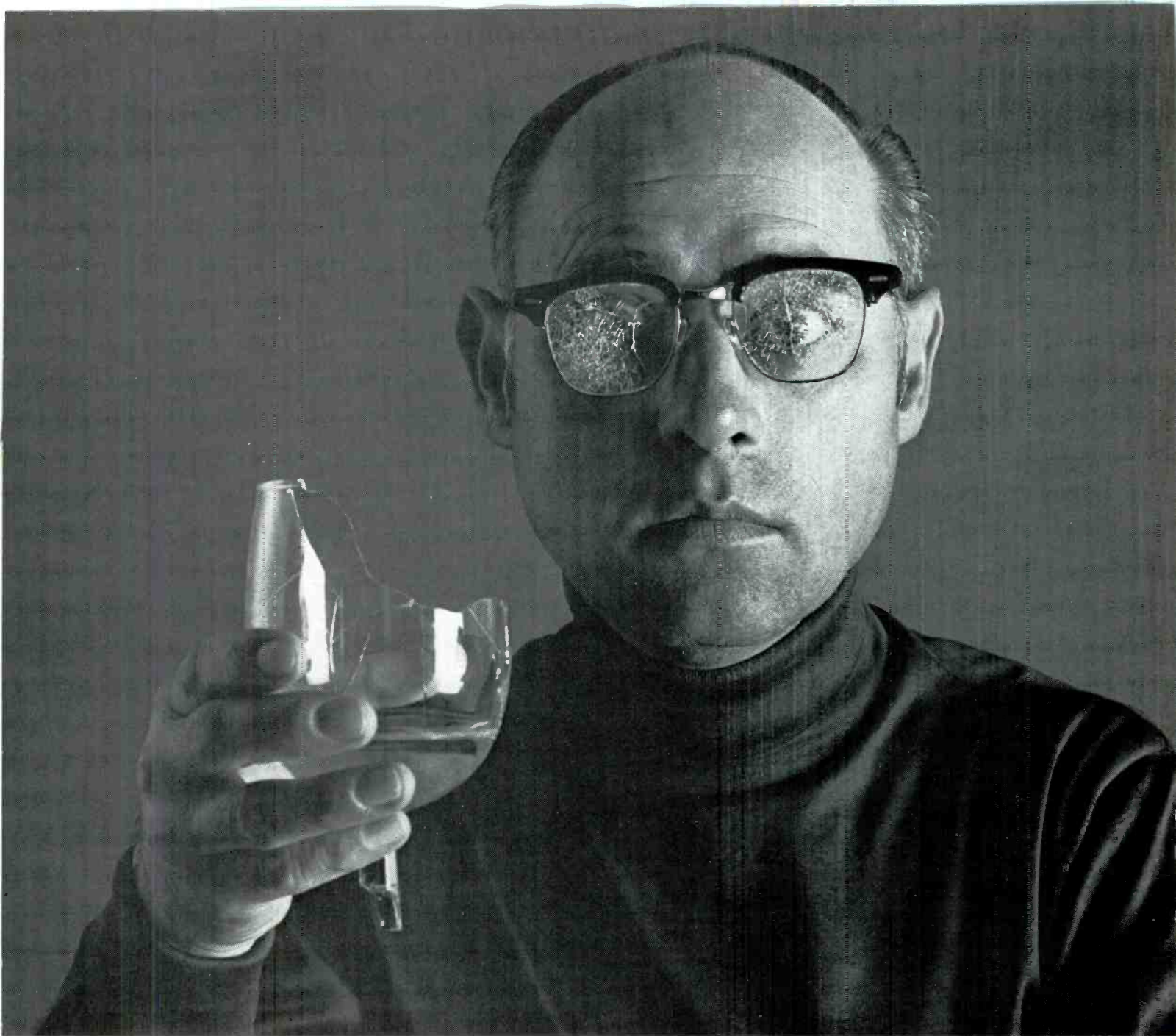
Telex Studio 1



Telex Serenata

These models were not available in time to include their performance characteristics, but they will be included in a future issue. Ivory plastic shells; surgical silicone compound ear pads. Adjustable steel band, plastic cover, with head pad. Slide-type level controls on each phone, together with tone control for each. Coiled cord, 25 ft. long, with molded permanent plug. Weight, 24 oz. Price, \$99.95. Studio 2 (without controls), \$84.95.

Check No. 126 on Reader Service Card



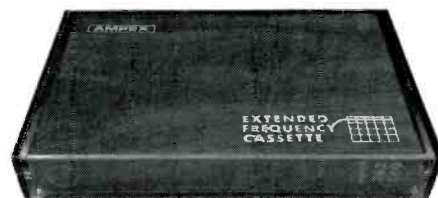
Introducing the Ampex Extended Frequency Cassette

You no longer have to trade quality sound for cassette convenience. With Ampex Extended Frequency Cassettes you can use the full range, the maximum frequency response of your stereo system. Record anything. Rock to Pop to Classics. Enjoy better listening with lower noise because of super-smooth Ferrosheen® tape. Get higher output with exclusive small particle black oxide formula that produces more magnetic energy per square inch of tape. Capture it all on Ampex Extended Frequency Cassettes...cassettes that look as good as they sound.

Packaging so handsome it complements any piece of fine equipment. Combined with complete inside indexing and packaged with gold leaf for elegant labeling.

Ask your Ampex dealer to demonstrate the difference.

Ask, too, about the special cassette caddy introductory offer. (Buy 6 C60 Extended Frequency Cassettes and get a handsome walnut grain storage case free.) Your equipment deserves nothing but the best—Ampex Extended Frequency Cassettes.



Check No. 27 on Reader Service Card

AMPEX

Ampex Corporation,
Magnetic Tape Division
401 Broadway, Redwood City,
California 94063

A Sound-Level Meter

How to Build and Use a Sound-Level Meter with One-Third Octave Filters

DAVID GRIESINGER

SPECIFICATIONS

Sensitivity	30 to 120 dB SPL when used with microphone having sensitivity of -60 dB re $1\text{V}/\mu\text{bar}$
Frequency Range	20 to 20,000 Hz in three ranges
Frequency Accuracy	$\pm 10\%$
Accuracy	
Input Impedance	100 k ohms at Mic input 1.0 Meg at high-level input
Power Required	9 V at 2.5 mA from transistor radio battery. Life about 10 hours.

MOST SERIOUS RECORDED-MUSIC listeners are aware that the sound they eventually hear depends to a large extent on the acoustics of their listening room. Even after determining the best possible placement for the speakers, and perhaps adding some drapes or a rug, the system as a whole can sound muddy, or lack the lifelike quality of the more-fortunate systems. True realism depends on having a flat frequency response where you listen, and most rooms will not cooperate. Fortunately, frequency response is easy to vary electronically. Several devices have appeared recently which are intended to deal with this problem, and simple electronic filters are really quite easy to make. Unhappily, adjusting such a filter can be frustrating. It is difficult to determine just what corrections to make by merely listening to music. One of the most meaningful ways of measuring the frequency response of a hi-fi system is to measure the response of the system to narrow bands of filtered noise. The little instrument described in this article, when combined with a high-quality omnidirectional microphone, is capable of making this kind of measurement as well as many others. The sound level meter is not tricky to build, and should cost less than fifty dollars.

All the meter needs to measure room response is a calibrated preamplifier, a tunable active filter, and a VU meter. To measure the sound levels of music and machines, a bass filter is included to give the standard "A" weightings. The result is a true sound-level meter, capable of measuring sounds down to 20 dB SPL and third-octave noise down to 0 dB SPL. With a microphone sensitivity of -60 dB re $1\text{V}/\mu\text{bar}$, this corresponds to a pure tone input of only $0.18 \mu\text{V}$ rms, making it possible to measure the noise output of almost anything.

Before describing the circuit, I think I should say something about the way the instrument is to be used, and how that use determines the choice of microphone. Figure 1 shows the response of my living

room to pure tones and to third-octave noise, with the mike placed where I do most of my listening. The wide variations in the pure-tone response exist in all rooms, and correspond to resonances or standing waves similar to the ones in organ pipes. The number of possible frequencies for these resonances or standing waves is very large, since the sound wave can bounce around the room in many directions, using combinations of the walls, floor, and ceiling as reflectors. We hear the combination of all the reflections. For some frequencies, these reflec-

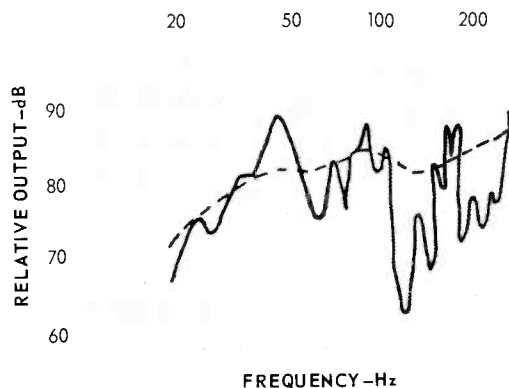


Fig. 1—Low-frequency response of the author's room with AR-5 placed near a corner and microphone at room center. (--- $1/3$ octave noise; — pure tones)

tions add up in phase, creating a peak, and for others they cancel each other out, giving us no sound at all. The ear is much more sensitive to peaks in the response than to dips.

Above 200 Hz the response to pure tones looks similar, except that it becomes rather difficult to measure. The variations in the response get very close together on the dial of the oscillator, and unless you tune very slowly it is easy to miss them entirely.

Fortunately, music sounds much better in such a room than this curve would seem to predict. Musical tones are continuously changing, and the individual resonances do not have time to build up. The response that we subjectively hear is the average of nearby resonances, and is a lot smoother than the pure-tone curve. Unfortunately, it is still not very flat. To

measure accurately how a room sounds to music, one must use tones which resemble music in the way they waver. Although music generally wavers about a semitone, or a twelfth of an octave, noise filtered through a third-octave filter gives good results. Figure 1 shows that the third-octave curve follows the response to pure tones. The noise curve may look smooth, but it must be treated with respect. A dip or a peak of three decibels in a third-octave-noise curve is almost always audible, especially if it occurs between 300 and 2000 Hz.

The basic principle of this discussion has been that sound in a room does not simply come from the speaker to you, but forms standing waves which surround you. To measure the intensity of the sound correctly you must use an omnidirectional microphone. Cardioid microphones have a predictable response in a very large room or in an anechoic chamber, but when put into a standing wave their output can vary widely.

Microphone Selection

The microphone used must be at least as good as the system you are trying to measure. Fortunately, there are many high-quality omnidirectional condenser microphones available. These microphones have been designed for recording, but they can easily be used for sound

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 (1.5dB) 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

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measurement, especially if you do not need to know the absolute level of the sound.

There is a complication to using a recording mike. Any omnidirectional microphone is only really omnidirectional at low frequencies. When the wavelength of the measured sound becomes close to the diameter of the microphone, diffraction effects tend to reduce the response to any wave which does not come from the front. If the sound in your room comes from all directions, some roll-off to the measured sound will be noticed at high frequencies. To compensate for this effect some manufacturers build a treble rise into the response of microphones designed to measure noise. These mikes, such as the B&K 4134, are flat to randomly incident noise (Fig. 2). Recording mikes are usually closer to the B&K 4133, with a flat on-axis response. Most people would shudder at a treble rise in the on-axis response, although when using an omnidirectional mike in a large live hall some treble boost is often necessary.

Notice from Fig. 2 that diffraction effects depend strongly on the diameter of the microphone. B&K types 4131 and 4132 are one-inch microphones, 4133 and 4134 are half-inch, and 4135 and 4136 are quarter-inch. For a microphone of $\frac{1}{4}$ -inch diameter or less, these diffraction effects occur mostly above 4 kHz, and are serious only above 10 kHz. The sound in a room is usually not omnidirectional at those frequencies. Some loss of treble will be noticed due to the nature of the microphone, but if it is pointed directly at the speaker this roll-off is not too serious. In any case it is not possible to predict exactly how much it will be. When making measurements at these frequencies it is better to look for the smoothness of the response. If you want an exact number, the best way to get it is to point the microphone 90 deg. from the speaker, and correct the resulting measurements for the response of the microphone to randomly incident noise. Some microphone manufacturers supply such a curve with the mike. For those which don't, it tends to be close to the response to pure tones at 90 deg. incidence.

The condenser microphone chosen should have a well known on-axis response, and be $\frac{1}{2}$ -inch diameter or less. If you intend to make a large number of speaker measurements, a $\frac{1}{2}$ -inch sound-measurement microphone might be a good investment. Otherwise it would be wise to choose your microphone for its use in other applications, such as recording. Remember that good omnidirectional microphones of similar diameter and flat on-axis response will sound identical. Cardioid microphones are currently pop-

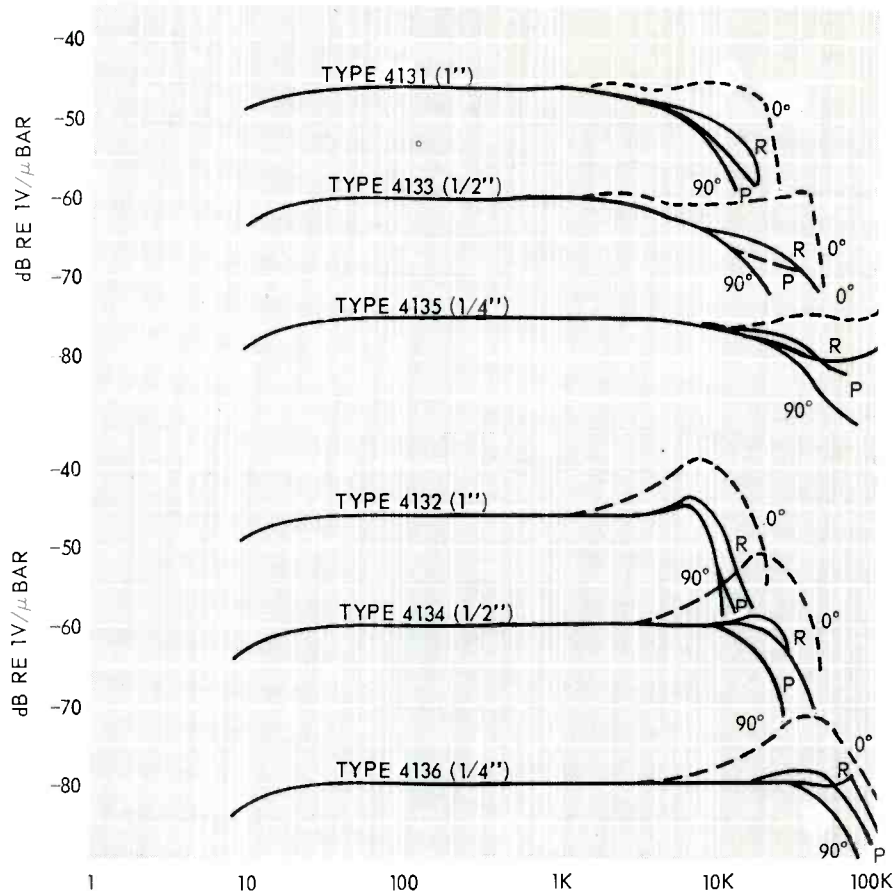


Fig. 2—Typical frequency responses of some B & K condenser microphones. 0°=free-field response at 0° (normal incidence); 90°=free-field response at 90° (grazing incidence); R=random incidence response, and P=pressure response.

ular, but I prefer to use an omni wherever I can. They tend to add echo in a natural way, and lack the increase in bass when close to the source of sound.

Making the Measurements

Making speaker measurements is delightfully simple. You just feed some source of broad-band noise into the speaker system, and measure the resulting sound with the meter. Noise which sounds uniform in frequency content and has equal energy content per third-octave band is called pink noise. If you have such a generator, use it. Otherwise, use the interstation noise from an FM tuner. You may have to disconnect the antenna to get noise which sounds uniform enough. This noise is not pink, but you can correct your curves by measuring it electrically with the meter.

The microphone should be placed in the position you use for most of your listening. If you get too close to the speakers, interference between the drivers can give misleading results, although you can test for high-frequency dispersion this way. You should occasionally turn off the speakers to make sure that the background sound in the room is

below the level you are measuring. Measure each speaker separately, since they usually require different compensation. If you insist on having a composite curve for the whole system, be sure to set the tuner on stereo to get independent noise in both channels. Otherwise interference effects can occur.

The measured response is usually less than wonderful! What can you do about it? Try moving the speaker first. The standard things to try are lifting the speaker off the floor or away from the wall by a foot or so, to the long side rather than the short side of a room, or vice versa. You should avoid having two reflective surfaces facing each other. I prefer to make these changes by ear, using a choral recording or a record of a familiar voice.

Your response will probably still show various slopes in the midrange. These slopes are very important. Try varying both the settings of the speaker balance controls and the amplifier tone controls. If you can't do much this way, you must add some compensating networks between the preamplifier and the amplifier. If your preamp has low output impedance when compared to the input impedance



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- "Especially notable are its low wow and flutter, low distortion, excellent signal-to-noise ratio, absolute meter accuracy, and smooth extended response for both playback (of pre-recorded tapes) and for record/playback (of tape made on it)..." (HIGH FIDELITY, MAY 1970)
- "The distortion was under 1.6% with record levels as great as +10 dB (far off-scale on the meters). In an A-B comparison of input and output signals, the Astrocom-Marlux did a truly excellent job at 7.5 ips. Even with FM interstation hiss as a "program" (one of the most severe tests of a tape recorder) virtually no difference could be heard between input and output signals..." (STEREO REVIEW, AUGUST 1970)

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of the amplifier, simple networks of the type shown in Fig. 3 will need no amplification. Often a simple network of this type can improve the sound greatly, especially when combined with changes in the speaker controls. More complicated filters can be built, but will require some amplification. See the article on integrated-circuit preamplifiers in the June issue of this magazine. When you are through you should have sound that is noticeably more natural. Don't hesitate to readjust your tone controls for individual records. Some speakers may have a hidden peak which makes the sound unpleasant, and records are often made with the treble boosted.

Circuit Description

The circuit of the meter (Fig. 4) looks more complicated than it actually is. The original version of the device used integrated circuits, but it had more noise and drew more battery current than this one, which draws only 2.5 mA. The basic amplifiers are very easy to build.

The first three transistors function as a simple preamp. The gain is determined by the value of the first emitter resistor. Even though the overall gain varies from 200 to one there is no tendency to oscillate, since the first emitter resistor controls both the open loop and the closed loop gains. Because of its single ended

input, when used at gains over ten this amplifier is capable of very-low-noise operation.

The next stage is both an amplifier and an active filter, and deserves some detailed explanation. Consider the circuit with the function switch in the first filtered position. Q_4 then acts as a simple emitter follower, and supplies signal from the mike preamp to the top of the frequency-selecting network. This network is called a Wien bridge. The top section, with the resistor and the capacitor in series, functions as a high-pass filter. The bottom section, with the resistor and the capacitor to ground, acts as a low-pass filter. Together the two networks form a band-pass filter with a center frequency given by $f = 1/2\pi RC$. At the center of the pass band, the output of the network is in phase with the input, and has about one third the amplitude. Since both the high-pass and the low-pass networks have only one section, the slope of the sides of the band-pass curve is 6 dB per octave.

We can make the filter sharper by adding positive feedback. The amplifier which follows the bridge has a gain of about ten. Signal from its output returns to the input of the filter through the feedback mixing resistors R_2 and R_3 . When we add positive feedback the gain of the whole circuit is increased, but since the

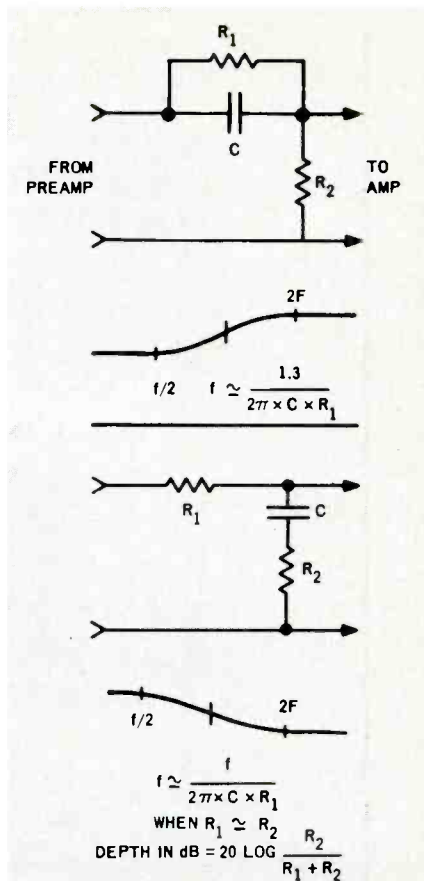


Fig. 3—Showing simple bass- and treble-boost circuits.

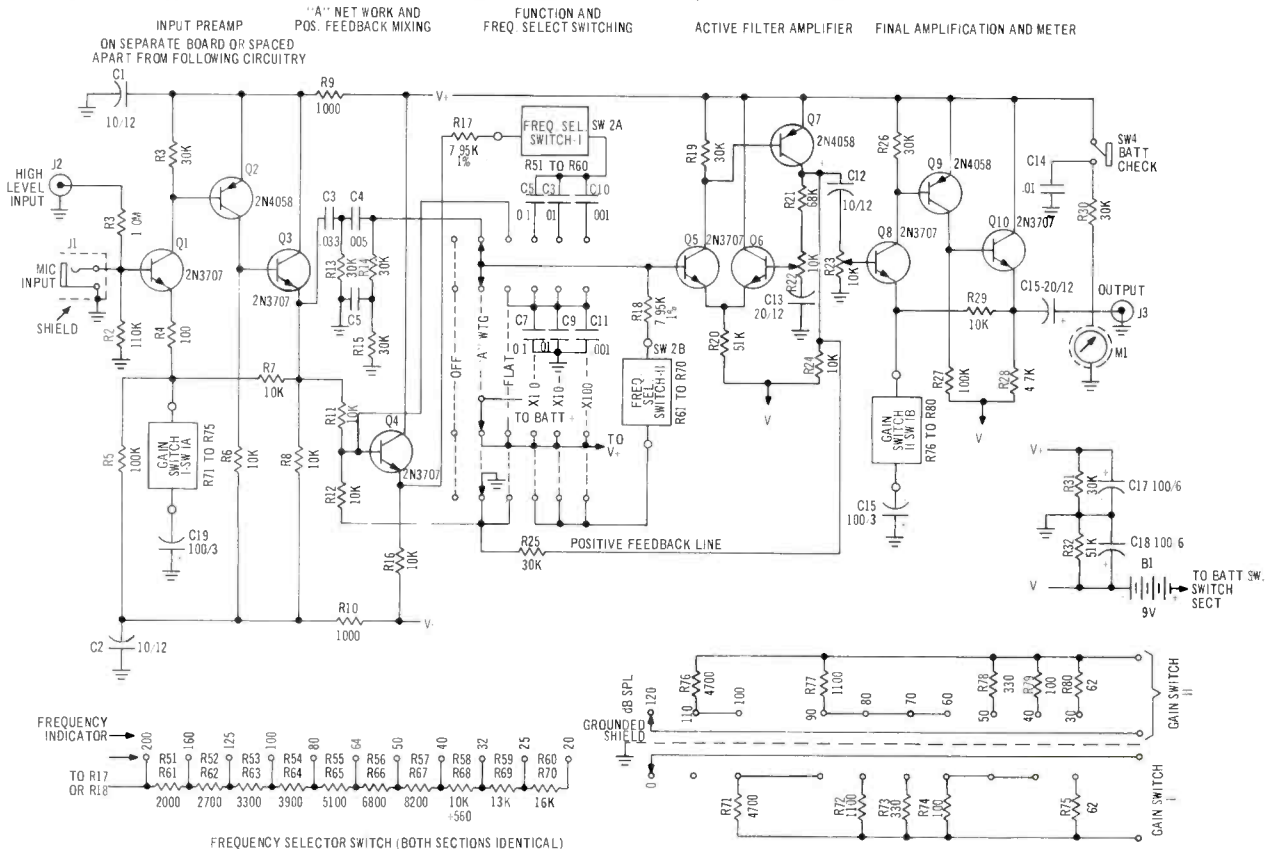


Fig. 4—Overall schematic of author's third-octave sound-level meter. Both sections of frequency determining switch are identical. The two sections of the gain switch are shown independently.

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.

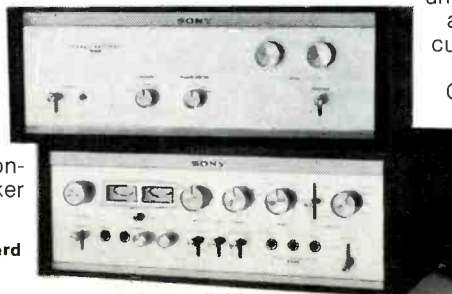
Their sole vice: they are hardly inexpensive

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.

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band-pass filter is inside the feedback loop the amount of feedback, and thus the increase in gain, is controlled by the network. The center frequency, since it has both the highest amplitude and the correct phase, is boosted the most. Frequencies far down on the sides of the band-pass curve get very little positive feedback, and are not increased in amplitude. Obviously, if the gain of the amplifier is set high enough to overcome the losses in the feedback mixing network and the Wien bridge, the unit will oscillate at the center frequency. By using just slightly less gain, you can make the filter as sharp as you want.

Setting the gain of the filter amplifier is equivalent to adjusting the Q of an LC resonant filter. You set the filter to give a third-octave pass band by setting an oscillator to the center of the pass band in one position of the frequency-selector switch, and then adjusting the amplifier until the meter indicates 10 dB less when the switch is moved one-third octave either way. The resulting filter shape is shown in Fig. 5.

Notice that the bottom of the curve still has a slope of 6 dB per octave. Since the frequencies down there have no positive feedback, the slope of the curve is determined by the response of the Wien bridge without feedback. The slope could be increased to conform to the U.S. standard for sound level meters only by adding two more independent Wien bridges in series with the first, and that would make the meter much more complicated. Fortunately, this filter shape is adequate for measuring speaker response, and will also give useful results when used to measure most noises.

When you measure a noise in the flat or "A" positions of the meter, and then filter out all but a narrow band of frequencies, the power reaching the meter is lowered. This device compensates for this effect by raising the response of the meter to pure tones by 20 dB when you switch to a filtered mode. The addition of positive feedback causes the pure-tone gain to increase by about 14 dB, and the additional 6 dB is obtained by lowering the sensitivity when the meter is set to "flat." In this position, the feedback line is grounded, and R_1 and R_2 reduce the signal. Q_1 is bypassed to improve the signal-to-noise ratio. The "A" filter also reduces the signal, as well as providing the proper bass response for these measurements.

The amplifier which follows the filter adds extra sensitivity to the unit, and helps to keep the input preamplifier from overloading when there is a strong signal outside the pass band of the filter. The rather strange way the gains of the two amplifiers have been staggered represents

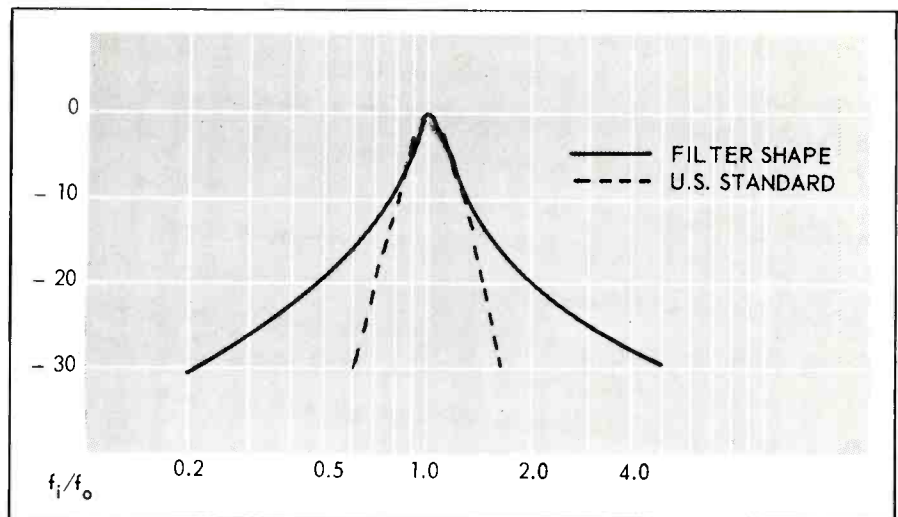


Fig. 5—Filter shape of sound-level meter compared with curve for standard third-octave filters. Note that skirts of the curve do not continue at the same slope, but instead decrease to a slope of 6 dB per octave.

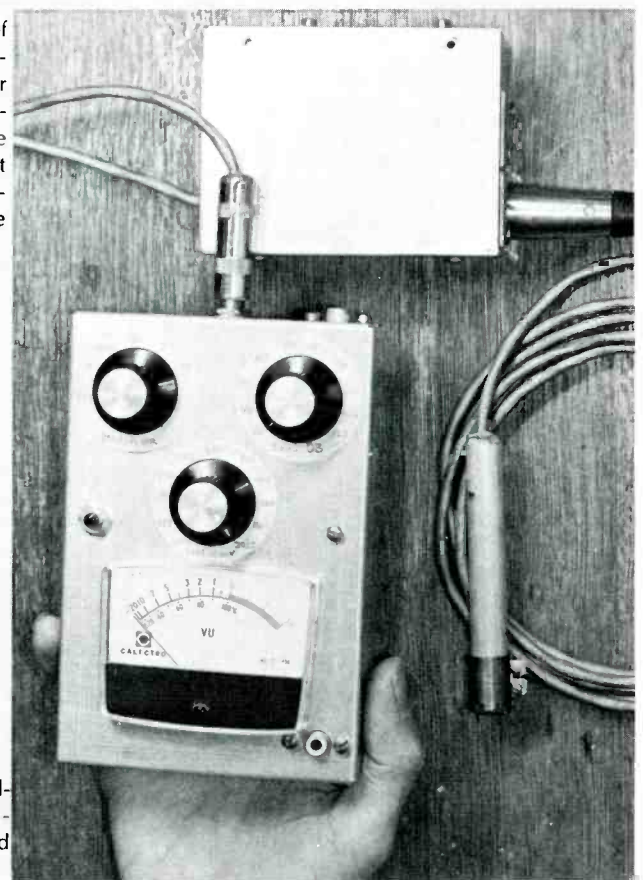


Fig. 6—Completed sound-level meter with condenser microphone and its power supply.

a compromise between optimum signal-to-noise ratio and freedom from overload.

The output of the final amplifier goes directly into a standard VU meter. These meters are damped to have a relatively fast response, and when measuring low frequency noise the meter tends to jump around quite a bit. However, I found that it was not difficult to average the swings by eye, and no attempt was made to give the meter a slow response. Any standard VU meter will work in the circuit, although the damping in the cheaper models tends to vary from unit to unit.

Construction

Building the circuit is rather straightforward, and many alterations are possible from the parts listed. The suggested case is only 4 x 6 x 1½ in., but it is not too crowded if the PSA switches are used. A larger case could be used, but if it is plastic it should be lined with grounded foil. The transistors listed have very low noise, and are inexpensive. Make sure you use Mylar capacitors in the bridge. Ceramics types have too great a power factor. No matter how you build the circuit it will work for measuring

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speakers, but the extra gain can be a lot of fun. To keep the device stable at the highest gains I was forced to add a shield between the sections of the sensitivity switch. I simply cut a piece of metal about 1 inch square from a can and added it like an extra wafer to the switch. A pair of 2-56 nuts on top of the shield ensure that it stays grounded. Since the works of a VU meter are connected to the output of the final amplifier, you may have to add a grounded foil shield around the case of the meter. I built the preamp and its power-supply-decoupling capacitors on a separate board, tucked behind the sensitivity switch. The input jacks and wiring should be shielded. The rest of the circuit can be built any way you want, except that the output of the final amplifier should be at least one inch from any of the filter parts. I built the rest of the circuit on a large board which attaches to the meter terminals.

For those of you who have not done much construction of this type, I highly recommend using Vector board and T28 subminiature clips. Make sure you also use an insertion tool. Figure 6, A-D, shows how I built the filter amplifier.

Calibrating the instrument is simple, although there are some tricks to making the device work properly at all settings of the switches. First, the 8 k resistors in the frequency-selecting network must be matched to within 1 per cent. If the selectivity (or the sensitivity to pure tones) changes as the frequency-selecting switch is rotated, these resistors should be trimmed. Reducing R_3 will increase the selectivity at the high-frequency settings. Since you will probably want to make this resistor by putting two lower resistors in series, simply measure the resulting combination on a good ohmmeter, and adjust it to 8 k. Secondly, the ratios of the capacitors in the bridge circuit must be matched to within 1 per cent. If you can find a capacitance bridge, or 1-per cent capacitors, use them. Otherwise, adjust the selectivity of the unit with the multiplier set on the lowest range. Then switch to the next range, and add small trimming capacitors to one of the .01 capacitors until this range has the same selectivity. You may have to readjust the oscillator to stay at the center of the pass band. Increasing the value of the upper capacitor will increase the selectivity, and vice versa. Then do the same for the highest range. When you are through, the meter should have the same selectivity and sensitivity to pure tones through the whole audio range.

The overall sensitivity of the unit is adjusted by using the *cal* potentiometer.

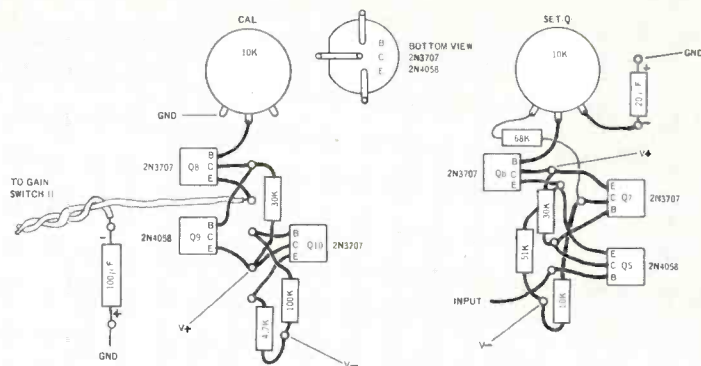


Fig. 6B—Layout of parts on Vector boards for final amplifier at left and filter amplifier at right. Preamp section is similar to the final amplifier. All layouts are designed to be maximally flat so cover can be slipped on barely over the parts, thus serving as a shield.

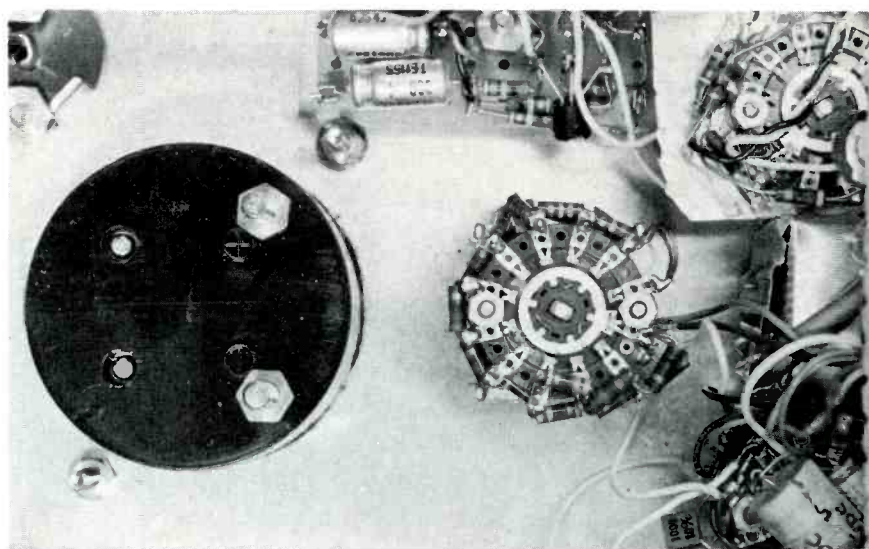


Fig. 6C—Start of construction, before Vector board is installed over meter terminals. Note shield between sections of gain switch at lower left. Frequency-determining switch is seen at upper left corner. Metal shield at left covers microphone input jack.

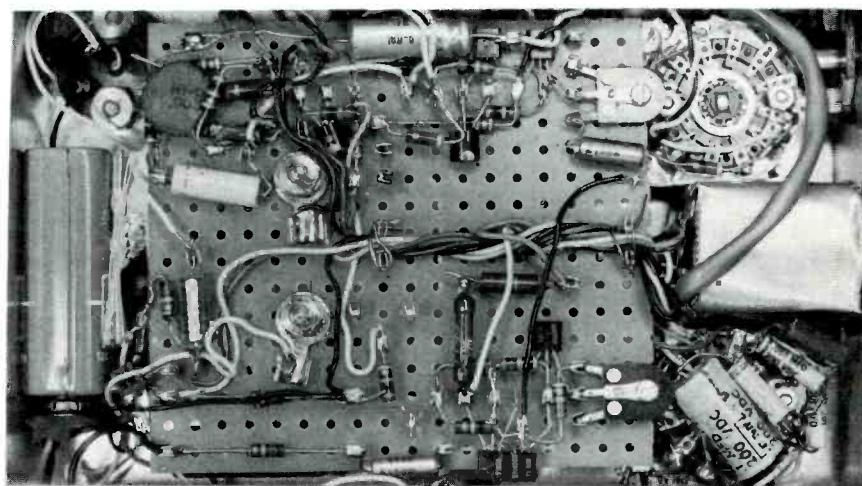
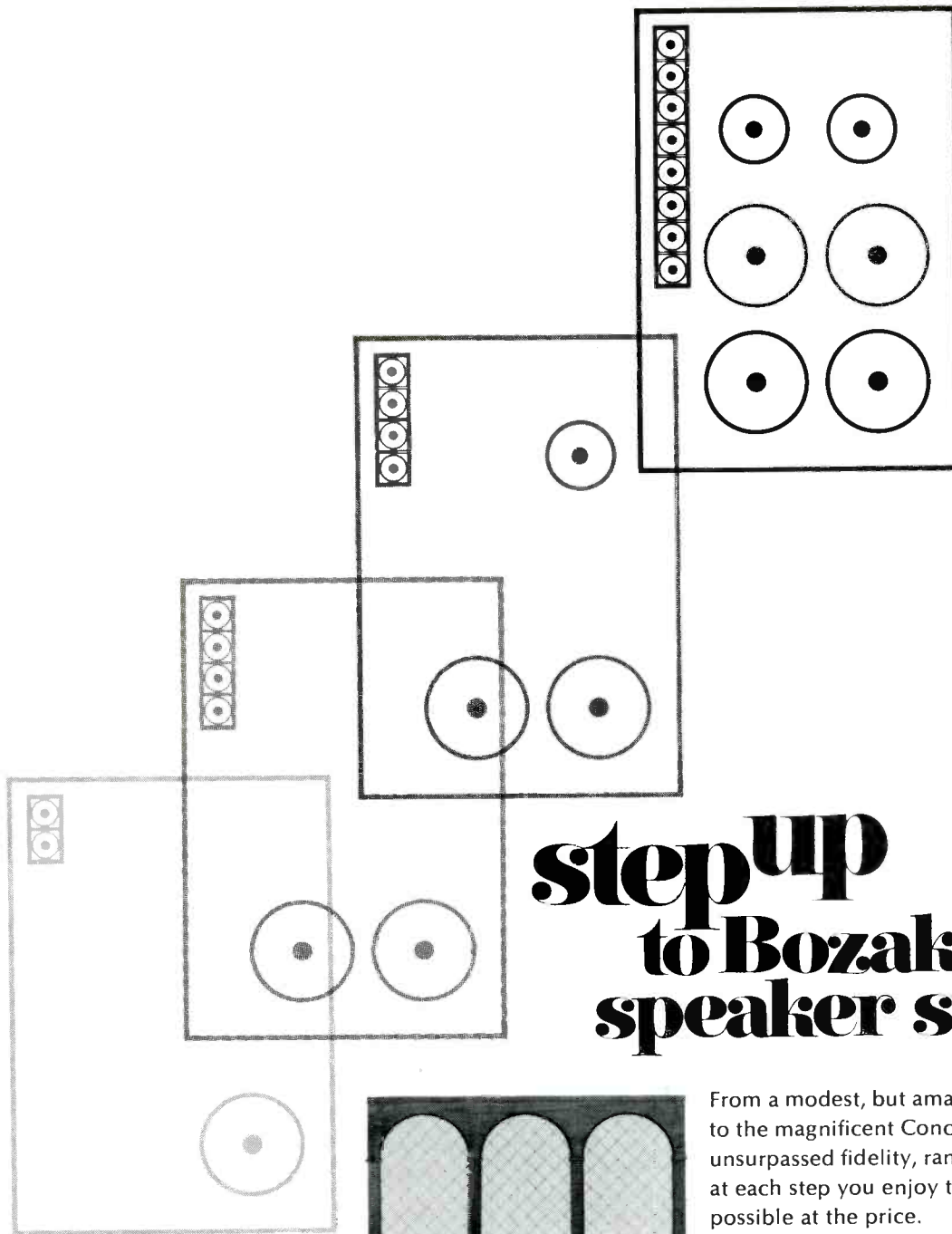
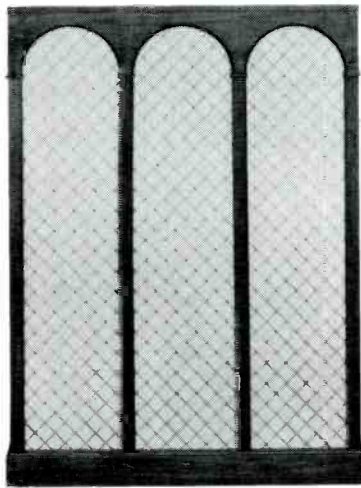


Fig. 6D—Vector board in place over meter terminals. Note similarity of parts layout to drawing of Fig. 6B.



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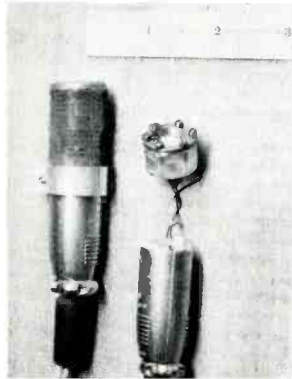
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To do this you will have to determine the sound pressure which corresponds to a voltage you can generate easily. Unfortunately, microphone specifications are given in many ways. Figure 7 may be useful. Sound measurement microphones without built-in transformers tend to have a sensitivity of about -60 dB re $IV/\mu\text{bar}$, and the meter is designed around this kind of input. Many recording mikes have some 20 dB greater sensitivity due to a matching transformer. If your micro-



The author designed and built this microphone for use with his S-L meter. The electronics are similar to an Altec 21D.

phone is above -55 dB re $1V/\mu\text{bar}$, you should reduce the level to about -60 dB with resistors, or use the microphone without a matching transformer. One μbar is equivalent to 74 dB SPL, so a microphone of -60 dB sensitivity re $1V/\mu\text{bar}$ should have an output of .02 V rms at 100 dB SPL. This corresponds to .05 V p-p, so a 1-volt p-p signal into the high-level input should read 105 dB on the meter.

0 dB SPL =
 $20 \text{ microNewtons/meter}^2 =$
 $2 \times 10^{-4} \mu\text{bar} (1 \mu\text{bar} = \text{dyne/cm}^2)$
 Thus all the following microphones have the same sensitivity:
 -60 dB re $1V/\mu\text{bar}$
 -40 dB re $1V/10 \text{ dynes/cm}^2$
 $1 \text{ mv}/\mu\text{bar}$
 When using a transformer, multiply by the square root of the impedance ratio.

Fig. 7—Some comparative sensitivities.

When you are through you should have a very useful instrument. Besides making many speaker measurements, I immediately used mine to shop for a really quiet air conditioner. I have used the meter to design low-noise mike pre-amps, and for making signal-to-noise improvements in my tape recorders. One can easily calibrate it in microvolts, and use it as a very sensitive a.f. voltmeter. Use your imagination!

PARTS LIST

Capacitors:

C1, C2, C12	10 μF , 12 V, electrolytic Sprague TE-1128
C3	.033 μF , Sprague 3339R8
C4	.0047 μF , Sprague 4929R8
C5	330 pF, Sprague 3329R8
C6,* C7*	0.1 μF , 1%
C8,* C9*	.01 μF , 1%
C10,* C11*	.001 μF , 1%
* Mylar. Suggest you buy four of each and match, according to text.	
C13, C15	20 μF , 10 V, Sprague TE-1130
C14	.01 μF , Sprague 1039R8
C16, C19	100 μF , 3 V, Sprague TE-1402
C17, C18	100 μF , 6 V, Sprague TE-1102

Resistors— $1/4$ -watt, 5%, except as marked.

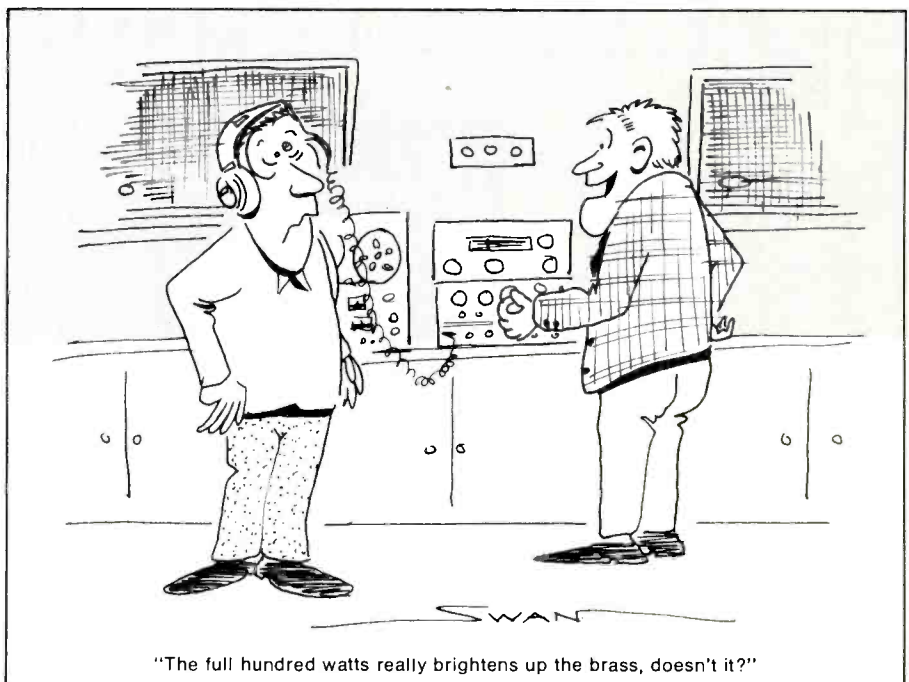
R1	1.0 meg
R2	110 k ohms
R3, R13, R14, R15, R19, R25, R26, R30, R31	30 k "
R4	100 "
R5, R6, R27	100 k "
R7, R8, R11, R12, R16, R24, R29	10 k "
R9, R10	1000 "
R17, R18	7.95 k, " 1%
R20, R32	51 k "
R21	68 k "

Resistors, Cond.

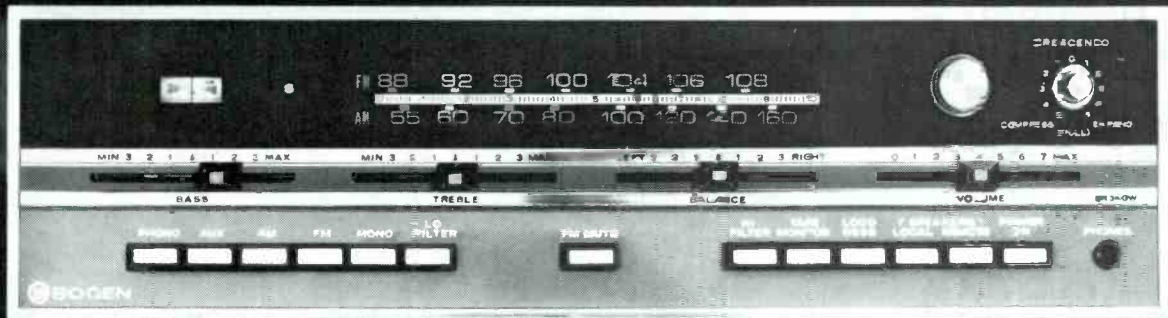
R22, R23	10 k pot, Mallory MTC-1
R28	4700 ohms
R51, R61	2000 "
R52, R62	2700 "
R53, R63	3300 "
R54, R64	3900 "
R55, R65	5100 "
R56, R66	6800 "
R57, R67	8200 "
R58, R68	11 k "
R59, R69	13 k "
R60, R70	16 k "
R71, R76	4700 "
R72, R77	1100 "
R73, R78	330 "
R74, R79	100 "
R75, R80	62 "

Miscellaneous

Q1, Q3, Q4, Q5, Q6, Q8, Q10	2N3707 transistor (NPN)
Q2, Q7, Q9	2N4058 transistor (PNP)
Case	Bud AC-1405
Bottom plate	Bud BPA-1505
Sw 1, 1A	Centralab PSA-204
Sw 2, 2A	Centralab PSA-204
Sw 3	Centralab PSA-210
Sw 4	Switchcraft 903
Meter	VU, Calectro DI-930
Battery	Eveready 226BP, 9 V transistor radio type
Battery Clip	Cinch-Jones 5M



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Have You Heard Sinatra?

DON ALTOBELL

EVEN AFTER 31 YEARS and more than a thousand records since his first, that isn't as silly a question as it first sounds. Because I didn't ask if you ever heard of Frank Sinatra, or if you know it's he when one of his records is played. I asked if you ever *heard* him. And the difference is like seeing the sun go down or watching a sunset: one is physical, surface; the other emotional, total.

To hear Sinatra, you've got to *listen*, immerse yourself in the lyric and let him tell you the story of the song.

Sure he's made some ho-hum recordings and some downright poor ones. But when he *cares*—and that's most times—he turns out what is usually the truest vocal reading of the song he's singing. That is not to imply there aren't any better singers than he. I think Steve Lawrence is, and probably Vic Damone still is, and some others too. And it doesn't mean that sometimes a good record by Sinatra won't be done better by someone else. (His "Funny Valentine" is fine, but I believe Eydie Gorme's is more dramatic; his "Wait Till You See Her" is excellent, but I like Damone's better.) But . . . Sinatra's reading of a lyric is the reading of that lyric more often. *Most* often. And many times besides being the best reading, it is so superior, you never want to listen to anyone else's.

What makes the difference? I'll feebly try to put down on paper some of the distinctive qualities that set Sinatra apart.

Allowing there are better singers, there is, nevertheless, his trueness of tone. Depending on the sentiments of the particular lyric, the timbre of his voice can be warm and loving or cold and bitter; it can be bursting with joy or remorseful almost to tears. A lot of this he does by his enunciation of the key words of the key phrase of the song. And because of his good taste, he invariably knows which *are* the key words and phrases.

When he sings "I love you," the vowel in "love" is prolonged, yet subtle; the "ve" tagged on, yet never sounding like an afterthought. The "you" is intimate and personal: he means *you*, young lady, only you. With words such as "heart" and "hold" and "help," he often purrs the "h" to bring you right in close. Here again though, he doesn't use this device everytime, with every "h," but only when it's right for the mood of the song.

Sinatra's breath control lets him sing almost as many words as he wants to without breaking a phrase to take a breath. He does this so naturally you forget that other singers sometimes indiscriminately gulp for needed breath. Maybe they can't breathe the way he does or else they just don't realize they ruin the word or phrase. Sinatra has both the breath *and* the feeling to phrase better than anybody else!

More about his diction. You never have to guess what he's singing. This is carefully accomplished, because even today when he speaks you can hear more than a trace of his north Jersey-New York upbringing, and yet even his earliest records were free of this. Another example of Sinatra's discipline to detail.

He always has had the benefit of the finest musicians. And because, probably, of his three years with Dorsey at the start of his career, he makes the most of these musicians. The Columbia records with Axel Stordahl in the forties were, for the most part, rather stereotyped. But the orchestration was lush with lots of strings and usually a harp which clothed well Sinatra's voice and the love songs he usually sang. Kind of ordinary maybe, but certainly never bad.

When he switched to Capitol Records in 1953, however, Sinatra teamed up with a different arranger, Nelson Riddle, who was highly imaginative and inventive. Riddle used fewer strings than Stordahl, and many of his ballads had a hint of muscle to

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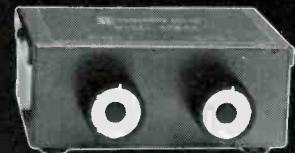
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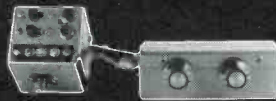
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them. This approach fit the new Sinatra voice perfectly. The baby fat was gone from it; the tone and phrasing more commanding. On up-tempo tunes, which he'd never been consistently good at until then, he often played with the beat while never losing it. And Riddle orchestrated for him as no arranger had ever orchestrated for any singer before. It was a totally new and exciting sound for both ballads and rhythm.

Then in 1957. Sinatra cut his first album with Gordon Jenkins, and as Frank described it, "It was 200 violins and one drum!" Of course it was a lot more than that. "Where Are You" was oboes and flutes and bassoons in a symphony of despair, and Sinatra's voice took on a new and darker sound, more melancholy, more remorseful. Then, two years later, they followed with more of the same sound in their second album, "No One Cares."



In the sixties, it was more Riddle, more Jenkins, along with some others mostly good, and last year Sinatra used Don Costa exclusively. Costa, who had done one album with him a few years back using a lush ballad sound, added new excitement to his orchestration with guitars and vibes and even a harpsichord. Wild! . . . yet tasteful. And when it was needed, when it was right . . . a ballad touch. For instance, when they did "By the Time I Get to Phoenix" and "Little Green Apples," Sinatra made these love songs *sound* like love songs and not just "catchy little tunes."

These ingredients alone, however—tone, diction, phrasing, breathing, and the right orchestration—do not a Sinatra make. This is evident in the scores of vocalists who have tried through the years to utilize these skills. They usually only sound like Sinatra copycats and not very good. Because they *are* copying, and more importantly because they lack his nonpareil good taste in the interpolation of a lyric. This is, perhaps, the most important ingredient: Good taste. Sinatra knows *when* to do what he does and how to interpret the lyric to give it a personal expression that transcends words.

"Come Fly With Me," for instance, is bursting with ebullience and cock-o'-the-walk confidence, just like his "Mr. Success." And in "Moonlight Becomes You," when he sings . . .

*"You're all dressed up to go dreaming,
Now don't you tell me I'm wrong.
What a night to go dreaming!
Mind if I tag along?"*

you can see your best girl looking prettier than she's ever looked before! When he sings "Sleep Warm," you wish her the pleasantest of dreams, and there was "My Girl," the little known tune by C. Freed that Frank recorded 20 years ago . . .

*"Lucky heart to be part of a love like this
Where every single kiss is a short cut to heaven.
Heaven knows, she's everything that's dear to me . . .
She smiles . . . and cloudy days are clear to me.
Yes, the world is my oyster and I've got the pearl . . .
I'm happy, 'cause I've got my Girl!"*

Schmaltz? Sure! But when Sinatra sings it, you believe every word; My Girl becomes *your* girl, and you love her like crazy!

One of his outstanding vocal performances is "You My Love." This is from the film, "Young at Heart," and never got the play of the title song. But Sinatra sings it flawlessly, and his breathing and phrasing are so good he sings the song all the way through taking only nine breaths.

These are examples of his I love you/you love me artistry and there are many more, but it is the songs of unrequited love, the bittersweet lament of the tormented loser that he does best. Have you ever been hurt by love? Just listen to "I'm a Fool to Want You," or "A Cottage for Sale," or "What's New?" You'll cry your eyes out! And there's the lonely melancholy of "Dindi" . . . *"like a river that can't find the sea, that would be me, without you my Dindi,"* and the hopelessness of "Maybe You'll Be There" . . .

*"Each time I see a crowd of people,
Just like a fool I stop and stare.
It's really not the proper thing to do,
But Maybe You'll Be There!"*

There are dozens like these, *scores* even. And there are also a few of the other side of sadness. You know, when the girl loves you and really pours her heart out, but you don't love her anymore

*"How insensitive I must have seemed
When she told me that she loved me.
How unmoved and cold I must have seemed
When she told me so sincerely . . .
What was I to say . . . what can you say
When a love affair is over?"*

He makes you hate yourself and everybody who's ever shunned a lover!

Other artists have recorded most of these songs. But none like Sinatra. None with his musicianship, his vocal honesty. *None!* So ask yourself, "Have I ever heard Frank Sinatra?"

If you have some of his albums, listen to them again. And *really* listen! By yourself, lights out, door closed. You'll *hear* him, *feel* his artistry. And you'll never be the same again.

If your collection is lacking, start by buying "Wee Small Hours," "Songs for Swingin' Lovers," and "Come Fly With Me." These are all Capitol albums recorded some years ago, but they should still be available. If not, shop around for them, or write to Capitol. It's worth the effort.

Wee Small Hours	CAP W581
Songs/Swingin' Lovers	CAP W653
Come Fly With Me	CAP W920
Only the Lonely	CAP W1053
September of My Years	REP FS1014
With Antonio Carlos Jobim	REP FS1021
A Swingin' Affair	CAP W803
Where Are You	CAP W855
Songs/Young Lovers	CAP W1432
Ring a Ding Ding	REP FS1001
Swing Easy	CAP W1429
Look to Your Heart	CAP W1164

And his latest album, "Watertown" REP FS1031, shows that while the voice may no longer be *The Voice*, he still has no peer in wringing your heart strings in a story of abject remorse. No peer!

Lyrics quoted are from the following songs:

"Moonlight Becomes You" Burke/ Van Heusen	ASCAP Famous Music Corp.
"My Girl" Freed	BMI Ludlow Music, Inc.
"Dindi" Gilbert/Jobim/Oliviera	ASCAP Ipanema Music Corp.
"Maybe You'll Be There" Bloom/Gallop	ASCAP Triangle Music Corp.
"How Inesentive" Jobim/Gimbel/ De Moraes	BMI Duchess Music Corp.

Canby Looks at the TV Discs

EDWARD TATNALL CANBY

NO—THE DISC isn't about to die. It will be reborn in a radically new format, for a long new lease on life.

That was my instant conclusion as I took in the astonishing details of the new Teldec disk, described in *AUDIO* in September (p. 8). *There it is!*, every instinct screamed at me, either this amazing disc or another of similar aspect. Not merely a disc for audio, this time. A disc for TV with incidental sound and—more important to us—an *audio disc with TV capacity*. An enormous new signal potential, to encompass everything in audio we can now imagine and more. That's how the new disc must be. In the near future audio and video are going to be seen and heard together more and more often. Most new-generation media will have at least the capacity for both sound and picture, though sound alone will remain important when we want to have it that way.

As you see, I am in a predicting mood. Mark my words, then, and roast me whole if I'm wrong.

Let's survey the present background. No doubt about it, our present disc is approaching a kind of glorious dead end. Not yet in terms of perfection for, miraculously, it is still advancing (and—at this writing—we have yet to hear the Dolby B disc though Dolby B cassettes are in production). The original LP-45 promoters of the late Forties, if they had been in isolation all these years, would be astounded at the elegant sophistication of our present disc product with its wide dynamic range, near-silent surfaces (sometimes) and remarkably low distortion. Disc is still mass production quality king. Reel-to-reel tape is unlikely to catch up. Cassette will take a little longer—the cassette *does* have the potential, as we have found in this last year or so.



(Eight-track for autos is not really in the quality sweepstakes. It seems OK in its own special way.)

And so in present terms, assuming no larger pressures, we find disc comfortably established with room still left for technical polishing; we see cassette coming along fast, rapidly taking up its own larger potential for improvement; and thus the two are ready to compete for the quality audio-recording market as equals, neatly sewing it up between them with plenty of room for both in full stereo.

But how much more there is to say!

Pressures. First, pressure of technological advances. Mass production requires a crystalizing of formats within fixed limits, while technical know-how moves inexorably onward. In time, these limits become intolerable and internal adjustments can no longer keep up. There must be a Big Break. A drastic readjustment, like an earthquake that relieves major earth strains at a fault line. Today is a time for Big Breaks, as we know, particularly in areas involving electronics and miniaturization. Like disc.

Not only disc. Magnetic tape, too, is in trouble. That once-red-hot hope for new audio and then video technology is now working dangerously close to a technical bind, even as it expands into brilliant new formations. It's going too slowly. Audio tape does improve, cassettes and Dolby and chrome add new dimensions;

in TV the videotape system is still expanding by contracting its information density—more for less. But not fast enough. New technologies are overtaking *all* forms of tape.

Second, two specific major pressures are now battering both tape and disc, like two hurricanes hitting a pair of overloaded freighters. One, the big one, is TV itself, an enormous, overbearing monster (to change analogies) which swallows up audio, given half a chance, the way the whale took in Jonah. (The whale didn't even notice until Jonah began fighting, down inside.)

The thing about TV, right now, is that it is invading the recording field—not merely in professional video recording but in the much more potent area of consumer records, *TV publications*, mass produced like LPs and 45s. That is a new and enormous behemoth crowding in on our little audio territory.

Present audio recordings—all sorts—relate to this coming TV somewhat as radio did to earlier television broadcasting. *Change fast, or be absorbed!* Radio did, and radio is still with us, perilously. (Earlier, the old acoustic disc went through the same thing in the face of early radio broadcast. It changed, radically, and managed to survive.) Radio lives on because it responded with new exclusives, unbeatable FM quality and unmatched stereo, but also by exploiting new formats, idiomatic for sound alone.

(Somehow, TV isn't yet very desirable, say, on the beach or in a car, or walking in the park. Nor for a Beethoven symphony, which is more sound than sight.) Big challenge, big response. And so in audio it's no longer merely which disc vs. which tape. It's audio recording vs. video. A new game. New rules. Big Changes needed.

Television is the big hurricane. The smaller one, a mean little storm, is this new four-channel stereo, quadrasonics (as I like to call it). The impact of it is particularly crucial at this moment because it throws the present audio scene into the proverbial cocked hat; it is so *variably* compatible with our present systems. Suddenly, audio disc is up against it, right in its own domain. So, oddly, is the new cassette, if for different reasons (compatibility with present cassettes.) And lo! the lowly eight-track cartridge gains an instant advantage by virtue of its conservatism—lots of tracks on an old fashioned quarter-inch tape! Crazy. Disc and tape are thus caught in a frenzy of uneasy cross-currents, with a dozen ways to impress four channels into the space where there are now two, or expand present two-channel recordings into four (it goes both ways); and none of them seems really right though all have overlapping merits which we cannot afford to ignore. Only one can win, in the end. Which will it be? If you ask me, *none*. Not in the long view. Our present media are just too lopsidedly inadequate. This second hurricane is too much.

I hate to say it, but to impose four channels of sound *via any system* upon the present disc is like installing integrated circuits in a trolley car. Wrong vehicle. Even a PCC car, one of those streamlined modernized trolleys. *Wrong vehicle!*

And of course it is quite out of the question to impose video capability on present commercial discs. Even though it has bravely been tried.

Technology, you see, while bringing the disc to unheard-of perfection in its present format, has simultaneously moved on far ahead. Our noble disc is an outdated vehicle.

Remember how radical the micro-groove record seemed when it first appeared? An unbelievably tiny groove, a tiny pickup and stylus, a vastly lengthened playing time at much slower speeds, a new, flexible record to replace breakable shellac. Was *that* a compound Big Break! It updated the disc process to match the accumulation of sixty-odd years of potential. Now, in a shorter time (we move faster), there is again a vast accumulation. And another Big Break is absolutely in the works. Not instantly.

But inevitably. Big breaks are proliferating all over the place, and inexorably in the new directions already noted above—the combination of audio and video elements that will clearly be the Age to Come. Mixed media! Multi-media! Already, these are normal terms in the language. New technologies! EVR, television in published cartridges via a return to photographic miniaturization, a picture one quarter the size of the tiny super-8 picture, color coded in black and white (it plays in color), and two incidental channels of audio—all in one miniature cartridge film. RCA's coming alternative, the "plastic wrap" TV recording made with holographic techniques and cheaply *embossed* on its medium. It's still underdeveloped but it will be coming along.

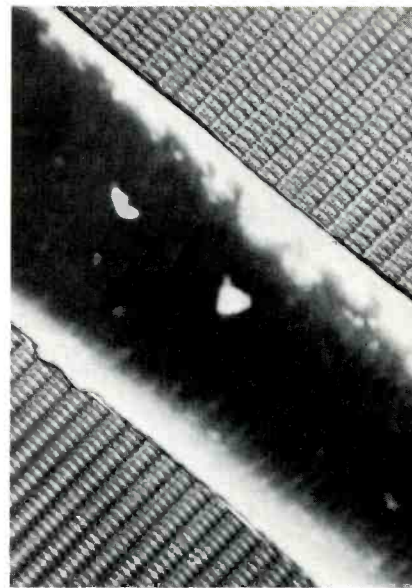
These, you see, are Big Breaks, into brand new areas. And these TV records will fly right in the face of our present audio records—unless. Unless we adapt and change. Teldec disc is the beginning of that change. We will meet these challenges only with equivalently radical new capabilities, new super-vehicles. This is one of them.

But, you say, it's a TV disc so what's the fuss. Please read again. It makes no difference. *It's a disc*. And it has fantastic new capabilities, for whatever you want to do with it. Any disc that can accommodate TV in practical form can also absorb, alternatively, all the audio you can ever imagine at one gulp, with miles of 100m to spare. Phew! You want a twenty-channel stereo disc? Teldec can do, if I guess right. Four channels, as the Editor noted in September, offers no problems. Hardly even notice them. There is enormous audio reserve capacity, to be slanted in any direction or combination of directions we may want—fidelity, length of play, number of channels, control functions, turning off the house lights, setting the furnace thermostat and letting out the cat. Put it all on this disc! Could be. (Yes—incidental problems. I blissfully by-pass them. They'll get solved.)

Let me sum up the Teldec characteristics again, to give you a more vivid sense of the degree of updating with which we are now to be involved.

1. Tiny grooves—130 per *millimeter*, less than a tenth the size of the big, fat LP microgroove. (See photo Sept. p. 96.) An ultra-thin, pliable disc more like a sheet of film, reproducible in the millions. A speed, for TV, of no less than 1500 rpm. Could run at any slower speed for audio uses.

2. This thin disc *can be tracked*, even with such grooves and at such a speed. (Thin discs of standard microgroove type often will neither turn nor track.) A new



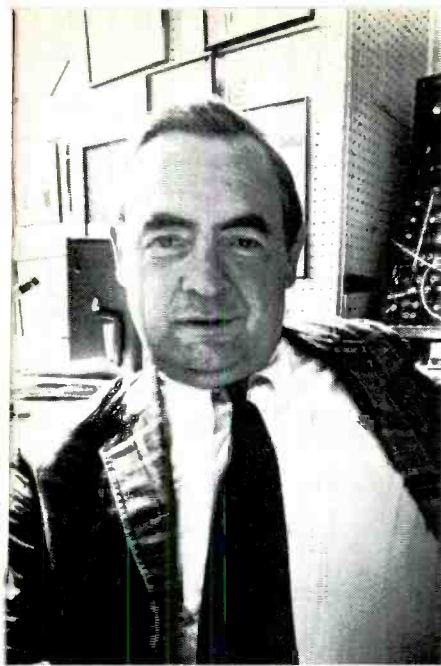
Microphotograph of a hair compared with the new record grooves.

overhead tangential system, with feedback, keeps the stylus where it belongs under these extraordinary conditions. (A bit clumsy, with cords like an old fashioned dentist's drill, but remember the early record changers?) The fragile disc itself stays in place by being air suspended. It's an airfoil disc. It sits, turns, on a cushion of air which flows out past the edges. By a circular venturi action at the outside edge, reduced pressure forces the disc down. Atmospheric pressure above is higher. Simple! An old idea in an ingenious new application. (Is it a venturi or an airfoil? I guess it's both.)

3. The grooves are *vertical-cut* and *frequency modulated*. Wow! An FM disc. Is that revolutionary enough? This should eliminate much unwanted noise (goodbye Dolby?). And it allows, more directly, for a groove of constant width, so that grooves may be packed densely side by side, without variable land. Edison did the same, to an extent, with his vertical-cut discs of WW I vintage which played much longer than their lateral equivalents.

4. The pickup system, to my mind, is the most revolutionary aspect. At last, after our years of fighting plastic's annoying elasticity and bounce, Teldec has put this very factor to work. As you could see in our illustration, (Sept. p. 96,) the new stylus rides in the groove, first compressing the vertical modulations, then letting them *snap back into place* to generate the signal. If I get this right, it is a wholly new way of "reading" the disc message. In one swell foop, as we used to say, it converts a problem parameter of discs into a major asset. Enough

(Continued on page 90)



A TV commercial composer talks about the new VM professionals.

"If you're a pro, you can't help but be impressed with the new VM PROFESSIONALS."

"I sure like the way my music sounds on them. Sensitive. Subtle. And yet this is the kind of equipment you can play ten hours a day and not have trouble with."

"I am particularly impressed with the receiver. The VM PROFESSIONAL 1521. It has a new type filter that really gives you great FM selectivity. And the stereo separation! It's almost as good as some 8-track playbacks I heard in recording studios."

"And I really like the VM PROFESSIONAL automatic turntable. The "Synchro-Matic" 1555. It tracks beautifully. I can't pick up any tonal variation from the beginning to the end of a record. That's probably because the tone arm is longer. 9 1/2 inches. And the tripping mechanism is photo-electric, so there's no mechanical distortion."

"It's really great at reproducing those nuances and shading you work so hard to get out of a vocal or an arrangement."

"And the spindle! Really something to see. It gently lowers records all the way down to a motionless platter. That's what I call loving care."

"Of course the speakers make the whole outfit payoff. They're VM's new Spiral Reflex System speakers. Compact. And very efficient. Gives you really clean basses and horns. And none of the instruments ever sound strained or pushed, even in attack-passages."

"And another thing, about 95% of all the component parts in the VM PROFESSIONAL line are made in America. And I know it isn't fashionable, but to me that means better and tougher."

"The only problem I have with my VM PROFESSIONAL outfit is, I can't decide whether to leave it at my studio or take it home."

"I just may have to buy another one."

THE VM PROFESSIONAL 1555
Two synchronous motors -24-pole for turntable, one for changer mechanism
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Bill Walker makes his living in sound. He writes and produces music for television and radio advertising. Chevrolet, Kraft, Oldsmobile and Continental Airlines. He pioneered in the uses of the Moog Synthesizer. And has written songs for Peggy Lee, Dean Martin, Gordon MacCrea and others. Over the years, Bill produced more than 5,000 sound tracks for radio and television.



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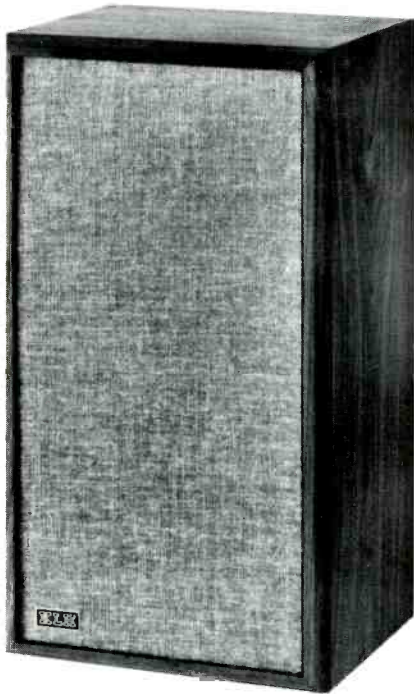
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Equipment Profiles

- KLH Model 33 Loudspeaker System 62
- Empire Troubador Turntable 63
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KLH Model 33 Loudspeaker System

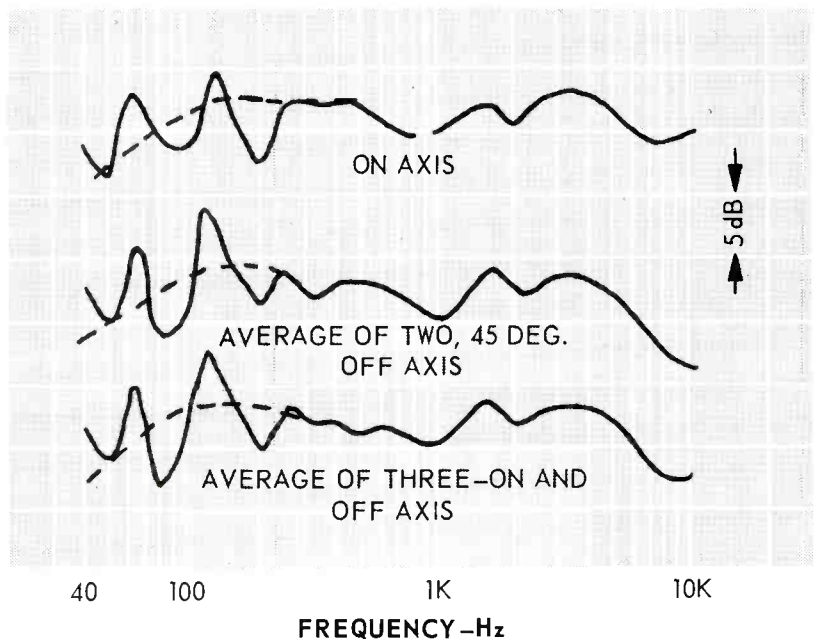


Fig. 1—Frequency-response curves measured 4 feet above the floor, horizontal position.

MANUFACTURER'S SPECIFICATIONS:

Impedance: 8 Ohms. **Dimensions:** 23-5/8" x 12-3/4" x 10-15/16". **Weight:** 33 Pounds. **Price:** \$99.95.

KLH's Model 33 is an excellent new speaker, which departs from conventional acoustic suspension by incorporating a 2-in. diameter ducted port in the front baffle. KLH calls it "controlled acoustic compliance" and it is so heavily damped that very little radiation occurs. What it does is smooth the impedance and control cone motion at the lowest frequencies.

The two-way system utilizes a 10-in. high compliance woofer having a 7-in. piston made of asphalt-impregnated paper and a 1½-in. tweeter with a ceramic magnet. A metal screen protects the tweeter from prying fingers. The crossover frequency is just below 1500 Hz. A 3-position high-frequency level control, recessed into the rear of the enclosure, evenly attenuates the high end.

The oiled walnut cabinet, which is finished on all four sides, has a beaded front molding and a brown grille cloth, backed by black. These combine with the nice proportions to give a really appealing touch to this compact loudspeaker system. The recessed input terminals and tweeter level control permit use of the speaker right up against the wall—either vertically or horizontally.

We measured frequency response by placing the speaker in a room horizontally, at sitting-ear height. The tweeter level control was set to NORMAL position. Test signals of ½-octave pink noise were fed to the speaker at a level which caused the speaker to put out a SPL of 90 dB on-axis at three feet.

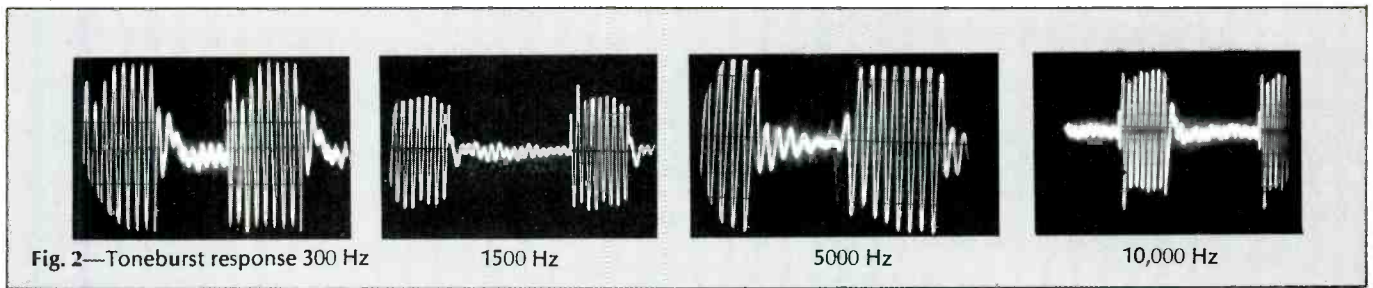
A second set of test readings was then taken at two 45-deg. off-axis positions and averaged. The third curve is an averaged plot of three off-axis and the on-axis response. It most closely represents the system's power response.

As seen in Fig. 1, the frequency response of the Model 33 is excellent, averaging to ± 3 dB over the entire range measured. The low-frequency variations are room effects and are to be disregarded.

The unit's impedance curve is shown in Fig. 3 and gives some clue as to the speaker's smoothness confirmed by white noise tests.

Harmonic distortion measurements were made at 6.4-volt and 9-volt inputs, and are shown in Fig. 3. These represent approximate power levels of 5 and 10 watts, respectively, and show the low distortion of the woofer. At 40 Hz, for example, the distortion was less than 2 per cent at 5 watts. We consider 40 Hz to be the low-frequency limit of this speaker.

Efficiency of the KLH 33 is average relative to acoustic suspension speakers as a whole. We recommend using an amplifier with 30 watts of available power (rms) per channel. There is no problem



in using a much more powerful amplifier either. In fact the speaker system can handle 90-watt bursts without noticeable distortion.

Oscilloscope photos of tone bursts are shown in Fig. 2. They confirm the fine transient response of the speaker.

Listening tests conformed closely to our test data. The high end was there and evenly dispersed into most parts of the room, resulting in a very transparent quality, easy to listen to. Only the lowest-frequency fundamentals present on some materials were subdued. Otherwise the bass was unusually clear and tight for such a small box. We would favor this speaker in a moderately priced installation. Another nice product from KLH. Congratulations, Victor Campos. A.R.

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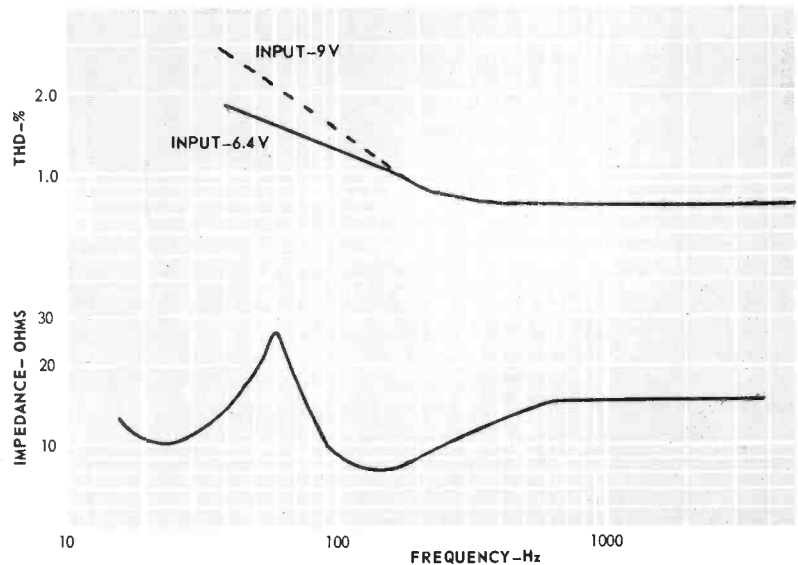


Fig. 3—Impedance and harmonic distortion.

Empire Troubador Model 598 Turntable System



MANUFACTURER'S SPECIFICATIONS:

Speeds: 33 $\frac{1}{3}$, 45, 78; **Motor:** Hysteresis-Synchronous, outer-rotor type; **Platter Diameter:** 12 in.; **Drive:** Belt, from stepped pulley on motor shaft; **Platter Weight:** 7 lbs.; **Arm:** Model 990, integral; mounted on three-arm "star" structure with turntable bearing at center; star is flexibly mounted to motor board; **Stylus-force method:** Balance and calibrated spring; **Max. Tracking Error:** 0.7 deg.; **Wow and Flutter:** .01%; **Rumble:** -55 dB (NAB); **Dimensions:** 16 x 13 $\frac{1}{2}$ in.; **Height above mounting surface:** 3 $\frac{1}{4}$ in.; **Depth below base plate:** 3 $\frac{1}{2}$ in.; **Finish:** Swiss ground gold. **Overall Dimensions** (with base and dust cover: 17 $\frac{1}{2}$ in. wide, 15 $\frac{1}{8}$ in. deep, 8 in. high. **Price:** \$199.95. Optional walnut base and Plexiglass dust cover, \$34.95.

The new Model 598 from Empire was made necessary when the latest cartridge—the 1000 ZE—was found to be limited only by the turntable/arm combination with which it was used. The cartridge was actually capable of lighter stylus forces than could be employed with existing turntables and arms. So the en-

gineers started out to improve the turntable/arm part of the record-playing chain to take advantage of the performance possible with the new cartridge.

To begin with, the turntable itself had to be driven by a belt from a hysteresis-synchronous motor to ensure constancy of speed and a minimum of rumble which in many units is transmitted from the motor to the platter by contact through the idler. The platter had to be heavy, and even at its relatively slow rotation it had to be dynamically balanced. To avoid interaction between the platter and the magnets in the usual magnetic-cartridge, the platter had to be of non-ferrous material—aluminum. To be heavy, therefore, it had to be large, with most of the weight concentrated in the rim, which meant that the rim had to be deep. But a 3-inch thickness of platter standing above the chassis of a turntable would not look very attractive, so it was made of two parts—the heavy, deep aluminum platter, and a “dress” ring of the same aluminum proportioned attractively, which could be left visible above the chassis, while still leaving the heavy belt-driven platter as it was, only now it would be obscured unless the dress ring was removed—a necessity when changing speeds, for additional speed-changing “hardware” would only complicate construction and lead to possible increases in rumble. Then a large customized rubber mat was added to cover the platter and dress ring, resulting in a handsome visible part of the turntable.

It is, of course, necessary that the arm and the turntable be solidly attached to each other—no compliance or relative motion can be tolerated—and furthermore, the entire structure must be flexibly mounted to the chassis, which could then be firmly mounted to a base, or into any custom enclosure the user wanted. Consequently, the two were mounted on a cast tripod-like structure, with the three “legs” each suspended by a combination of a spring and a piston which effectively damp out any vibration or shock which might be transmitted from the chassis to the tripod. The shaft, integral with the turntable, is of finely polished chrome steel, and the oilite bearing honed to fit the individual shaft with which it is to work.

The arm is mounted on a “shelf” on one of the tripod legs, and electrical connections are made with a 5-pin plug and socket. Both vertical and horizontal pivots are sealed instrument-type ball bearings, and after balancing with the counterweight for the mass of the cartridge, the stylus force is set by a calibrated hair-spring, the dial being calibrated in one-gram steps, each about $\frac{1}{8}$ in. At the top of the bearing structure, a vernier adjustment sets the anti-skating compensa-



Fig. 1—Showing arm mounting and “Dyna-lift.”

tion. The counterweight axis is an extension of the stylus-to-pivot axis to eliminate any unbalance from that source. The cueing control lifts and lowers the arm gently and exactly where you want it, with no bias as the arm is lowered. The whole arm assembly can be raised or lowered over a range of $1\frac{1}{2}$ in. to permit its use with *any* turntable when it is obtained as a separate unit. On its base is a “Dyna-lift” which will raise the arm at the end of a record, or if you want to play a record with a smaller-than-standard runout groove, you may tilt the lift away.

The head of the arm is permanently attached, with a cartridge-mounting plate that is instantly removable by loosening a thumbscrew in the center of the head. This allows the cartridge and mounting plate to be removed from the arm. Contact between the plate and the arm is by gold-plated pins and springs.

The arm rest is attached to the chassis, and fitted with a light which illuminates the record surface where the stylus is to be set down. A plastic ring can be rotated to douse the light when it is not wanted. The rest is fitted with a nylon hold-down pin which is spring loaded to secure the arm gently but firmly. The white nylon pin serves also as a pilot light to indicate when the power is on—which is done by depressing a black push-push button near the front of the chassis to turn power on or off.

A die-cast cover plate protects the motor pulley and the belt, and is removable when a speed change is desired. The belt is simply moved from one step on the pulley to another, and the platter rotated by hand for a revolution or so to get the belt in alignment with the pulley step. An adjusting screw on the motor mount provides a vernier speed control.

The chassis plate, arm, dress ring, and arm rest are all in a Swiss gold finish, providing a handsome unit which could well be mounted where it could be admired. When used with the optional walnut base

and plexiglass dust cover, it is a truly handsome unit. The dust cover has walnut end pieces, and is hinged to a walnut back plate in such a manner as to stay where you put it—either raised or lowered or anywhere in between.

But enough for the description—let's get to the performance.

Performance

The 598 is just about all it is claimed to be. It does have a very low rumble, it does have a very low wow-and-flutter figure, it is almost impervious to jarring or bumping of the base so you can use it in a home where the flooring is not as sturdy as you would like. The rumble figure is probably the most important, and we measured it as -54 dB by the NAB method, which corresponds to about -74 dB by the ARL (audible rumble loudness level), and even that -54 figure is straining our measuring facilities. In short, the turntable is practically silent—sort of a Dolby-ized phonograph. Imagine what that will mean when we get more Dolby-ized records. After a brief run-in, we found wow-and-flutter to be .03 per cent in the 6- to 250-Hz range, with an increase to .06 per cent in the 0.5- to 6- and 0.5- to 250-Hz ranges, all of which are excellent. The remaining important parameter is the arm resonance, which we found to be well below 10 Hz, and from observations of the response curve—on which we found a tiny bump at 13 Hz—to be at 6.5 Hz.

In view of these performance figures, one can only conclude that the 598 is a finely crafted and well designed record playing device. And its sheer beauty should make it acceptable to any homemaker who prefers equipment that does not look like a broadcast station.

C.G.McP.

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PE Automatic Turntable, Model 2040



MANUFACTURER'S SPECIFICATIONS:

Speeds: 33, 45, 78 rpm; **Pitch Control:** Range of 6% at all speeds; **Wow and Flutter:** 0.1%; **Rumble:** -58 dB (ARLL); **Tangential Tracking Error:** 1.8 deg. max; **Vertical Tracking Angle:** Adjustable to 15 deg. for 1 to 8 records; **Stylus Force:** Adjustable from 0 to 6 gms; **Cartridge Weight Range:** 3 to 15 gms; **Dimensions of chassis plate:** 14×12 in. **Weight:** 15-1/2 lbs. **Price:** \$145.00.

The PE-2040 is the successor to the earlier PE-2020 which was profiled in these pages in May, 1968, and in many respects is similar, but with a number of refinements and improvements that come in the normal course of manufacture. It still retains the unique ability to be adjustable for a 15-deg. vertical tracking angle for any particular record on a stack from one to eight, with a compromise setting of "4" when playing an entire stack automatically, thus ensuring an average variation in tracking angle for the first and last records, and a correct angle for the middle one.

The turntable operates at the three most common speeds, and this is one of the differences between the PE-2020 and the newer PE-2040. The older machine also operated at 16 $\frac{1}{2}$ rpm, but the only records we have encountered at this speed are "talking books"—none is apparently being released with musical content, to our knowledge.

The arm consists of an aluminum tube with the angled head at the forward end, a counterweight at the rear, the cross pivot being angled in the favored manner. Stylus force is set by a calibrated knob on the sturdy bearing structure, and covers the range from 0 to 6 grams. The counterweight is flexibly mounted on a nylon sleeve which is threaded to permit fine adjustment of balance for the particular cartridge in use—a set-up operation which is done with the stylus-force knob set at "0" on its range. The desired stylus force is then set by the knob.

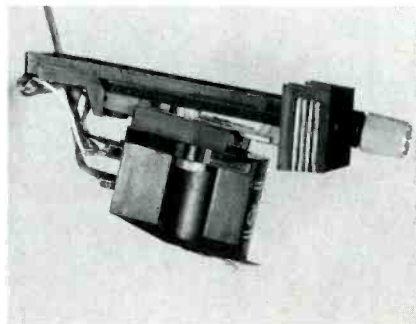


Fig. 1—Showing head with Ortofon cartridge.

Anti-skating compensation is controlled by a knob at the left rear of the arm bearing as well as by the setting of the stylus-force control knob. If you are using a conical stylus with a radius between 0.6 and 0.7 mils, you simply set

the anti-skating control to "4" and the proper compensation is applied regardless of the stylus-force selected. For other styli—both conical and elliptical—you consult a table in the Operating Instructions for the correct setting of the anti-skating knob. All anti-skating compensation can be removed by turning a screw in the center of the stylus-force knob to its maximum counter-clockwise position. The compensation is returned to normal by rotating the stylus-force control to "0" and then resetting it to the desired value.

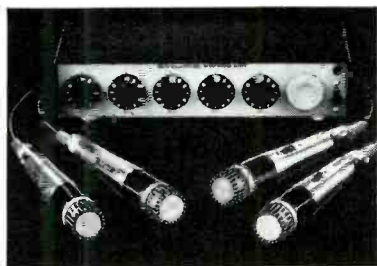
The operation of the turntable has some interesting features. As in most automatics, the cycling is provided by a mechanism driven by a gear on the hub of the platter, and in the PE-2040 this gear is nylon. The cycling operation is inaugurated by the control lever, which has four positions—from left to right, they are MANUAL START, 0, AUTOMATIC STOP, and AUTOMATIC START. When this lever is moved to the AUTOMATIC START position, a linkage shifts a small segment of the gear on the main cam into engagement with the turntable gear, and as the cam is rotated, the various functions are performed. When the selected operation is completed, the control lever returns to "0" position.

The platter has a depression in the center large enough in diameter to accept a 7-in. record. If a 7-in. record is in place, it depresses a pin in the platter which causes the set down position of the arm to be at the proper place for the 7-in. record. If no record is on the platter, the arm will not set down on the rubber mat, thus avoiding possible damage to the stylus. This is a valuable protective feature.

If there is a 12-in. record on the platter, a sensing pin which rises from the chassis during the change cycle encounters the larger diameter of the record and "sends a message" to the arm to set down at the 11 $\frac{1}{2}$ -in. diameter as required by the 12-in. record. A 10-in. record holds down the safety pin, but does not get scanned by the sensing pin, so the set-down position is correct for the 10-in. record. This function is in effect for the automatic operation only, since in the manual position, the arm is free to be lifted and set down on the record in the usual manner for manual tables—with the fingers—or by the "lift lever" located just behind the operating control lever. You can, however, place a single record on



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the platter and start the unit in the automatic mode and have the arm set down at the proper place without touching the arm or the lift lever. At the conclusion of play, the arm will lift and return to its rest, and the motor will stop. In addition, the idler is retracted from contact with platter and motor shaft.

In the **MANUAL** position, the unit can be used to cue a specific point in a record for such applications as dubbing onto tape to create a musical background. The cueing spot is found, and with the stylus left in the groove, the platter is stopped by moving the control lever to "0". Then the platter is rotated by hand about half a revolution backward—the stylus still in the groove. To cue in the desired music, the control lever is moved to **MANUAL START**, and the level control on the recorder turned up to the correct position for recording. This may sound complicated, but with a little practice you can make cues as effectively as anyone can with professional equipment.

The single-play spindle attaches firmly into the mechanism with a quarter-turn clockwise. A rotating sleeve on the spindle turns with the record and avoids the possibility of wearing the center hole. The automatic spindle attaches in the same manner, and will hold a stack of ten records. By inserting the automatic spindle and *not* rotating it, the unit will play the record on the platter continuously over and over until stopped.

The motor is a dynamically balanced four-pole induction type, flexibly mounted to the chassis, which is a steel stamping with an attractive dress plate of grained aluminum. This plate is bonded to the chassis to avoid resonance. The motor pulley has three slightly tapered steps, with the speed changes resulting from the three steps, and the pitch-change feature is provided by moving the idler up and

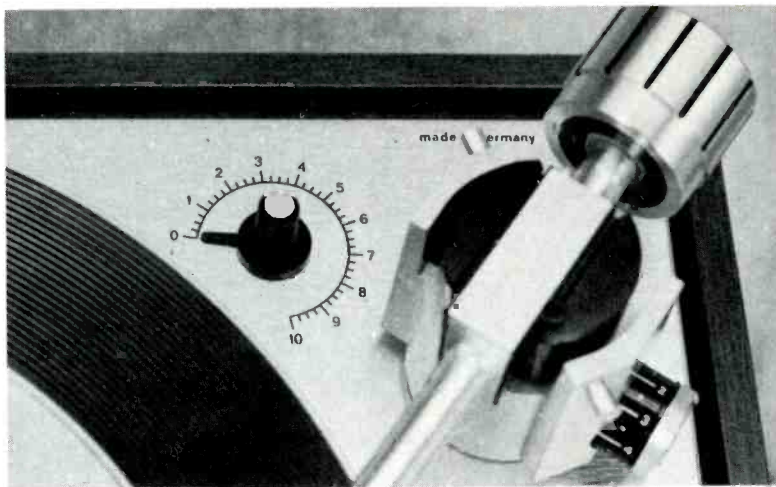


Fig 2—Showing anti-skate control.

down slightly on the tapers by means of the lever at the left front corner of the chassis.

Among the features we found most interesting are: the triple lead carrying the two shielded signal cables and the single third grounding wire; the jig for setting the stylus to the proper position for the 15-deg. vertical tracking angle, as well as for correct overhang; projections on the chassis to permit the unit to be used on the bench off its optional base without the possibility of damaging any of the mechanism; the dynamically balanced motor armature and the platter itself; the attractive appearance of the dress panel; and the overall ease of operation.

Performance

Wow and flutter measured .05% over the range from 6 to 250 Hz, with an increase to 0.11% in the ranges from 0.5 to 6.0 and 0.5 to 250 Hz. Since the motor is of the induction type, frequency variations in the supply caused no change in speed over the range from 40 to 80 Hz.

Reduction of supply voltage to 80 caused a decrease in speed of 5%; at 90 volts the unit was 1% slow, while from 100 to 135 volts there was no change in speed whatsoever. Arm resonance with the Ortofon cartridge used for the measurements was 9 Hz. Tracking was consistent down to ½ gram as far as tripping was concerned, although it is not likely that most cartridges would perform well at that value. Signal-to-noise measured 42 dB by the NAB method, which is from 10 to 20 dB less than the ARLI figure often employed. Cycling time was measured at 10 seconds at 33½ rpm.

We have used the PE-2020 regularly for the past two years and found it completely satisfactory, even if a little slow in cycling. With the PE-2040, any question we may have had about the 2020 has been answered. The unit is very attractive, and an effective performer. Even the shipping carton, with its separation of components for their protection, is a good indication of the quality of manufacture.

C.G.McP.

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VM Model TF-10 Deluxe Component Stereo Receiver

MANUFACTURER'S SPECIFICATIONS:

FM TUNER SECTION: **IHF Sensitivity:** 1.9 μ V. **S/N:** 75 dB. **THD:** 0.5%. **Frequency Response (Stereo):** 20 Hz to 15 kHz within 1 dB. **Capture Ratio:** 1.8 dB. **Selectivity:** 75 dB. **Spurious Response Rejection:** 100 dB. **Image Rejection:** 90 dB. **I.f. Rejection:** 100 dB. **IM Distortion:** 0.5%. **AM Suppression:** 50 dB.

AM TUNER SECTION: **IHF Sensitivity:** 150 μ V/Meter. **THD:** 2.2%. **Image Rejection:** 75 dB. **I.f. Rejection:** 60 dB. **S/N:** 40 dB.

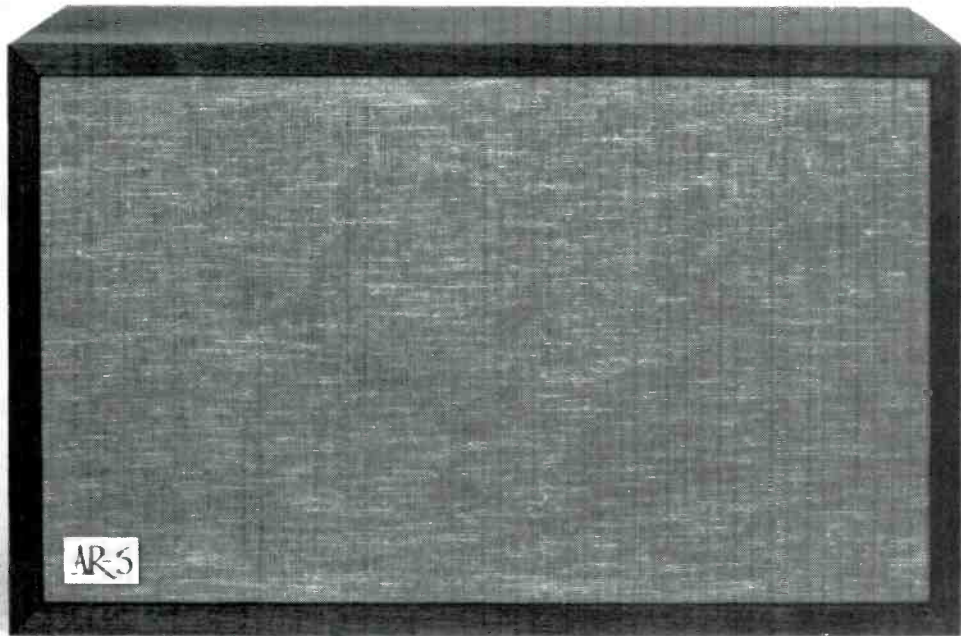
AMPLIFIER SECTION: **IHF Power Output:** 110 watts, 8-ohm load @ less than 0.5% THD. **RMS Power Output/Channel:** 40 watts @ less than 0.5% THD. **Power Bandwidth:** 9 Hz to 30 kHz. **Frequency Response:** 20 Hz to 20,000 Hz \pm 1 dB. **Damping Factor:** 60. **Hum and Noise:** Magnetic Phono: (10 mV reference): 60 dB. Aux 1 & Aux 2: 70 dB. **Input Sensitivity:** Magnetic Phono: 3.8 mV; Aux 1 & Aux 2: 130 mV. **Stability:** Stable with all speaker loads. **Input Impedance:** Magnetic Phono: 47K ohms; Aux 1 & Aux 2: 150K ohms.

GENERAL SPECIFICATIONS: **Dimensions:** 19" W x 6½" H x 13¼" D. Walnut cabinet enclosure included. Price: \$500.00

There's a "new" company to be reckoned with by the serious-minded high fidelity component receiver shopper these days. The quotation marks are there because, in truth, VM Corporation of Benton Harbor, Michigan has been in the electronics manufacturing business for just about as long as we can remember, but their previous efforts were directed more towards mass-produced popular-priced radio-phonographs and

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record-changers. With the introduction of two well-designed and excellent-performing receivers (the Model TF-10/Special differs from the TF-10/Deluxe only in power output, which is 80 watts IHF in the lower priced unit) VM has successfully made the transition to "our kind" of product design and production. In terms of styling, VM was obviously in an advantageous position. Not bound by traditional concepts (and expensive previous model tooling which still had some economic usefulness), they were able to come up with one of the smartest looking front-panel designs it has been our pleasure to examine. The photo in Fig. 1 can hardly do it justice, nor can the verbal description which follows. Next to the *recessed* stereo phone jack at the lower left is a power on-off rocker switch which becomes uniformly illuminated when the switch is in the on position. Further along the bottom of the gold colored panel is a series of eight push buttons. The two at the extreme ends of the bank are of the push-push variety and are used for FM muting and low-frequency filtering. The others are interlatched and are used for selecting FM, AM, Aux 1, Mic, Mag Phono, and Aux 2. A single microphone jack (also recessed) comes next (microphone use is limited to monophonic applications, regrettably), followed by four large control knobs. Three are dual acting, in that the volume control, when pushed in, provides loudness contouring, the balance control, when pulled out, parallels both amplifier channels for monophonic operation and the treble control, when pulled out, introduces a high-frequency filter circuit. The bass control is located at the extreme right of the lower section of the panel—a reversal from usual practice which places bass to the left and treble to the right.

The large dial scale, normally blacked out in all but AM and FM functions, is brilliantly illuminated with FM frequency numerals *only* when the FM button is depressed and with equally dramatic AM frequency numerals when the AM button is pushed. There is no dial pointer, per se. Instead as you begin to tune from the low-frequency end of the high-frequency ends of the AM or FM calibration, a brightly illuminated bar moves progressively along the scale. Visibility of this scheme is so good that the tuned-to frequency is easily readable from across the room. This system of dial reading is reminiscent of speedometer indication used in Buick automobiles for several years, but as executed in the VM TF-10 receivers it is extremely effective, practical, and a delight to use. To



the right of the dial scale area are two rectangular windows. The lower one illuminates in the FM mode to disclose an oversized center-of-channel tuning meter. The upper window becomes illuminated in the presence of a stereo FM signal. The other rotary control in the upper right section of the panel is a speaker selector switch which has positions for main, remote, or both sets, or with the speakers off.

The rear panel of the VM TF-10 receiver has the usual input jacks for low-level magnetic phono (2-millivolt nominal rating), high-level magnetic phono (7-millivolt nominal rating), AUX 2 and AUX 1 pairs, as well as a pair of RECORD OUT jacks. VM did not provide tape-monitor facilities on these receivers. FM (300-ohm) and AM antenna terminals are located directly over a ground binding post. Next come speaker binding posts which are of a high quality and designed to prevent accidental shorts between adjacent wires. However, we found the terminal posts clustered too close together and located in a position that makes it rather difficult to "get in" to effect the necessary connections. This condition is further aggravated by the fact that a single "common" post is provided for both the "main" and "remote" speakers of the left channel, and a similar arrangement is used for the right channel, making it necessary to wrap or insert two leads in each of these ground terminals if two sets of loudspeakers are used. The whole area is a bit cramped, but when one considers that these connections need be made only once, the problem is relatively minor. An a.c. convenience outlet comes next, followed by a fuse holder and a three-wire power cord (the third wire intended to serve as a local FM antenna by capacitive coupling to the a.c. line).

Internal Construction and Circuitry

Figure 1 shows the top view of the receiver chassis. In addition to the sealed FM front-end, there are separate printed-circuit modules for the AM and FM i.f. sections. The latter includes two integrated circuits as well as two phase-linear 5-pole sealed toroidal filters which require no alignment. The FM front end includes four tuned circuits, two dual-gate MOSFET's (for r.f. amplifier and mixer stages) and a bipolar transistor for the local oscillator. The multiplex decoder section utilizes a single multi-purpose integrated circuit plus one stage of preamplification and isolation from the i.f. output. Tone-control circuitry is of the "losser" type, while the power amplifier sections are transformerless, employing a complementary-symmetry circuit which, with the aid of positive and negative 35-volt d.c. supplies, results in the elimination of any capacitive coupling to the loudspeaker circuits. Heat-sensing diode arrays affixed to the output transistors limit driver current when and if the output transistors start dissipating too much heat. These and the line fuse constitute the only forms of circuit protection incorporated in the receiver, aside from the very stable forms of bias regulation and zener-diode control of critical supply voltages. Mechanically, the layout is logical and easy to service and the chassis itself is rugged and well planned. Heat sinks for the output transistors are more than adequate in size and no unusual heating problems were encountered during our extensive testing. The extra hole clusters visible at the top of Fig. 1 are used in the lower-powered TF-10/Special receiver mentioned earlier for mounting less powerful output transistors directly to the chassis in that case. All r.f. and control facilities remain the same in the alternate receiver, however.

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Performance Measurements

Beauty of external design is one thing, but when that excellence is accompanied by conservative specifications that are more than met in production units, a reviewer's job poses no conflicts at all. To put it succinctly, the VM TF-10/Deluxe Receiver met or exceeded every one of its published specifications and did very well by some of the specifications it failed to mention altogether. Clearly, VM, intent upon conforming scrupulously to IHF required specifications, failed to include some of the more recent specifications that most manufacturers feel are important albeit they are omitted in the somewhat antiquated IHF standards for tuners and amplifiers.

Figure 2 is a plot of FM monophonic performance characteristics. Note that IHF sensitivity was measured at $1.8 \mu\text{V}$, as opposed to the $1.9 \mu\text{V}$ claimed. More important, even, than the S/N of 75 dB achieved is the fact that S/N with a signal input of only 5 microvolts is already 57 dB, and 60 dB of S/N (the best figure obtained at *any* input with a great many receivers) is reached with a mere $7 \mu\text{V}$ of signal input—with still a way to go for ultimate S/N of 75 dB which is reached with a signal input of only $50 \mu\text{V}$. You couldn't ask for better quieting! Full (1 dB) limiting is reached at just about the same $1.8 \mu\text{V}$ as IHF sensitivity and THD decreases to 0.4% at any input signal greater than about $25 \mu\text{V}$.

While no "specs" are given for stereo FM separation, we plotted this characteristic in Fig. 3. Best separation of 35 dB was obtained at mid-frequencies and 30 dB of separation was maintained all the way down to 50 Hz with the high end decreasing gradually to 20 dB at 15 kHz. Next time, publish these figures, VM! They're nothing to be ashamed of.

THD and IM for the power amplifier section are plotted in Fig. 4. With both channels driven, we read 0.5% THD at 45 watts output as opposed to the 40 watts claimed. At rated output of 40 watts, THD was only 0.2%. At all power levels below 30 watts per channel, readings were below 0.05%. IM distortion reached 1.0% at an output of 45 watts per channel, decreasing gradually to under 0.1% at 1-watt listening levels and below.

Figure 5 combines plots of tone-control range, loudness-contour action (at 20 dB below full volume setting), high- and low-filter characteristics, and frequency response. We felt that the low-cut filter begins to "bite into" the mid-range a bit too early while the high-cut filter is just about where we like to see it.

Power bandwidth is plotted in Fig. 6

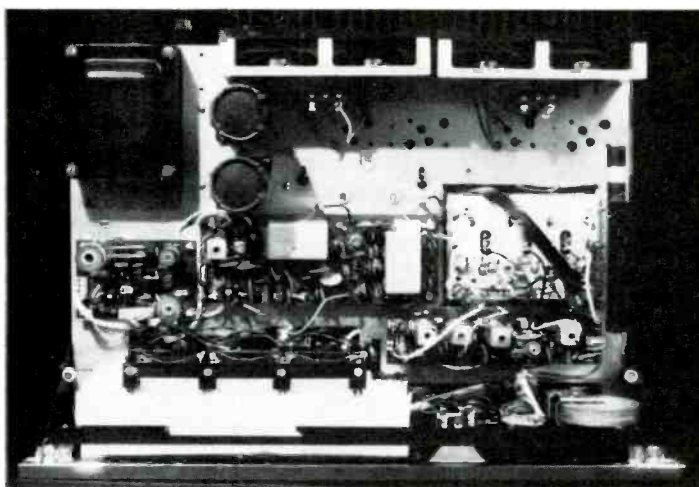


Fig. 1—Showing top view of VM receiver chassis.

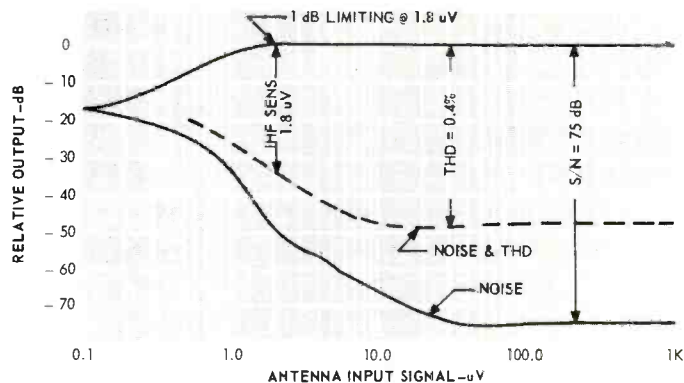


Fig. 2—FM monophonic performance.

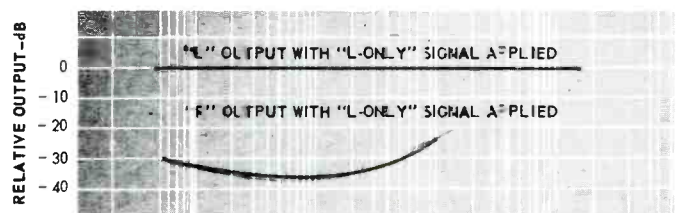


Fig. 3—Stereo FM separation.

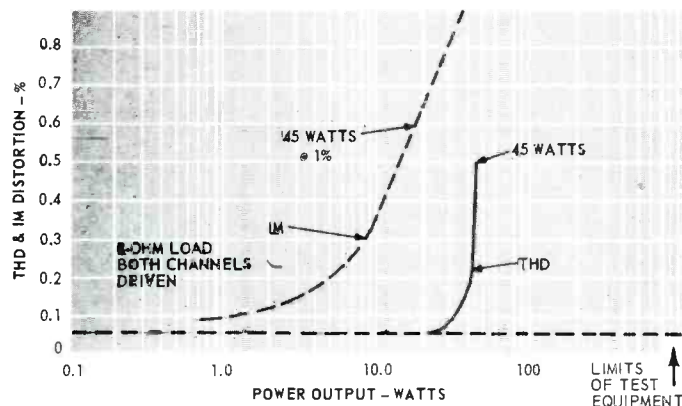


Fig. 4—Percentage of THD and IM distortion.

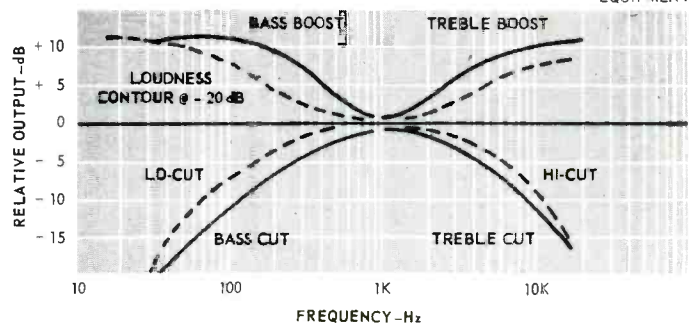


Fig. 5—Tone-control, loudness-contour, and filter characteristics.

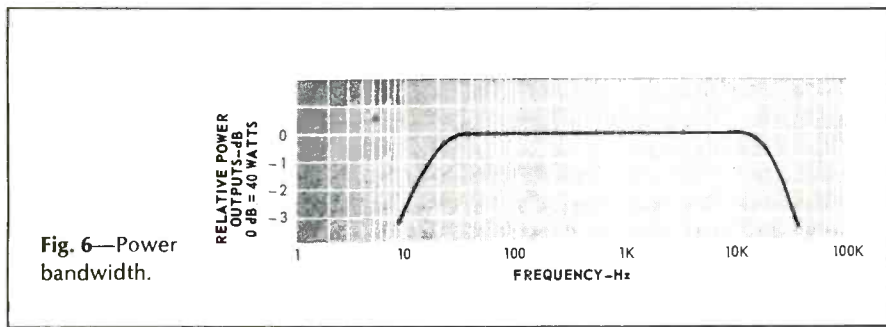


Fig. 6—Power bandwidth.

and extends from 9 Hz (as claimed) to 32 kHz (a bit better than claimed).
Listening Tests

In listening to the FM section of this receiver we were conscious of the excellent selectivity and overload characteristics of the design. We purposely used both indoor and outdoor antennas, to approximate all kinds of signal-strength situations. Of the fifty four stations received clearly with the high-gain outdoor antenna, only four were "disabled" when we depressed the "mute" control. Since the mute control threshold was measured as being at about 5 μ V, this suggests that the four stations previously heard (with mute out) were providing signal strengths at the antenna terminals of 5 μ V or less. Re-tuning to these four stations, we found them, nevertheless, quiet and listenable. That's what you get when limiting takes place at less than 2 μ V and when S/N rises as steeply as it does in the TF-10 receiver. The stereo indicator light, by the way, is absolutely positive. It's either ON or OFF—no flickering between stations.

AM reception was good, but not exceptional, and dial calibration for both AM and FM was extremely accurate from the low end to the high end of each respective band. In using the controls, we wish the loudness-contour and volume settings of the master volume controls were reversed. That is, we would have preferred to have to pull out the control to *introduce* loudness contouring, instead of the other way round, since, in our view, loudness contouring is a "sometimes" use, whereas normal volume control action is more often desired, but a user would soon get used to this reversed relationship. As long as VM went to the trouble of creating such dramatic lighting for their AM and FM dial scale, it might have been nice if they had some visible (illuminated) way of denoting AUX 1 & 2, Phono, etc. During the use of these facilities, the entire dial scale goes dark.

As for the power amplifiers, they provided good, clean sound to two sets of low-efficiency bookshelf speakers at dynamic levels which probably exceeded anything you'd want in your listening

area and there was no evidence of "breaking up" at low frequencies. Transients were crisp, and there was no sign of any muddiness with a variety of specially selected recordings which we used. The 60:1 damping factor, though not actually measured, certainly seems to be present. The sections of the master volume control tracked well, in that we did not require re-balancing by means of the balance control even at "whisper" levels.

While we have always been concerned with the completeness of customer instruction manuals, we learned a surprising lesson from VM's printed material which accompanies the TF-10 series of receivers. Instead of the usual "instruction manual," VM supplies just five single sheets of attractively printed information. The first sheet tells about installation (speaker and antenna connections, etc.). The next sheet (printed on only one side, mind you) tells all you need to know about actually operating the receiver and should be used with the third sheet—a pictorial diagram of front panel and rear panel with numeral-coded explanations of all the controls, jacks, and so on. The fourth sheet (again, printed one side only) tells about speaker selection considerations, while the final piece of literature, a single sheet folded in half to make a four-page brochure, lists features and specifications for the more technically oriented user to peruse at his convenience or leisure. A useful Technical Glossary is also provided, offering some ninety-one clearly expressed definitions of high fidelity terms. We tried out this "instruction sheet" approach with a couple of neophytes and, surprisingly, they were able to hook up the receiver and get it going in just a few minutes. Maybe the fresh thinking which VM applied to this excellent receiver extends to "instruction book" writing as well—and maybe VM, long experienced in producing merchandise for mass consumption can combine the best of both worlds as they enter the inner circle of componentry—for enter it they have—with the introduction of the TF-10 receivers.

L. F.

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Classical Record Reviews

EDWARD TATNALL CANBY

Berlioz: *Les Troyens*. Vickers, Veasey, Lindholm *et al.*, Wandsworth School Boys' Choir, Chorus and Orchestra of the Royal Opera House, Covent Garden, Colin Davis. Philips 6709 002 (5 discs) stereo (\$31.82).

I was in a way reflecting history when I found myself unable to get through all ten sides of this immense opera in one evening. It was never performed in its own time, a century ago; not until the late 1950s was the whole thing produced in a piece as Berlioz wrote it. Here, it is recorded complete for the first time in the notable Colin Davis Berlioz series. In effect, this is a brand new Berlioz work—his last, a quarter-century after the familiar “Symphonie Fantastique.”

The four-hour-plus span of the music was actually normal for the modernist of that day. “*Les Troyens*” is contemporary with Wagner’s “*Tristan*,” which is longer, and far from the first of Wagner’s enormous productions. But what a difference!

For one thing, France was much more conservative in its established national opera. French opera styles have always been rigid, as Mozart had found to his cost some ninety years earlier. Wagner too. “*Tannhäuser*” was a Paris flop at about the time “*Les Troyens*” was completed, in spite of revisions to fit French taste. (Wagner flatly refused to insert the traditional ballet!) Thus we can ascribe the failure to stage “*Les Troyens*” (except in a truncated two-evening version) simply to French conservatism in high places—which Berlioz himself had predicted. But there are profound differences, even so, between this monster and the parallel Wagnerian operas. In a sense, Berlioz is much more difficult to take *in toto*, so to speak, in one sitting. It has an altogether different sort of continuity.

The Wagnerian music drama is one huge, muscular whole, an architectural super-construction welded into a piece out of interwoven themes, the famed *Leitmotiv* fabric that unites voices and orchestra into one huge, continuous-flow mass of suggestive sound, carrying the senses along hour after hour in a vast sonic flood, a veritable Mississippi river. Mixed metaphors! No matter. For Wagner, one needs a dozen metaphors all at once. Typically Germanic.

But France has never really tuned itself to these gargantuan workings, in any of its arts. Where Bach wrote vast orchestral suites and huge variation structures like the Goldberg Variations for keyboard, Rameau and Couperin composed their French suites as assembled collections of beautifully made miniature pieces, and the same with variations. So too, oddly enough, with the great Berlioz in the heyday of immensity in music. A huge Berlioz work is huge in length and cumulative impact, but not in its structure, which is classically French, an assembled series of smaller pieces.

Indeed, “*Les Troyens*” is almost compulsively classical, for a last work by such a composer—it harks back to the jointed recitative and aria format of earlier operas, avoiding any show of *Leitmotiv* structure, scarcely even allowing a continuous flow; the music still breaks up into separate “numbers” approximately à la Gilbert & Sullivan (if we may take a musically poles-apart example). Thus—“*Les Troyens*” isn’t easy to follow in its grand lines. It is a vast variety show, yet deadly serious, a long sequence of “scenes” each more or less independent of the others; the inner continuity is a matter of subtlety and will not really hit you until the numberless recitatives and arias are familiar and in the memory. How long

will *that* take? All the time you can spare!

Fortunately, the recorded medium is ideal for this type of music. Play as much as you want at a time, with the libretto in hand (the language, again unlike Wagner, moves along smartly; the action is expanded naturally, at a normal “living” tempo, rather than by slowing-down as in Wagner). Quit when you must—it’s OK in this music. Take it up again later. The impact does *not* depend on cumulative, unbroken, hypnotic listening as in Wagner. It will hit you just as well with intervening breaks for relief.

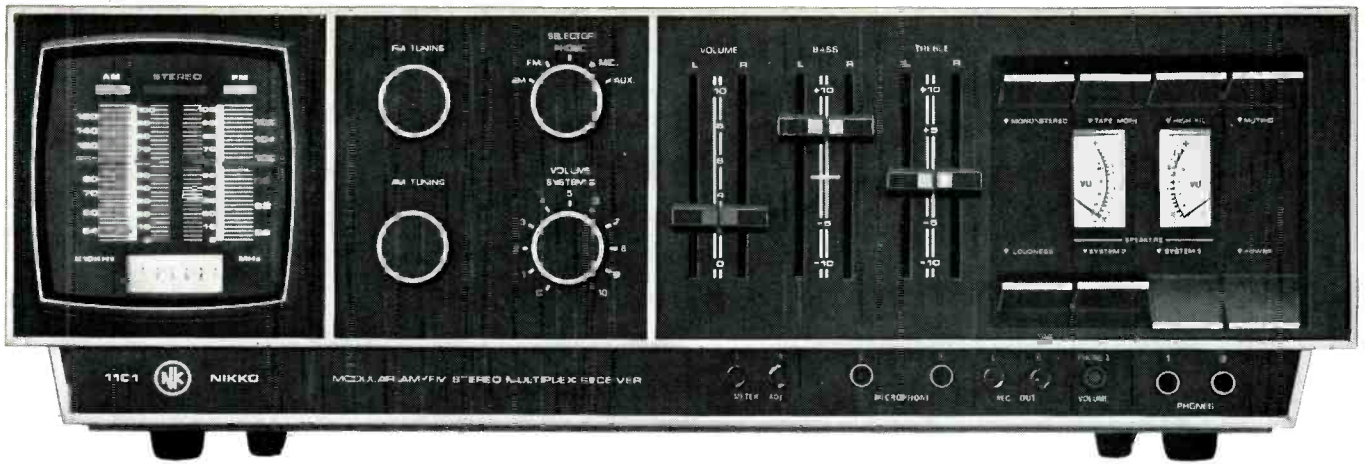
To tell the truth, I found a good deal of the music somewhat vapid in impact, the intensity not really backed by enough sheer musical content. It often happens, or seems to happen, in Berlioz, whose harmonic palette was, actually, as rigidly limited as that of Mendelssohn. I found that the big, climactic scenes—the holocaust of the fall of Troy with the Trojan women committing suicide right and left, the final immolation of Dido, forsaken by Aeneas in Carthage—left me cold, or lukewarm. Much horror, many diminished-seventh chords, more melodrama than most of us can take these days, though not a fault of Berlioz since this sort of thing went down well in the nineteenth century. The quieter scenes are more easily digested, and those of glorious pomp and circumstance. The horror scenes are overdone, as we hear them.

A superb, if unique, performance, out of that curious British affinity for French music that goes back through Sir Thomas Beecham, who did great Berlioz in his day. It is hard to imagine a better-tailored rendition of the sense of the huge work, with a classic restraint which is precisely right for French music (would *we* ham it up!) and yet enough tension to project everything that Berlioz has to offer. Even the vocal sounds are somehow French, though the French accents are a bit dim, to put it mildly. The two chief ladies, Cassandra in the first part (Berit Lindholm) and Dido in the second (Josephine Veasey) are triumphantly good. Their joint foil, Aeneas (Jon Vickers) is a somewhat nasal disappointment—but perhaps only too accurate to the conception of that hero, a rather colorless pawn of the gods (exactly as in Purcell’s “*Dido and Aeneas*” of the middle 1600s), who shows very little character of his own.

The album is winning every known prize for excellence, and surely deserves it on every ground, both musical and technical.

Performance: A—

Sound: A—



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Wilhelm Backhaus—Beethoven Sonatas Nos. 16, 22, 27. London CS 6639 stereo (\$5.98).

Wilhelm Backhaus Memorial (1908, 1927, 1938). Parnassus 3 mono (130 Arnold St., Staten Island, N.Y. 10301).

Readers of Our October issue (p. 64) will note that I used the present tense in describing Wilhelm Backhaus as "the grand old man of the recorded Beethoven Sonata." No—he did not die between the writing and the publication of those words; he was already dead. But his records were still coming forth, brand new. Like the Columbia discs of the Philadelphia Orchestra and the RCA discs of the Boston Symphony.

As has often been observed in these columns, recordings are in a special sense *timeless*. 99 per cent of them have no specific connotations of any particular moment in time (or, for that matter, in space) as we actually listen. They exist basically in the present; for that is their impact on us. *They are happening as we listen*. And they happen again as we listen again.

Thus the "present" in terms of new recordings is always to some extent the past and, more often than not, we listeners do not even know—or care—how far, or in what circumstances. Reviewers often thus refer to the past in the present tense, because *that is the way we listen*. Do we say "Shakespeare is the greatest English dramatist," or "Shakespeare was. . ."? Does it make much difference?

Wilhelm Backhaus died in mid-1969, with his record-making career (in both senses of that term!) still up to date in full *ffrr* stereo. It covered (covers) a time span of more than sixty years, the longest ever. The first of the above records is a new release—Backhaus is still coming out with new material and his career in its disc form is not yet completed. The second disc, the Memorial, includes an item from his first set of recordings, put down into wax by the acoustic process in the year 1908. Unbelievable! He was then 24.

For general comment on the current London *ffrr* Backhaus in stereo see again my review of October. It applies to the sense and "feel" of this later issue in the series, the sonatas No. 27 (Op. 90), No. 22 (Op. 54) and No. 16 (Op. 31, No. 1)—the same elderly Backhaus, in his eighties, a bit clumsy but astonishingly vigorous and Beethoven-wise in an elder-statesman way.

The Memorial album is, of course, an LP reissue of early electric and acoustic 78s. In sonic quality the recordings aren't too good, as old piano recordings go; one hears little distinction between the Brahms of 1927 and the Schumann

of 1938. But the sense of the playing is easy to get, and the quality of the younger Backhaus pianism. Yes, his finger technique was fabulous in those years, rivalling perhaps Hoffman. Top musicianship, too, a sense for the grand line and flow, as in the later recordings. Also a few mistakes here and there (they were let pass on 78s, remember), again as in later recordings! The mannerisms of an earlier time are also apparent—young Backhaus takes "liberties" with strict printed time values in the style of the day, reminding us of Cortot, of Mengelberg, or any number of pianists on the restored player-piano recordings. Nobody plays that way now. Styles of playing do change.

The fluency and "rightness" of the very early Chopin (Fantaisie Impromptu Op. 66) and the big Schumann Fantasia in C (Op. 17) are immediately striking. It was an age when such music could be played naturally, within the still-modern Romantic movement. The 1927 recording of the Brahms "Paganini" variations, still a pianist's showpiece today, is played with an almost French lightness and speed—Brahms with a touch of Chopin. Enlightening.

The LP restoration, obviously a labor of love (with pages of typed-out annotation), may or may not be "authorized"—but who can object to a reissue that otherwise might never be made? I'd ask for a bit more scratch and a bit less filtering. Some of us prefer a faithful rendition of the older discs, even including the scratch. (The 1908 Chopin has a curious ringing background sound which must be from the original turntable's mechanism, judging from its frequency range.)

Performances: A *Sound:* B-; C

Zukerman Barenboim. Mozart Violin Concertos No. 4 in D, No. 5 in A ("Turkish"). Pinchas Zukerman; English Chamber Orch., Barenboim. Columbia M 30055 stereo (\$5.98).

"Genius meets genius" says Columbia in its best pompous style. Two of today's "most acclaimed" musicians. Perhaps these inspired words put me off to begin with. Ugh. Who isn't *acclaimed*, these days?

But there is more that is disturbing here, perhaps because, just maybe, our older ears are all wrong and this new-style Mozart is nearer to the "original" than the Mozart we have been accustomed to. I'm frankly in two minds about it. I recognize the change, and recognize what it gets away *from*—the old "neo-classical" way, the too-precious Mozart, making of his music a sort of miniatur-

ized collection of gem-like bits, as compared to "real" music like, say, the Tchaikovsky Violin Concerto. That, surely, was a false approach (and we must remember that Tchaikovsky worshipped Mozart). But what do we have instead of the old gem-like miniature perfection?

We have what seems to me a lack of any real style. These youths (22 for the violin, 28 for the conductor) bring Mozart up to full size and bigger. Not a bad idea in itself. They bring out every bit of implied emotion, overtly. Not so good. But even more, they somehow apply an indeterminate mixture of playing styles, now suggesting Tchaikovsky or Lalo, now Beethoven, now what-have-you. Mozart's undeniable innovations are played up relentlessly—the slow introduction, ultra-slow, played for all its worth, for instance, the cadenzas drawn out unconscionably and all out of proportion, each of the undoubtedly serious bits of sudden chromatic expression done up like Brahms, portentously, pointing up the Significances. And yet that over-all tension of melodic shape and of harmonic structure which makes fine music out of these concerti is lamentably missing; the phrasing of the melodies is for my ear haphazard and unconsidered, therefore lax. (Long notes in the violin, short ones in the orchestral repeat of the same phrase, for instance). And there is the matter of tempo. Yes, perhaps it used to be too fast; now it goes snail-like. The "Turkish" minuet lumbers like a Bach-Stokowski fugue, the opening movements which should sparkle are merely neutral, neither sparkling nor heavily serious, the intense successions of key-change harmonies in the development sections seem slack and casual, as though they weren't going anywhere. The whole slowed-down flow lacks shape and continuity.

Generally, the new Romantic approach is a healthy reaction to past excesses in a lot of classical music, I'll admit. We covered up too much, resorted to a kind of refined, rarified polish that younger musicians find as distasteful as so much else in the older point of view. The trouble here, again, is that a definite approach is replaced by a fuzzy one in terms of artistic coherence. Merely being honestly, openly, unashamedly Romantic isn't enough—even for Romantic music, let alone Mozart.

I probably exaggerate. You'd better try out this Mozart for yourself. After all, both young artists are top technicians and the English Chamber Orchestra is England's best.

Performance: B- *Sound:* B

(Continued on page 83)

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RICHARD FREED

Music for Christmas

CERVANTES' *Don Quixote* is said to have inspired at least 50 works of music and Shakespeare's *Romeo and Juliet* almost as many, but no theme in literature, history, or religion has given rise to anything like the quantity of music brought forth by Christmas. Joyous holiday pieces abound, as do settings of the Christmas liturgy, secular works in virtually every form relating either to the story of Christmas or the celebration of it, and, of course, the famous carols, some of which are by unknown authors.

There is certainly no scarcity of Christmas music on records, with more than a dozen current versions of Handel's *Messiah*, as well as substantial representation of other titles ranging from the *Christmas Oratorios* of Heinrich Schütz and J. S. Bach and the *Christmas Concertos* of Corelli and his contemporaries to Tchaikovsky's ballet *The Nutcracker* and Humperdinck's opera *Hänsel und Gretel* (both created as Christmas entertainments for children) to latter-day classics such as Menotti's *Amahl and the Night Visitors*, Irving Berlin's *White Christmas*, and Johnny Marks' *Rudolph the Red-Nosed Reindeer*. There are also, of course, countless collections of the great carols—*Silent Night* and all the rest, in various arrangements, some simple, some elaborate, for voices and/or instruments. I would not attempt to evaluate or even to catalogue the many recordings of these durable favorites, which is neither possible in the space available nor in any way necessary, but intend to expatiate instead upon some of the less conspicuous of the really exceptional discs for Yuletide listening—the best of which, of course, are no less welcome in July than in December.

Some of the records on my own list of unhackneyed Christmas music will not be found in the *Schwann Catalog* for one reason or another, and some are not really Christmas material but nevertheless seem to fit the spirit beautifully—a spirit exemplified in large measure by the descriptive pastorales of the Italian baroque and by

the traditions of "English good-fellowship" (to borrow an apt expression from Sir Edward Elgar) which antedate Dickens and survive gloriously in the Britain of Britten. I see that what I regard as the most attractive record ever made of Christmas carols in their (more or less) original state was deleted last year, but that one of the least-known but most ingratiating of all the Italian *pastorales* has just made its belated first appearance on microgroove. Neither one is too easy to find at the moment, but both are very much worth a hunt. Let's begin with the carols, for many of the more elaborate works begin with them, too.

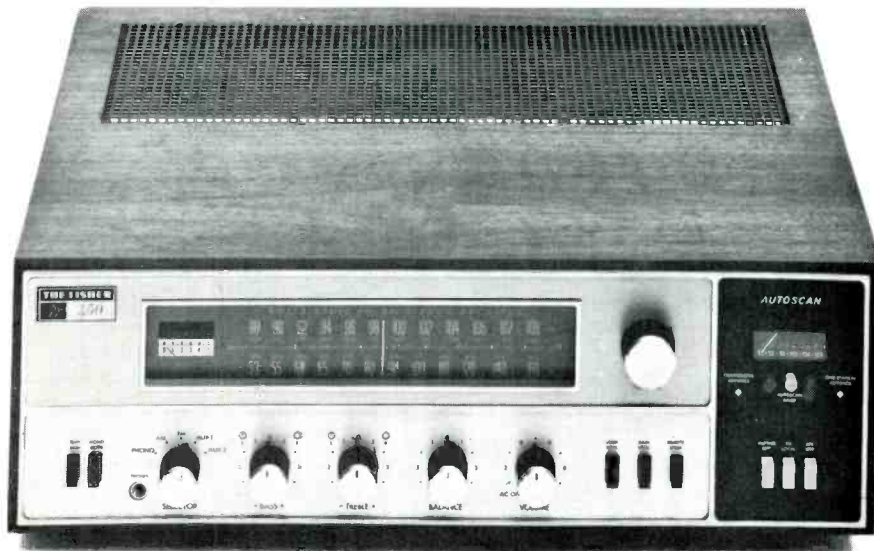
In the spring of 1966, Columbia introduced a new low-priced label, Crossroads (nominally a subsidiary of Columbia's full-price subsidiary label, Epic, but such details are undoubtedly more meaningful to the people at CBS than to us), created expressly for the release of recordings made by Supraphon in Czechoslovakia. A year ago that affiliation was allowed to expire, and Columbia not only withdrew all its Supraphon material (there was some on the Epic and CBS labels too), but deleted the entire Crossroads catalogue, which by then numbered about a hundred items. In many ways the most notable of those cut-outs was the collection titled "The Christmas Carols of Europe," in which Miroslav Venhoda conducted the Prague Madrigal Singers and a small instrumental ensemble, with the great tenor Beno Blachut as soloist in two of the Czech songs and the English *Good King Wenceslas*. One side was devoted entirely to Czech carols—15 of them, in arrangements by Miroslav Klement—the other to a total of 16 from no fewer than 14 lands, among which only the German *Es ist ein' Ros' entsprungen* and the aforementioned *Wenceslas* were likely to be at all familiar. The remaining 14 were gems, all of them, but especially the Yugoslav *Rajsko strune zadonite*, a duet for soprano and alto with bagpipes, the French

Nous étions trois bergerettes, sung by two sopranos and an alto with clip-clop accompaniment, the vivacious Spanish *Los animales ante el Nacimiento*, sung by alto Marie Nemcová with tambourine and (evidently) krummhorn, Blachut's lively solo in *Pásli ovce Valasí*, with recorders and fiddles, and the rousing Czech *Gloria* for the whole chorus of sixteen voices and most of the instruments. The other countries represented were Belgium, Greece, Italy, Bulgaria, Sweden, Norway, Austria, and Poland. The number was Crossroads 22 16 0054 (also issued in mono, 22 16 0053): a record absolutely not to be missed, should you be lucky enough to find a copy.

Another victim of the scuttling of Crossroads was a pairing of Britten's *Ceremony of Carols*, sung by the Prague Radio Children's Chorus under Bohumil Kulinsky, with Honegger's *Christmas Cantata*, in which Serge Baudo conducted the Czech Philharmonic Chorus and the Prague Symphony Orchestra. Both sides were exceptionally well done, and this disc, too (Crossroads 22 16 0154), is worth picking up if you come across it, but there are, of course, several very attractive current versions of the Britten, and the late Ernest Ansermet left us a splendid account of the Honegger, packaged with his performance of the same composer's Second Symphony (the one for strings and trumpet) on London OS-25320.

Une Cantate du Noel was Arthur Honegger's last completed work, and it well may prove to be the one by which he is best remembered. It is invariably moving in its apparently artless swirl of German, French, and Latin hymns (including *Es ist ein' Ros' entsprungen*, *Vom Himmel hoch*, *Il est né le divin enfant*, and *Stille Nacht*), and Honegger's imaginative use of the children's chorus with the adult chorus, baritone solo, and an orchestra smaller than the listener might imagine. Although fairly straightforward in construction, this

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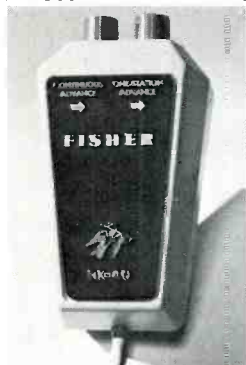
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is no mere jumble of familiar tunes, nor is the adjective for it "colorful"; it is a mysterious, exultant, and exalting work, one of the really great examples of Christmas music and perhaps, after all, Honegger's true masterpiece. The instrumental component of this performance, of course, is the Orchestre de la Suisse Romande, the baritone is Pierre Mollet, and the overside symphony, with its overtones of spiritual affirmation, is an appropriate companion-piece.

Making use of actual carols is an old and happy tradition. During the Renaissance, dozens and perhaps hundreds of composers made successful blends of "popular" and "serious" music in this way, some using only the words of the carols and creating new musical settings for them, others using the melodies of the carols (and, for that matter, other popular songs) in their masses and other sacred works. One of the most fascinating of all Christmas records is one released in Deutsche Grammophon's Archive series seven years ago under the title "Ten Christmas Carols in Arrangements from the Time of Praetorius." Thirteen composers are represented, some of them more than once and seven of them by their settings of the respective verses of a single carol. One of the ten carols is performed by a huge group composed of four choirs, a wind quartet, four each of recorders, trombones, and *viole da gamba*, a lute, harpsichord, two organs, and offstage trumpets and drums. Another is given in an affectingly simple setting for solo soprano and krummhorn. Among the performers are soprano Margot Guillaume, tenor Helmut Krebs, a boys' choir from Eppendorf, the Town Choir of Hamburg, and an instrumental ensemble under Adolf Detel. Aside from its Christmastime appropriateness, this disc (SAPM-198816) is a brilliant sampling of Renaissance music, its vitality and its sounds, studded with interludes and fanfares played on such instruments as the zink, pommer, dulcian, clarino, rauschpfeife, krummhorn, and bassbumbarde.

The final selection on that Archive record is Michael Praetorius' setting of *In dulci jubilo*, from his collection *Polyhymnia caduceatrix et panegyrica*; four other excerpts from that collection may be heard on a new Nonesuch record in performances by a similarly vast array of vocal and instrumental forces under the direction of Wilhelm Ehmann. These elaborate settings (Praetorius and his contemporaries called them concertos) represent the peak of Praetorius' achievement; the four on the Nonesuch disc (H-71242) are *Puer natus in Bethlehem*, *Vom Himmel hoch*, *Omnis mundus jocundetur*, and *Als der güttige Gott*.

The reverse principle is demonstrated exquisitely in Marc-Antoine Charpentier's *Midnight Mass for Christmas*, constructed on the themes of several of the best-loved French carols of the 17th century. Two recordings of this work are listed in the *Schwann Catalog*, but the most effective one is not: it is the one issued by the Musical Heritage Society, in which Louis Martini conducts the Jean-François Paillard Orchestra, with soprano Martha Angelici and Edith Selig, counter-tenor André Meurant, tenor Jean-Jacques Lesueur, bass Georges Abdoun, and the chorus of the Jeunesses Musicales de France; the organ interludes are played by Maurice Duruflé (MHS-522).

Another MHS release is of interest here, even though none of the music on it has anything to do with Christmas, according to its titles for I can think of few records of any kind whose character is so eminently well suited to the kind of listening one tends to favor at this season. On this new record (MHS-1060) Paillard conducts his own orchestra in three works each by the German composers Johann Pachelbel (1653-1706) and Johann Friedrich Fasch (1688-1758). The first of the Pachelbel



pieces is the Canon in D major by which that composer is most likely to be identified. To be sure, it has been recorded before, but never with so striking an effect. It is radiant in its simplicity, with the violins carrying the serene, long-breathed melody over an uninterrupted pizzicato accompaniment by the violas, a droning cello, and a harpsichord whose contribution is imaginative but unobtrusive. The word "enchancing" is bound to turn up sooner or later in a discussion of Christmas records, and it could not be more fittingly applied than to this recording of the Pachelbel Canon—only seven minutes long but more than enough on its own to make this disc downright irresistible.

There is more to it, though, and, while perhaps less stunning than the Canon, the other pieces are in every way worthy companions to it. The Fasch side opens with a jubilant little Concerto in D for trumpet (played by Maurice André), two oboes (Pierre Pierlot and Jacques Chambon), strings and continuo, followed by a four-movement Sinfonia in G which is in everything but nomenclature a Christmas Concerto. One might

almost say as much for the Sinfonia in A major which concludes this side and the two five-movement *Partias* on the Pachelbel side. Everything on this record exudes a Christmasy air of peace, warmth, confidence, and good cheer.

Musical Heritage Society records are not listed in *Schwann* because they are sold by MHS itself by mail instead of being offered in stores. (Music Masters in Manhattan and perhaps one or two other shops do stock MHS discs, but they are not otherwise distributed to retailers.) No serious collector can be without this company's catalogue, which represents the largest single collection of high-quality, low-priced discs, with emphasis on the less familiar repertory. MHS produces some of its own recordings but most are derived from such prestigious European sources as Erato, Amadeo, Supraphon, and Angelicum.

The Italian baroque Christmas Concertos everyone knows are those of Corelli (the best-known of all), Torelli, Locatelli and Manfredini, all four of which have been packaged together on a single disc more than once. One of the loveliest though, if one of the least-known, is the Christmas Symphony of Gaetano Maria Schiassi (1698-1754), a work recorded by the Arthur Fiedler Sinfonietta some thirty years ago, when the conductor of the Boston Pops was recording Bach, Mozart, Telemann, and Hindemith with his hand-picked group. This was, in fact, one of the 78s reissued by request in Victor's "connoisseurs' series" shortly after World War II, and it was hoped for 25 years that it would be transferred to LP or that Arthur Fiedler would rerecord it. Neither happened, however, and it has taken until now for the Schiassi to be recorded again.

The new recording is not yet in the *Schwann Catalog*, but it happens to be on the Schwann label, in the "Musica Mundi" series issued by the Düsseldorf publishing house L. Schwann. Under its original title, *Pastorale per il Santissimo Natale di Nostro Signore Jesu*, the Schiassi is part of a collection headed "Festliche Weihnachtsmusik grosser Meister," performed by the Cologne Chamber Orchestra under Helmut Müller-Brühl. Also on the disc (VMS-806) are the "Shepherds' Christmas Music" from Bach's *Christmas Oratorio*, an orchestral arrangement of the Chorale "Jesu, Joy of Man's Desiring" from Bach's Cantata No. 147, excerpts from Handel's *Messiah*, the aria "Et incarnatus est" from Mozart's Mass in C minor, and the little interlude "Nuit" from Charpentier's oratorio *In Nativitatem Domini Jesu Christi*. Soprano Sylvia Meinardus is heard in the Mozart and Handel arias.

The Schwann "Musica Mundi" records are in very limited distribution in this country as imports (this one may not even have arrived here yet), at the hefty price of \$6.98 per disc. Since this catalogue includes so many other interesting titles not otherwise available, such as the Dvorák *Notturmo for Strings*, Mendelssohn's early Violin Concerto in D minor, Beethoven's *Musik zu einem Ritterballett*, and several symphonies and concertos of Haydn (the slogan on the label is "Unbekannte Kostbarkeiten"—"Unknown Treasures"), it would be gratifying if some U.S. company were to make the Schwann productions available on a domestic label (perhaps Nonesuch, Vanguard, Victrola, or MHS). In the meantime, the Schiassi is probably worth the price.

The last record on my list has only the most tenuous connection with Christmas, but it will suffice to justify its inclusion, for it is one of the most unusual releases of 1970 or any year in many ways. Though it may not be among the most "important," its uniqueness and charm could make it the most appealing to listeners of various musical persuasions. It is London's "Salute to Percy Grainger," in which Benjamin Britten is heard either as conductor of the English Chamber Orchestra or as pianist in 14 of Grainger's marvelous settings of British folk music, abetted here and there by tenor Peter Pears, baritone John Shirley-Quirk, pianist Viola Tunnard, and the Ambrosian Singers.

The Ambrosians are heard unaccompanied in the one "Christmas" piece, *There Was a Pig Went Out to Dig* ("on Christmas Day in the morning"). The most exciting piece in the collection, as well as the longest, is the *Scotch Strathspey and Reel*, a free-wheeling fantasy for chorus and orchestra on *What Shall We Do with a Drunken Sailor* and several other Irish and Scottish tunes. The loveliest, without doubt, is the haunting *Shallow Brown*, sung by Shirley-Quirk with the orchestra, but Peter Pears in *Willow Willow* is hardly less touching. The orchestra alone plays *Shepherd's Hey*, *My Robin Is to the Green Wood Gone*, *The "Duke of Marlborough" Fanfare*, and *Lisbon*. Chorus and orchestra are heard together in *The Lost Lady Found* and *I'm Seventeen Come Sunday*; Pears and Shirley-Quirk each sing one more song with the orchestra, Pears sings two with Britten at the piano, and Britten and Viola Tunnard play *Let's Dance Gay in Green Meadow*. Far more than the mere titles or any description can possibly suggest, this record (London CS-6632) is desert island stuff, and Christmas Day is the perfect time to get acquainted with it. **AE**

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TITLE	CONTENT	SOUND
Grieg: <i>Magic of Norway (Symphonic Dances Op 64; Norwegian Dances Op 35)</i> . New Philharmonia, Morton Gould. RCA LSC 3158 stereo (\$5.98).	Grieg didn't like being typed as a miniaturist, wrote these larger pieces, out of collected folk dances, partly to show his symphonic stuff. Not too good—nice tunes but the connective tissue is over-blown, dated in its fussy harmonies, dreadfully pompous. Gould tastelessly exaggerates the pomp in a driving performance. Quiet parts are nice.	The sound is absolutely enormous, matching Gould's interpretation. Hi fi and all that; but vast dynamic range and big reverb make relaxed listening difficult. Good example of hi fi energy gone to waste! (Unless, of course, you ignore the music and just listen to the fi.) (Op. 35 was orchestrated by Hans Sitt, in Grieg's style but not nearly as well.)
<i>Victoria de los Angeles—Songs of Catalonia</i> . Orq. Ciudad de Barcelona, Lamoureux Orch., Ros-Marbá. Angel S 36682 stereo (\$5.95)	A dream disc—even if the music isn't too profound. De los A. is at her finest, sensuously beautiful, marvelously true in pitch, the music old fashioned, opulent, impressionist (cf. "Songs of the Auvergne" of Cantaloube) but lovely of its sort, with a fine, sad Catalan atmosphere.	The E.M.I. (Angel) stereo technique somehow remains conservative, the orch. at a mellow over-all distance and blend, stereo mostly in the room sound, the voice fairly close but with space. Good for this impressionist atmosphere.
<i>Rosa Ponselle as Norma. (And other items.)</i> 1924-1929. RCA Victrola VIC 1507 mono (\$2.95)	Whether you go for this depends on your operatic stance. Ponselle is an American opera saint, and for opera lovers she did no wrong. Others may find her singing something less than neutral in terms of pitch, diction, general accuracy. Suit yourself!	These are all, I think, very early electrics, from 1924 to early 1929, with that curiously dead acoustics which makes them sound like non-electrics. Two have never been released before.
<i>Franck: Symphony in D Minor</i> . Orch. de Paris, von Karajan. Angel S-36729 stereo (\$5.98).	The Austrian yoga-swim-ski-mountaineering maestro, so un-French, does a splendid job with this old war horse, thanks in part to a crack French orch. that knows the tradition. Best Franck in years!	The Angel conservative stereo is good for Franck, too—a big space, the music at a distance, much stereo room sound, not much separation. Suits the Franck mistiness perfectly.
<i>Beethoven: Symphony No. 7</i> . New York Philharmonic, Toscanini (1936). RCA Victrola VIC 1502 mono (\$2.98).	The most famous of recorded Sevenths in its fifth release format. Surprisingly like the Dorati, above, but faster, more furiously intense—Toscanini at his middle-period best, super-Italian, high-powered, mesmerizing his orch., driving the music forward. It is "definitive"—for this particular approach to Beethoven, at least.	A very dead-sounding Carnegie Hall, as in most oldies. Mike placement?? Done in two straight run-throughs (alternating 78 wax cutters) without usual 4-minute breaks, unusual for the time. The musical sense is clear but the sound is thin, unfocussed, ugly in loud parts, lacking in detail. We've come far since 1936.
<i>Beethoven: Symphony No. 7</i> . London Symphony, Dorati. Mercury SR 90523 stereo (\$5.98). <i>Beethoven: Symphony No. 9</i> . Harper, Watts, Young, McIntyre, London Symphony Orch. & Chorus, Stokowski. London Phase 4 SPC 21043 stereo (\$5.98).	Two splendid recordings, newly alive thanks to impetus of the 200th anniversary. Both are in super-modern close-up stereo, wide dynamic range, ultra-clear—taking maximum advantage of this to project Beethoven's tremendous contrasts. The Dorati Seventh is the finest I know, expressive, accurate, full of life, beautifully recorded for inner details in the over-all. Stokowski's Ninth is a laugh—a superb one. Huge, portentous sound, vast space, close-up details. Heavy drama but fresh and effective. making the most of the music's potential for show. Last movement is cornily glorious!	
<i>Britten: Songs from the Chinese. Dodgson: Four Poems of John Clare. Elizabethan Songs (Dowland, Pilkington, etc.)</i> Wilfred Brown, tenor, John Williams, guitar. Odyssey 32 16 0398 stereo (\$2.98).	A curiously mis-cast record. The two Britishers do two modern tenor-guitar pieces—great success, and good listening! But the biggish, quavery modern tenor voice is all wrong for the Elizabethan songs, which need a small, simple, accurate voice to match the proper lute sound. (Not guitar.) Brown's voice, like Peter Pears', is fine for the modern music, impossible in the old. When will the English vocalists discover this? (The Germans long since have. They match voice to music.)	

Salute to Percy Grainger from Benjamin Britten. Peter Pears, John Shirley-Quirk, Ambrosian Singers, Viola Tunnard, Engl. Chamber Orch., Britten. London CS 6632 stereo (\$5.98)

Here's one of your Anglophile friends or your own British self, a curious (from the American viewpoint) reverence by a top group of pros in the British musical world for one of their own. Percy Grainger is "acclaimed" over here mainly for that dreadfully sprightly little tidbit the "Shepherd's Hey," but in his long life Grainger produced a great deal more than that, though virtually all of it was concerned with British folk music of one sort or another. The assorted settings on this record—with no less than Benjamin Britten in charge—range from "Shepherd's Hey" itself sounding remarkably insignificant, to a grandiosely humorous "What Shall We Do with the Drunken Sailor?" and a sorrowful "Willow Willow," that superb song which inspired the G & S satire, "Tit-Willow" in "The Mikado."

Grainger was an early folksong enthusiast, of the Vaughan-Williams, Holst, and Cecil Sharpe generation. His "innovations"—they need quotes today—were in the use of assorted chamber-sized instrumental groupings for the setting-forth of country folk tunes in proper concert-music garb. He is wholly of the school that took it for granted folk song must be transformed into "classical" format, and it is precisely this which so thoroughly dates him, at least for Americans. The more so in that his very professional settings are, nevertheless, somewhat derivative, over-lush, overdone (as we hear them) and out of that Elgar-Delius school of British music which has never made much headway with our ears, here on the American continent.

Performance: B

Sound: B

Thomas Schippers—Carl Philipp Emanuel Bach. (Concerto in For Two Pianos; Concerto in G for Organ and Strings.) Thomas Schippers, Barbara Blegen, pianos; T. Schippers, organ; N.Y. Philharmonic, Vienna Baroque Ensemble. Columbia MS 7427 stereo (\$5.98)

This brilliant, high-styled Schippers record—he both conducts and performs, in both concertos—puts old Bach's somewhat introspective middle son into modern concert-hall perspective, à la Philharmonic Hall, a setting that is unusual for this composer, who doesn't often rub elbows with Brahms, Rach-

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HOW'S *your* HYPOCRISY LEVEL this season? How many times have you, all of a sudden, thought about "peace on earth" or "good will toward men"? Amazing, isn't it, how the bulk of the year can slip by without once thinking seriously (at least seriously enough to be prodded into some positive action other than tossing pennies into a cannister) about helping, *really* helping, someone outside your immediate family or circle of friends. Somehow, though, the Christmas season causes just enough guilt to make us want to rectify our apathy, or non-involvement, for the past 11 months. Which is okay, or would be, if we don't backslide next month, retreat into our plastic shells once again.

Maybe that's what "Now Music" is all about, making our self-image a wee bit more real, more honest, helping us through chords and lyrics to understand the simplicity-complexity of the world around us . . . and doing it 12 months a year. Maybe that's why the blues, stemming, of course, from the depths of the black experience (but by no means limited to that color skin), have reached new heights of popularity. Perhaps that's why lyrics that deal with issues rather than moon-June-spoon platitudes and niceties are again coming to the fore. Perhaps that's why performer-writers such as Dick Holler, who was reared in the Bayou country of Louisiana, are pressing discs.

SOMEDAY SOON (Atlantic, SD 8268) is Holler's first LP for the label. On it are 10 tunes he wrote himself, then arranged in conjunction with Phil Gernhard. There's a strange sort of magnetism in his gruff voice (with its distinct country flavor), despite it not being trained or particularly good, but the real appeal is in his lyrics, compelling by their candidness. Often, the listener finds the folksy album, with its overtones of soft rock, difficult to take. But then, truth frequently is.

Most of Holler's songs seem to combine the lyrical beauty (and meaning) of a Tom Paxton with the caustic wit of a Phil Ochs. The result, naturally, is that the troubadour gets through to the listener, even if the latter doesn't wish it.

Case in point: "Little Joe (They're Out to Get You)," which neatly portrays the trap that many consider life to be. The tune is a poignant tale of a man pursued, in quick succession, by a girl, the government (which teaches him to kill, in Vietnam), and the cops (after he kills a man in a bar, almost out of habit resulting from his war experience). Obviously, it is also a commentary on the violence in our society. Not the kind of thing you like to think about at Christmas, but, then, can we stop future Vietnams if we don't expend *some* mental energy in that direction?

"Walk With My Friend" also is timely, for it explores how our hypocritical attitudes allow us to exploit others under the guise of friendship, our real goal all the time being a selfish one.

"Mother, Where's Your Daughter"—sung in medley with "Where Will the Love Come From?"—deals with the communications and generation gaps, pointedly aiming at the lack of touch between parents who seek a "green and gold existence" and offspring who speak "of love and peace."

"My Friend Joe" takes a potshot at bigotry via a ballad in which "a token spade" is hired by a company to avoid the loss "of federal aid." Joe, the hero of the piece, is a pleasant, soft-spoken, efficient worker (who ultimately is replaced by *two* men) passed over for promotion because of his color. "They'll start him at the bottom, and make damn sure he stays there," sings Holler.

Revolutionary, but in low-key, is "Fat Daddy," which tells of exploitation by Big Money men and the inevitability of a new wave taking over. In country-rock format, it hammers away at the theme:

*"Big Daddy, you got your people
Established up on the wall.
But every time one of your people
dies,
You will find one of my people rise
Up to take his place laughin' in
your face."*

And Holler's biggest success, the poignant "Abraham, Martin, and John," of course, is one more anti-violence plea, this time directly lamenting the assassinations of Dr. Martin Luther King Jr., the Kennedy Brothers, and Abraham Lincoln.

But the writer's best number is another country-rock opus, "Hey-Hey-Ho," which blasts the many double standards extant in American life:

*"You bringin' me down with your
preachin',
While your eyes give me bloodshot
looks.
You just voted down a school bond
bill
And you're tellin' me to hit the
books.
You're knockin' my clothes, but
you ain't showed me
One damn thing to do with a tie.
I'd really like to believe you, man,
But it's a well known fact that you
lie.
Hey-Hey-Ho, let's all go
Get drunk at the football game,
Make a little with your secretary,
And tell me who's to blame.
You pop more pills than I've
ever seen,
Your doctor says it's all right.
You run straight for your medi-
cine cabinet
Everytime you're gettin' uptight.
You wring your hands and curse
the Jew
And the black and the yellow
and red.
You blame everything on the
hippies,
Look in the mirror instead."*

Oh, yes, middle class America, it's a game of mirror, mirror on the wall, tell us who's most hypocritical of all.

Your answer, of course, is the same as it always is—and highly appropriate to the season: Bah, Humbug!! But why worry, Christmas comes only once a year, and Christ was removed from the season a long time ago. Just listen to those cash registers play "Jingle Bells."

CAPSULE CRITIQUES

... EARL GRANT (Decca, DL 75223) is the organist-pianist-vocalist's final disc of new material, for he died in an accident only a few days after taping. The liner notes say he considered it "the best work he had ever done," and this time the flacks may be right. Among the ten tunes are two calypsos, "Elizabethan Reggae" (with classical overtones) and "Model 'A' Reggae," an interesting combination of soul and country & western (Joe South's "Walk a Mile in My Shoes"), and a couple of vocals that sound much like Nat King Cole, "Looking Back" and "My Cherie Amour."

... BILL COSBY 'LIVE' (UNI, 73082), recorded at the Madison Square Garden Center in New York City, is a tour de force by the comic who, because of an instantaneous rapport with the audience, tossed away his prepared material and "winged it." Highly effective use of the mike for vocal sound effects is combined with hilarious story-telling about "Bill's Marriage," "His First Baby" and "Bill Takes His Daughter to the Zoo." Side Two slows down a bit, but you get your money's worth of laughs anyway.

... DON'T CRUSH THAT DWARF, HAND ME THE PLIERS (Columbia, C30102) is the third recorded effort of The Firesign Theatre—unfortunately, the worst. The quartet's attempt at contemporary satire evokes a few chuckles at best, failing perhaps because of a scattergun technique, hop-scotching from subject to subject, that doesn't focus long enough on any one thing. The four—Philip Proctor, David Ossman, Philip Austin, and Peter Bergman—aim simultaneously at radio preachers, take-out foods, middle-class America, high school life, TV movies, politics, and justice.

... THE MARBLES (Cotillion, SD 9029) is both an album and a group name (the latter being a duo, cousins Graham Bonnet and Trevor Gordon). Offering good pop-rock, middle-of-the-road stuff that always seems to find its way to Top 40 airplay, the two lean heavily on tunes by the BeeGees (5-count 'em—5). Best numbers are "I Can't

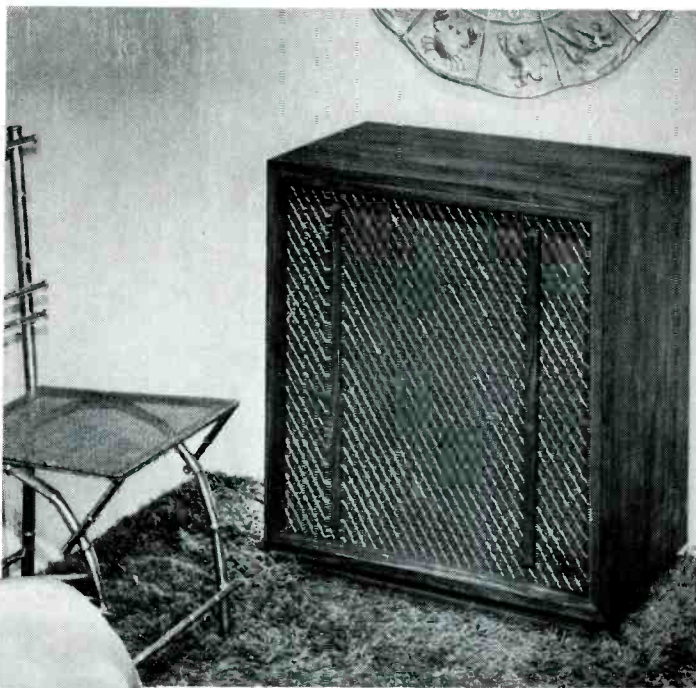
See Nobody," "A House Is Not a Home," "Storybook Children" and "Breaking Up Is Hard to Do."

... WANTED (Metromedia, KMD 1029) shows that The Cates Gang, aided by a background chorus, can combine blues and rock and country and pop music successfully—but not with enough flair to stand very far above the multitude. The quartet—Earl and Ernest Cate, Bill Wright, and Terry Cagle, uses standard rock instrumentation. Best tunes are "We All Got to Help Each Other," which lies somewhere between heavy

rock and bubble gum music, and "What's the Use in Lovin' You," a mournful, slow-tempoed contrast.

... GAS MASK: THEIR FIRST ALBUM (Tonsil, T-4001), produced by Teo Macero, epitomizes the mediocrity that exists on the rock scene. Sounding like a thousand other groups, Gas Mask offers ten tunes that are mostly a jazz-rock amalgamation. The hard stuff, however, is blues-oriented; the soft material is pop-leaning. Vocals are by Bobby Osborne; David Gross wrote "The Immigrant" and "The I Ching Thing," and

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the other songs were penned by Nick Oliva. Whole outing rates one large ho-hum.

... STEAMHAMMER (Epic, BN 26552) is an electric quintet that started as a straight white blues band and now incorporates touches of jazz (with classical injections now and then). Part of the so-called Second British Invasion, the group performs on ten cuts that would ring up a 50 on a scale of 100.

... BLOOMSBURY PEOPLE (MGM, SE-4678) includes a lyric sheet with the LP. It's the only extra that album pur-

chasers get, for the eleven cuts are absolutely routine. There is Latin influence (not as potent as that from any of a dozen groups). Lyrics are ordinary, and the straight rock sound features the normal instrumentation. Even "Lake of Sand," which utilizes the old-time megaphone gimmick, suffers from copy cat-itis.

... THINKING OF WHAT THEY DID TO ME (Arhoolie, 1053) spotlights blues from one of the best, Big Joe Williams of Crawford, Miss. The 70-year-old singer-guitarist provides 14 tunes, all self-penned, that reek of au-

thenticity. Assisted on four tracks by Charlie Musselwhite's harmonica, Williams, whose high-pitched voice occasionally drops with unexpected power, sticks to traditional sounds that work and wear well. Only "Throw the Boogie Woogie," a throwback to the rock 'n' roll of the '50s, escapes the pattern. Best, though, are "The Death of Dr. Martin Luther King," "Army Man in Vietnam," "Thinking of What They Did to Me," "King Jesus" and "Trouble for Everybody."

Sorry—in spite of a stellar cast of soloists and top-flight ensemble. I find this an outrageously bad "Creation" and you can

... GINGER BAKER'S AIR FORCE (Atco, SD 2-703), a two-disk package of big band rock-jazz a la Blood, Sweat & Tears. The supergroup, which includes Steve Winwood, Rick Grech, and Graham Bond, swings and swings and swings. But it's hard stuff, not intended for the over-30 crowd. A gimmicky cover encloses the vinyls, opening in reverse fashion from the usual (and advertised as the first "left-handed album").

... ENTRANCE (Epic, BN 26503), with Edgar Winter offering a dozen tunes backed by a big group that includes his brother Johnny on harmonica and guitar. Winters, as flaxen-haired as his brother (with whom he composed most of the songs), sings and plays piano, organ, and alto sax. A blues motif runs through the LP, but the frenzy in recordings by Johnny is missing; so is the radiance that makes the audiophile want to listen again.

... CRICKLEWOOD GREEN (Deram, DES 18038), with eight tracks of hard blues rock by Ten Years After. Acoustics are particularly fine; liner notes contend that "we have recorded this album in layers of sound rather than absolute separations." It's obviously the truth. More fans should flock to this group after this one.

... MAE WEST (Decca, DL79176), subtitled "original voice tracks from her greatest movies," gives the audiophile one lesson in nostalgia and another in how to laugh despite the seriousness of the times. The LP, which includes a poster, combines sex and comedy as only the comedienne could. All her best lines (and five songs) are here: "When I'm good, I'm very good . . . but when I'm bad, I'm better," "It's not the men in your life that counts, it's the life in your men," "When I'm caught between two evils, I generally like to take the one I never tried," and, of course, "Come up and see me some time." **AE**

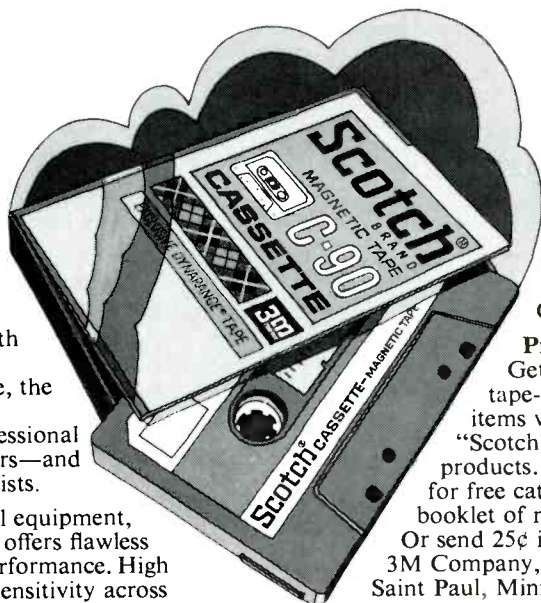
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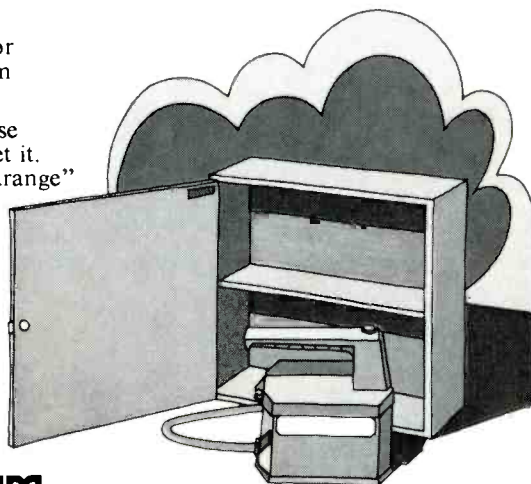
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Behind The Scenes

(Continued from page 12)

complete run through of the tape in less than a minute.

The recorder/player may be miniature, but it has a full complement of controls. Pushbuttons control motion with Play, Stop, Rewind, Fast Forward. There is an audio/video record button, volume control, tape tracking control and a meter for video level and battery check. There are secondary controls for tape tension, head clean, extended play switch, and camera trigger. Stereo playback is possible with two separate audio channels. Some performance figures for the system are video resolution on monochrome of 300 lines and for color, 240 lines. Signal-to-noise ratio is 42 dB. Both slow motion and stop action are possible. The monochrome camera, which is expected to cost about \$400.00, has a trigger grip which activates camera and recorder simultaneously.

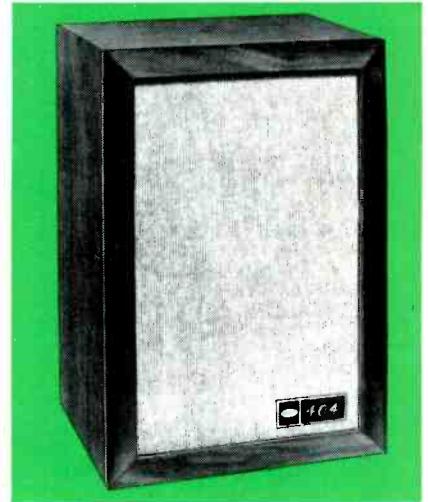
How good is the record and playback quality? What I saw in New York was by far the best in terms of clarity, good contrast balance, brightness ratio, of any video cartridge system I have encountered thus far. This smallest and lightest video cartridge looks like a cinch to use. At the demonstration Ampex had a typical skinny New York model, and she had the recorder slung over her left shoulder with the strap provided with the unit. She held the camera with her right hand and steadied it with her left hand as she photographed another model. We could see the head and shoulders of the girl being recorded in the tiny receiver screen of the viewfinder. It took just a few seconds for the tape to be rewound and the unit placed in the power pack, which was attached to a large screen TV set through the aerial input. The picture quality was really excellent. A cardioid mike is furnished with the camera, which of course records the sound synchronously with the video. Ampex then played back cartridges of several color shows that had been copied from the master video tapes and the results were just sensational. It was just about the best video color I have ever seen . . . with great color balance and fidelity, clarity and brilliance.

Ampex looks at their cartridge Instavision system as functioning in the area of closed circuit TV for industrial and educational applications, and for repetitive programming in the same areas; for instantaneous response, in the use of material just recorded and for home entertainment via either pre-recorded cartridges, or from portable recordings, or from "off-the-air" recording. As far as

pre-recorded material is concerned, Ampex has to deal with suppliers in the various media, just like any of the competing systems. They state they have been having "fruitful" conversations with Columbia Pictures, so one would assume eventual availability of feature films. Special new high speed tape duping equipment is now being designed and it is expected that the cost of the pre-recorded video cartridges will be competitive with that of other systems. Of course the big plus for this Instavision system is the ability to record. With the top model, the thousand-dollar recorder/player, one can record color "off-the-air," although it will be necessary to get a TV service man to connect your unit to the video output of your TV set. One can certainly envision that the more alert manufacturers of TV sets will furnish a jack on their sets for this purpose. One can think of endless uses for video photography with the black and white camera. The real breakthrough will come when relatively inexpensive color cameras become available. Present color cameras are very big and range in price from about \$50,000, to the least expensive unit recently announced by SONY at about 4500-5000 dollars. The goal is a color camera around 500 to 800 dollars, which I am told will probably be feasible in a few years. Ampex has stated that the thousand dollar cost of the top Instavision unit is predicted on a certain initially small volume, and that substantial reductions in price can be anticipated with increased volume. Thus the day may not be far off when one can take along a portable unit and record in color and in synchronous sound, the joys of a vacation, and on returning home, there is no wait for films to be developed . . . merely connect the unit to your TV set and you are ready to relive the big moments of your vacation. Or take the Instavision recorder to your son's Little League game, and later the same day, view in "living color" on your TV set, your little hero knocking in a few runs. And if he whiffs instead of hitting, you can record him over and over, play it back until he learns to correct his mistakes. This is another advantage of the Instavision system in that if what you have recorded is only of transitory value to you, you can erase and re-use the tape repeatedly without any diminution of quality.

Even with the Instavision system as presently constituted, with monochrome camera, "off-the-air" color recording, and the facility to play back pre-recorded cartridges, Ampex has unquestionably come up with a real winner. I, for one, am looking forward to using the Instavision equipment at the earliest possible moment.

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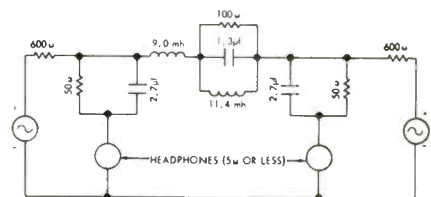
Headphone Review

(Continued from page 26)

A Word About Right and Left

By and large, most of the headphones described in these columns have some form of indication as to which is intended for the left ear and which is for the right. But we found that there is not much consistency in the way the plugs are wired to the phones. The custom of wiring the jacks in receivers seems to be that the right channel feeds to the tip and the left channel feeds the ring, with the sleeve being common to both channels. About half of the phones tested were connected in accordance with this "standard," and the others were connected with the tip to the left phone and the ring to the right. Not that it makes much difference, except that if you are accustomed to hearing the violins on the left in real life, you may be surprised to be hearing them on the right when you plug the phones into your receiver or amplifier. With removable plugs, you could change the connections at the plug; with permanent molded plugs integral with the cord, you couldn't—you would need to make the change at the phone jack on the receiver or amplifier—or put the phones on "backward."

When listening to loudspeakers, both ears hear the two channels—but with headphones, the channels are isolated. With the usual recording methods, the sound is unnatural—although many people prefer it! In order to restore correct "balance," crosstalk of appropriate phase and amplitude must be introduced between channels. One circuit which does this is the Bauer crossfeed arrangement, which is reproduced below (see AUDIO November, 1962).



Original Bauer cross-feed network.

ERRATUM: Parallel Speakers

In the November issue, it was stated in the third column of page 24 that an increase of 10 decibels would result in an increase in power output of an amplifier from 20 to 60 watts. This increase in power would result from an increase of 5 decibels, instead of 10.

AUDIOCLINIC

(Continued from page 6)

Record Cleaning

Q. I am writing in the hope that you can solve a serious problem. Some time ago, I was given some electrostatic record detergent as a gift. I assumed from the blurb on the container that this fluid would reduce the surface noise, remove the problem of dust attracted by static electricity, lengthen record life, etc. As my investment in recordings is not inconsiderable (a library of about 1,000 albums), I thought that the use of the cleaner would materially prolong the value of my discs.

Unfortunately, I have discovered that the effects of the detergent have been quite the opposite of those claimed. Many of my recordings now have an irritating level of surface noise. My problem, therefore, is what can I do about it? I'm hoping that you can advise me of some method by which I might remove the "glue" from my valuable recordings.
—Douglas Purkis, Toronto, Canada.

A. First, get rid of remaining "cleaner."

If the material you used to "clean" your records has attacked their surfaces, changing them chemically, there is nothing which can be done to restore these discs to their original condition. However, if the detergent has only deposited a surface film, this should be removable.

I suggest that you rinse your discs in warm water, NOT HOT WATER. If you have a sink spray, this is ideal because it will provide sufficient water pressure to really wash out surface deposits. If you do not have a sink spray, use a garden hose.

You will next want to dry the records with a lint free cloth.

If you ever wish to try another type of cleaner advertising its ability to do all sorts of wondrous things, my general thought is, "don't do it." However, if you want to try it for "kicks," try the cleaner on just one or two discs, discs which you are not particularly interested in. If these discs are ruined, the loss will not be serious. Do not clean an entire collection until you know that the product you are going to use is safe and, of course, effective. **Æ**

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

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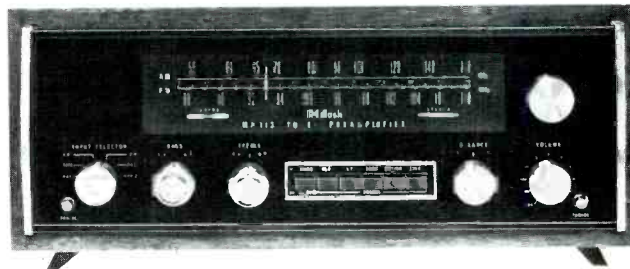
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Canby looks at Video Discs

(Continued from page 40)

to take an engineer's breath. How long will it take fully to explore the implications of *this* breakthrough? Years, I'd guess.

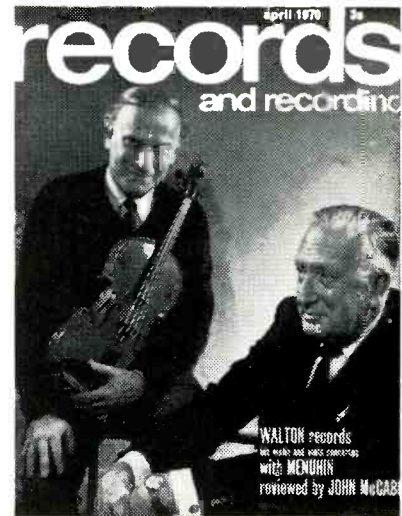
You can understand, then, the scope of a Big Break such as this, the magnitude of the changes in the system, the enormous widening of reserve potential. As you must have read with astonishment, the Teldec's information content rates at 100 to 1 as compared with present disc! That's the order of magnitude we need in a Big Break. The new bandwidth, for TV, is 3 megahertz—it's more dramatic to call it three million cycles. "Flat from 3 to 3,000,000." How does that sound?

A bit of Canby dream-arithmetic, for unimaginable audio. If you get twelve minutes out of the present Teldec disc with the 3-meg bandwidth for TV, then maybe we could use four times that length, at 375 rpm, with a quarter of the bandwidth. Or make it eight times, or sixteen. Or *thirty-two*—that would about cut it down to present audio size. If I dream rightly, this disc would be flat to 18,250 cycles or "above 18 kHz". But the d—nd thing would play six-and-a-half hours! So go back one step, for a doubled bandwidth and maybe four nice channels, pulsed or multiplexed. Three hours-plus. OK, back again, for an hour-and-a-half disc and channel after channel. That's what I mean. Keep in mind the 100:1 information-density figure. Room to play. Room for development, anywhere, everywhere. That's what we don't have on present disc or even tape.

Perhaps the Teldec isn't *the* disc in our future, but it is important because it shows us the substance, the scope, of what's to come. If the disc is to be a different model, it'll still be radical, on the same scale of enormity. That's for sure. Teldec shows us in the only way that counts—by example.

Meanwhile—please don't renounce the LP and the cassette overnight! Those high-quality end-products of an era will be around with us for a long time before we get any mass-produced start in these wild new dimensions. I suspect they'll last even longer, being so useful, before they finally fade away or merge in to some semi-compatible super-medium. More likely, we'll get a new multi-speed, multi-player . . . console, that will cope with everything at once, from shellac to cassettes, LP to EVR, RCA—and Teldec TV. We've seen worse. Æ

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Classical Record Reviews

(Continued from page 83)

maninoff & Co. It works well, even if the proverbial purists will wince at some of the Romanitized playing and the theatrical piano style in the double concerto. C. P. E. Bach can take it and even benefits. For many ears, this big-concert sound will for the first time bring out the essential seriousness and profundity of the composer.

The two-piano Concerto is a glossy product of the New York Philharmonic—all mink, so to speak. The Organ Concerto comes from Vienna and a palpably less-grand, more-intimate orchestra of the sort that in fact is technically right for the music. The organ, too, is of a Baroque sort. But the Schippers touch is enough to tie the two performances together in style and approach.

Performances: B Sound: B—

Schumann: Symphony No. 3 "Rhenish"; Overture to Goethe's "Faust." New Philharmonia Orchestra, Klemperer. Angel S-36689 stereo (\$5.98)

Schumann as conducted by the grand old maestro, Otto Klemperer, is as we could anticipate—largely conceived, solid, massive, and very Germanic. It is also slower than I seem ever to remember hearing this "Rhenish" music. Altogether an unusual treatment, since for many a year the trend in Schumann has been towards streamlining the old fashioned Romanticism for a newer century.

The Klemperer Schuman makes an interesting comparison with that of Bernstein, who in his own special way has restored a good deal of the old-time Romantic feeling. Bernstein, a few years ago, resurrected the original ultra-dense scoring of this symphony, long since put aside in favor of pared-down and simplified orchestration. Klemperer's version aims at somewhat the same end, a legitimately massive, thick sound, as ponderous as the 1850s could make it. Bernstein's is warmer and more impulsive in detail. Klemperer sticks to the grand lines and the ineffable poetry.

A dividend, worth hearing, is one of those not-too-successful Schumann overtures which, mostly, lie unplayed around the central Schumann literature of symphony and concerto. First recording of the "Faust" opus.

Performance: B+ Sound: B



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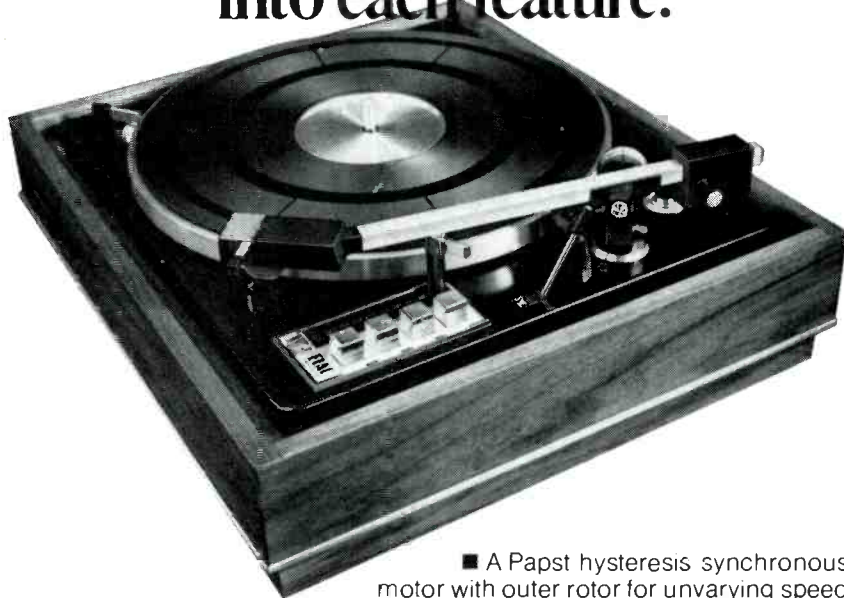
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Recorded Tape Reviews

BERT WHYTE

Only The Big Ones—Floyd Cramer, piano (with orchestra) RCA TP3-1048, **open reel**, 3¾ ips (\$6.95)

As implied by the title, this is a collection of top hits, chosen so they say, by Floyd Cramer himself. Whatever, this tape adds up to a tasteful potpourri of fine

piano playing by the nimble-fingered Floyd. Backed by some nice arrangements, and by excellent sound from RCA's Nashville Studio, it is easy listening to such as "The Shadow of Your Smile," "A Taste of Honey," "Yesterday," "The Summer Wind" and others of hit chart status. Nothing world-shaking, but a fine thing to accompany an icy cold martini.

Chacksfield Plays **The Beatles' Song Book** —Frank Chacksfield and Orch. Ampex/London L74142, **open reel**, 7½ ips (\$6.95)

This is one of those Phase Four recordings with engineer Arthur Lilley at the controls, and that is a virtual guarantee of high quality recording. Versatile man, Lilley. I have heard some fine symphonic work from him too. The music is of course,

one of the reasons that the Beatles have a reputation as the premier rock group, and why they are admired by people who generally can't stand rock music of any sort. I suppose it is true what some critics say about this music . . . that it isn't really in the rock bag at all. Whatever, there are some clever arrangements of the top Beatle tunes, played exceedingly well by Frank Chacksfield and his orchestra, and brought to a high sonic gloss by the magic microphoning of Mr. Lilley. As top background music, this can't be faulted . . . unless you like the blander variety.

Beethoven—**The Complete Overtures**

Herbert von Karajan cond. the Berlin Philharmonic Orch. Ampex/Deutsche Grammophon, K7046, **open reel**, 7½ ips (\$14.95)

This tape was obviously issued as part of the Beethoven birthday celebrations we are being overwhelmed with this year. It is a good thing Herr Beethoven is so durably listenable, else we could become utterly sated with his music. For the unregenerate Beethoven fanatics, this tape will be high on the list of "must have," as von Karajan does an altogether admirable job of conducting and the great Berlin Philharmonic gives him some inspiring playing, that is as ravishing in its sound, as it is precise in its execution. I thought I knew all the Beethoven Overtures, but I found an unfamiliar one in this recording, the Opus 115 "Zur Namensfeier" (name day). It is, of all things, considered as part of Beethoven's preliminary work for the 9th Symphony! Playing it through a few times does evoke some responses similar to that great work. As is usual with most of the von Karajan/Berlin Philharmonic recordings, the DGG engineers have managed to give us an orchestral sound that is nicely detailed, yet preserves the spacious ambience of the concert hall. Strings are very clean on this tape, and deserve special mention for their realism. All other elements are well recorded too, and except for a moderate amount of tape hiss, and a hint of print-through, this is a most exemplary tape.

Falla—**Nights in the Gardens of Spain**

Saint-Saens—**Piano Concerto #2**

Artur Rubinstein, piano; Eugene Ormandy conducting the Philadelphia Orch. RCA R85-1165, **Stereo 8** (\$6.95)

If my memory serves me right, Rubinstein recorded the Falla work many years ago, and it was a very popular recording. I'd like to hear that old disc, because I can't imagine it being more vital, more imbued with romantic warmth, than this

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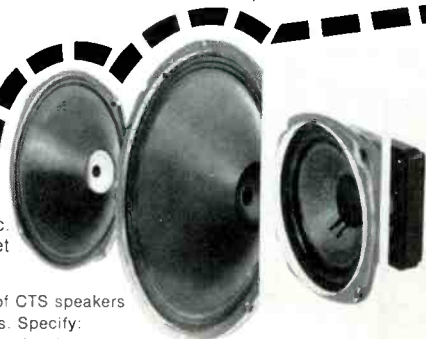
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splendid version. That Rubinstein can perform these pianistic miracles at his age is something to ponder. This work is supposed to belong to Alicia de la Rochas, and while taking nothing away from that estimable lady, this performance seems equally and authentically Iberian.

The Saint-Saens #2 concerto is familiar ground for Artur, and he tosses it off with great bravura, emphasizing the rich sonorities of this popular concerto. Ormandy gives fine support for Rubinstein in both works. The overall sound is nice and clean, with a good balance between piano and orchestra in a broad acoustic perspective. A fine recording on all counts, thus it pains me the more to tell you that throughout this cartridge, there are a series of low frequency sounds . . . bumps and thumps and such, which are most annoying. It is possible of course, that I just happened to get a defective copy. It is also likely that many speaker systems will not have the low frequency response to reproduce these sounds. Anyway, if you get this cartridge, have a listen, and let's hope you don't hear anything but beautiful music.

Dear Editor . . .

(Continued from page 14)

tion of less than 1% is quite hard to hear unless it is of a very peculiar or obnoxious type.

We must of course ask the question, is all this audible in real, music, program material? Since the distortion can be measured, it ought to be audible or are we perhaps less perceptive than we like to think. The following experiment was performed. Three acoustic suspension, 10" long throw speakers of very high quality were used in an A-B test. One speaker, with a 1000 to 1200 Hz crossover point was used in the regular manner. It was considered to have some faults in the mid-range sound. That is, the 400 to 1000 Hz voice range was not considered as perfect as it might have been. Two identical speakers were connected with two amplifiers and a variable electronic crossover. When the crossover was set at 1000 Hz

the two speaker and single speaker systems sounded identical. As the crossover frequency was lowered to 800, then 400 Hz, etc. the sound of the two speaker system changed appreciably. There was a *clear* difference between the systems when the crossover was set at the 200 to 500 Hz range. And in fact the two speaker system was judged to be much more natural in sound. The hollow sound of the single speaker had vanished. The only reasonable interpretation of this experiment seems to be that the lower frequencies were somehow distorting the 500 to 1000 Hz range of frequencies in the single speaker. When they were removed and reproduced by a separate speaker an immediate improvement was noted.

An interesting side comment might be the fact that the test speakers have recently been greatly improved by changing the crossover frequency to 500 to 600 Hz. This has reduced the modulation distortion possibilities by a factor of about two.

Sincerely,
R. A. Greiner,
Professor,
University of Wisconsin

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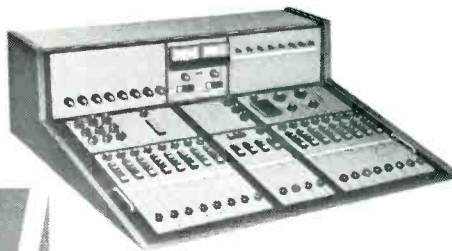
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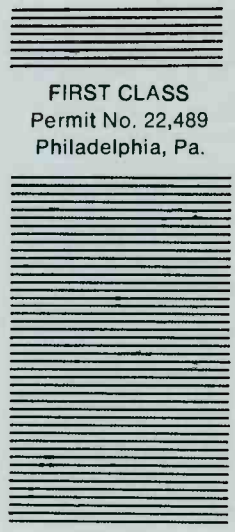
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