

Behind
The scenes

Audio

THE AUTHORITATIVE MAGAZINE ABOUT HIGH FIDELITY • JANUARY 1976 75¢

47425 

DESIGNING
A CUSTOM
INSTALLATION

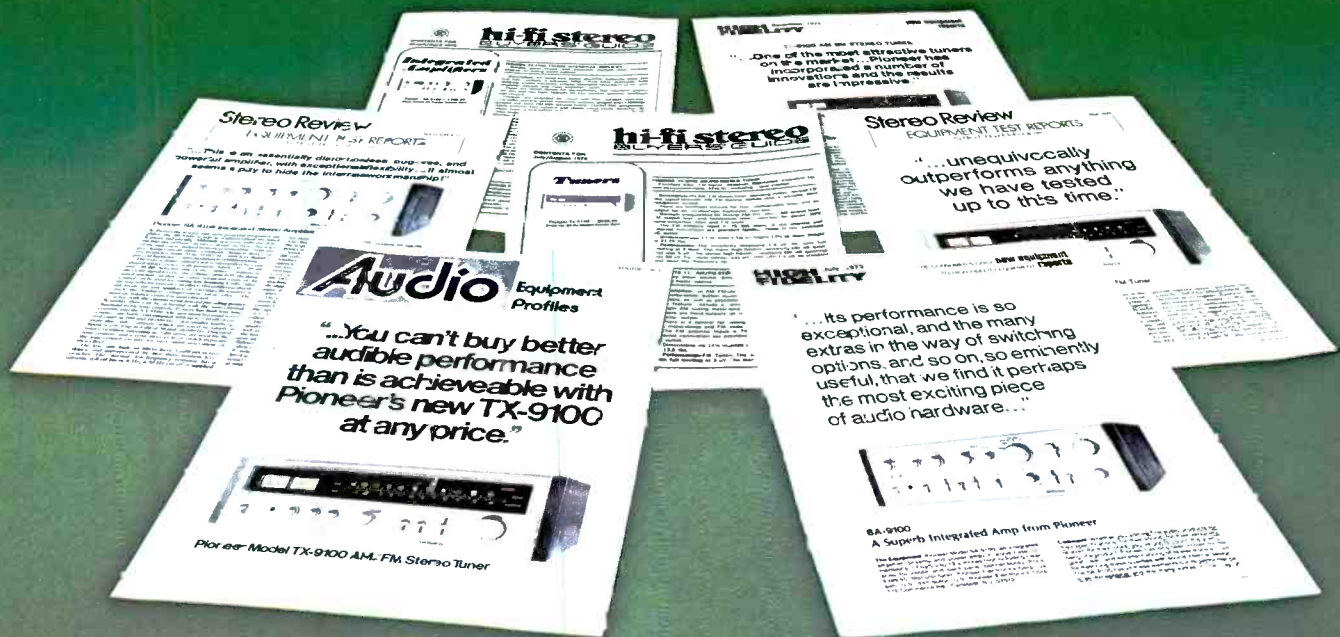
NEW
TUNER
STANDARDS

U0803760 0476 30725005P0101212
DON L HUNTER
2608 CENTRAL BLVD
EUGENE OR 97403



Why would Pioneer change the world's best-selling tuners and amplifiers?

The entire world of high fidelity acknowledged that Pioneer's SA-9100 integrated amplifier and TX-9100 stereo tuner were the best products of their type and value ever built. They established new standards for high fidelity performance. In fact, people recognized their greatness by buying more of them than any other tuners and amps in the world. Why then would Pioneer want to change these top-performing, top-selling components? There can only be one answer:



State-of-the-art features

Of course, both new Pioneer tuners have selectable deemphasis (25 μ S or 75 μ S), a must for listening to the newer Dolby FM and stereo FM broadcasts. Both have separate fixed and variable output terminals, too, for adjusting listening level to match other program sources. In addition to the signal-strength and center-of-channel meters, both tuners feature separate output terminals which can be connected to an oscilloscope. This permits visual tuning for best reception and lowest multipath interference.

The TX-9500 has a built-in recording signal level check. Use it to set recording levels on your tape deck for best results before you start recording.

For the great specs that make great performance, see Table 4.

This new series of tuners and amplifiers is unquestionably the most technically advanced ever developed. It represents the high fidelity industry's most outstanding value in performance, features, precision and versatility. And visually, it carries Pioneer's traditional handsome styling.

Hear these magnificent components at your local Pioneer dealer.

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West: 13300 S. Estrella, Los Angeles 90248
Midwest: 1500 Greenleaf, Elk Grove
Village, Ill. 60007/Canada: S.H. Parker Co.

PIONEER
when you want something better

(1) Amplifiers: Preamplifier section

	SA-9900	SA-9500	SA-8500	SA-7500
Phono Overload	500/1000 mV	250/500 mV	200/400 mV	200 mV
S/N Ratio	70dB	70dB	70dB	70dB
Dynamic Margin	46dB	40dB	38dB	38dB
RIAA Accuracy	$\pm 0.2\%$	$\pm 0.2\%$	-0.3%	$\pm 0.3\%$
Input Impedance	35K, 50K, 70K, 100K, selectable	35K, 50K, 70K, 100K, selectable	50K	50K

(2) Amplifiers: Inputs and outputs

No. of Inputs-S/N Ratio	SA-9900	SA-9500	SA-8500	SA-7500
Tape Monitor	2-95dB	2-90dB	2-90dB	2-90dB
Phono	2-70dB	2-70dB	2-70dB	2-70dB
Auxiliary	2-95dB	2-90dB	1-90dB	1-90dB
Microphone	1-65dB	1-65dB	1-65dB	1-65dB
Tuner	1-95dB	1-90dB	1-90dB	1-90dB

Outputs

Speakers, Headsets	2+1	2+1	2+1	2+1
Tape Decks	2	2	2	2

(3) Amplifiers: Power output specifications

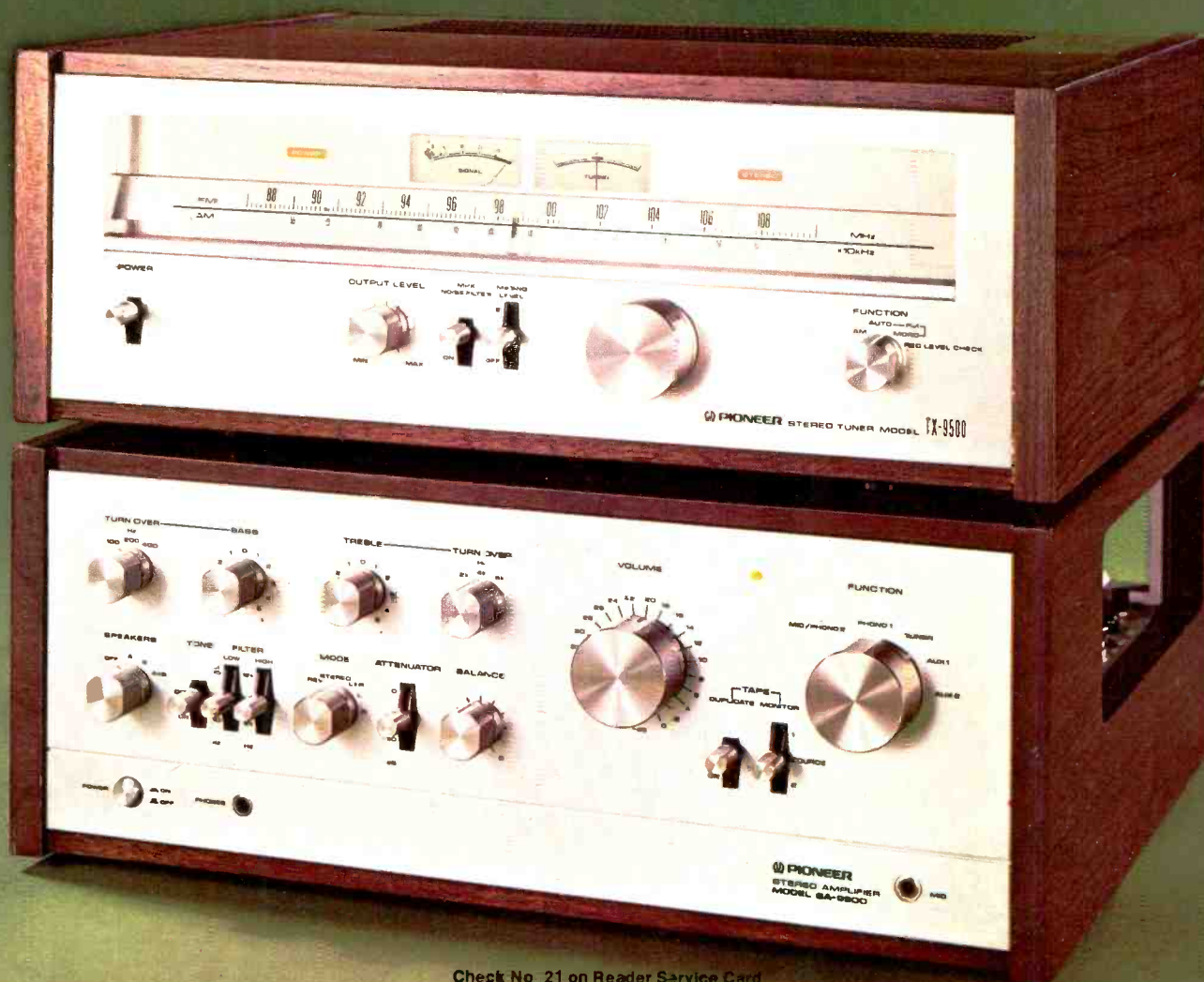
	SA-9900	SA-9500	SA-8500	SA-7500
Min. RMS power/channel both channels driven, 8 ohms	110 watts	80 watts	60 watts	40 watts
Min. RMS power/channel both channels driven, 4 ohms	110 watts	100 watts	75 watts	45 watts
Max. total harmonic distortion	0.1%	0.1%	0.1%	0.3%
Power Band	20Hz-20kHz	20Hz-20kHz	20Hz-20kHz	20Hz-20kHz
Price/under*	\$750.	\$500.	\$400.	\$300.

(4) Tuners: Specification highlights

	TX-9500C	TX-7500
FM Sensitivity (IHF), mono	1.5 μ V	1.9 μ V
50dB Quieting Sensitivity, mono (stereo)	2.5 μ V (35 μ V)	4 μ V (50 μ V)
Selectivity	85dB	80dB
Capture Ratio	1.0dB	1.0dB
S/N Ratio mono, (stereo)	80dB (75dB)	73 dB (68dB)
Image IF & Spurious Rejection	110dB	85dB, 90dB, 90dB
Stereo Separation 1kHz (20Hz-10kHz)	40dB (35dB)	40dB (35dB)
Distortion, mono 1 kHz (10 kHz)	0.15% (0.15%)	0.2% (0.2%)
Stereo	0.2% (0.5%)	0.3% (0.6%)
Price/under*	\$400.	\$250.

TX-9500

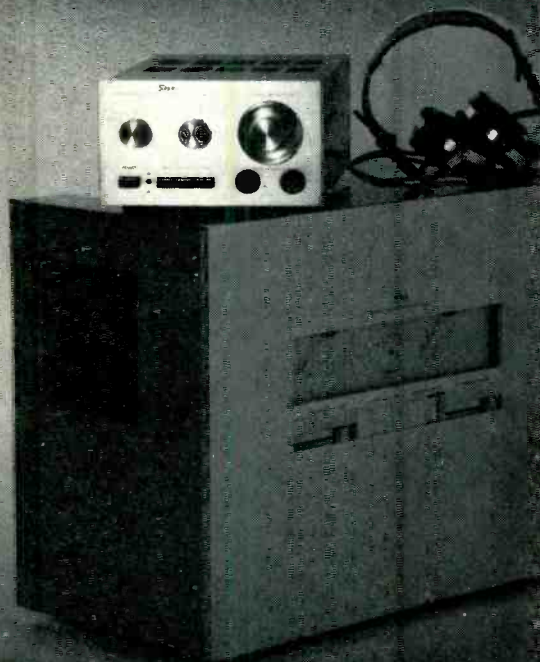
SA-9500



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Audio

January, 1976

"Successor to **RADIO** Est. 1917"

Vol. 60, No. 1

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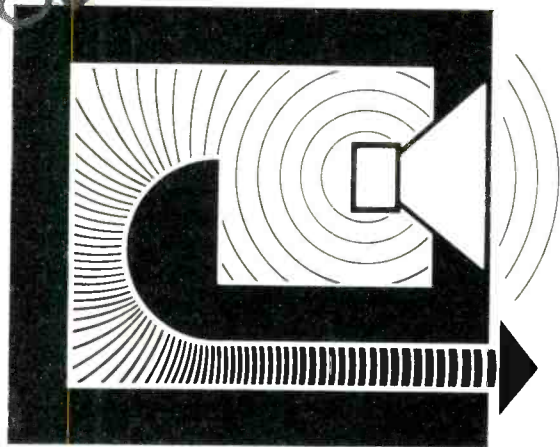
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U.S. PATENT
NO. 3,892,288



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From time to time discoveries are made which alter the state of the art.

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These innovations are unique.

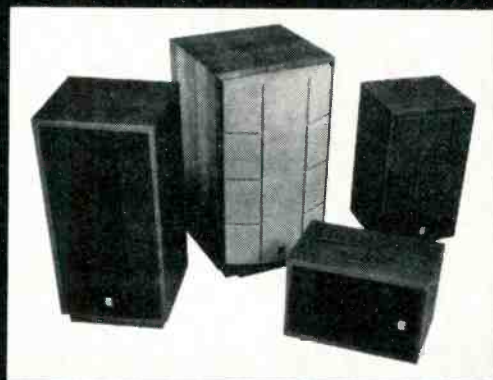
They are innovations you can hear.

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For our new Consumer Guide, which gives more details, see your audio dealer or write to "bee-eye-cee" c/o B.I.C. Venturi, Westbury, L.I., N.Y. 11590.



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*(Single channel operating; sine wave test signal into resistive load; extended operation or limited ventilation may require forced air cooling to maintain levels described.)

When listening
becomes an art,



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Tape Guide

Herman Burstein

Dolby and High Frequency Loss

Q. I have compared "Dolbyized" tapes, using the Dolby system, on playback to the original source from which the tape was recorded. The tape has a muffled sound as compared to the original. Also, much in percussion attacks, higher violin notes, etc., is completely missing from the tape unless I make the tape with the Dolby system switched out.

Moreover, when comparing cassettes made from the same source, the tape which has not received the Dolby process has clarity and high frequency performance, superior to the tape utilizing the Dolby process.

I have a passion for clarity in my music. The muffled sound which accompanies my Dolby system is so frustrating that I'd almost rather put up with the exaggerated tape hiss and switch out the Dolby system when playing my "Dolbyized" cassettes.—Name Withheld

A. There are factors which could make your Dolby system perform incorrectly. However, when everything is working as it should, the high frequency response from Dolby-processed tapes should be the same as that produced by tapes made with the same recorder, but with the Dolby system switched out of the circuit.

It could be that the system is not properly calibrated. If the Dolby system is supplied with a large signal, no treble boost will take place during recording. If the playback is calibrated incorrectly, however, treble cutting will still take place, ruining the recording. To check this, make a recording. As you do so, alternately switch the Dolby system in and out. Play the resulting recording with the Dolby system switched out. Note whether you can hear when the Dolby system is switched in and out. If you hear no difference you will know that the Dolby system is either not working at all during recording or that misadjustment of its input is present.

If you find that you do hear a pronounced difference, especially on softer music, during the foregoing tests, something is wrong with the playback. Possibly the Dolby system is not receiving sufficient signal. That

would mean that it would always cut treble excessively.

Perhaps you are using the wrong bias or the wrong tape for the bias to which your machine has been set. This would result in less treble than you have. An error of this kind would possibly not be too serious when listening to a straight playback. The Dolby system, however, magnifies such errors. To check all this, measure the overall frequency response of your recorder, with the Dolby system switched out of the circuit. If it is not flat, make bias and/or other adjustments so that the machine will have as flat a frequency response as possible.

To sum up, whatever happens to the signal during the recording process when employing the Dolby system, is exactly the reverse of what happens during playback. The final result will be a flat response. This situation is similar to what takes place when recording and playing discs. We boost treble during the recording of discs, but we play them back with the reverse of that boost. Surface noise is reduced in this process, but we also make the overall sound flat again.

The Dolby system is not that simple in action; it is not a simple cut and boost system. The amount of treble boost in recording varies with the dynamics of the program material, thereby keeping the tape from saturating at high recording levels. Thus, the playback will also have to vary in treble response in accordance with the dynamics of the program, but in the opposite direction from that of the recording process. Below some specific value of signal level, the Dolby system does not produce further treble boost. Above a certain signal level, the Dolby system does not act at all; the signal is flat. These limits must dovetail in the record/playback cycle or alterations of response will occur. This is the reason why calibration of the system is so important.

About The Cover: Lest we forget, when all is said and done, music is what we listen to. Model: Holly S. Candy; violin: House of Prima Vera.

Microphone Distortion

Q. I have two problems with distortion produced by the new, medium-priced electret-condenser mikes. I have found that when subjected to very loud sounds that they produce intolerable distortion. An example of this is found in a recording we made of a large and loud stage band. Two takes were made. One was made using four condenser microphones run through a mixer, and then into a tape recorder. The other take was made with two dynamic microphones and the tape recorder. The condensers distorted on loud sounds, especially at peak levels. In the bass region, distortion was so high as to make the music virtually unrecognizable. The dynamic mikes did not show apparent distortion at any sound level, but lacked the beautiful, flat reproduction of the condenser microphones. When recording choirs and some orchestras, the condenser mikes caused pinning of the VU meters when sopranos decided to hit high notes.

Is there anything to be done about these two problems?—James D. Caldwell, Jr., Odessa, Texas

A. I wonder whether the distortion you hear is actually created within the condenser microphones. Often, what happens is that the output signal from

the mikes is so great that it overloads the early stages of a recorder or mixer. These stages are ahead of any volume control, so that no improvement can be gained by reducing level. One sign of this condition is that the volume controls are down to perhaps 9 o'clock or less in order to obtain proper level.

There are attenuators which can be introduced between the mike and the input of a mixer or recorder. They are little more than voltage dividers. If you cannot locate one which has the appropriate connectors, you can make one up to suit your needs, with sufficient attenuation to reduce the signal to more manageable proportions. A 20-dB loss is usually sufficient.

Should it happen that you really do have distortion from the mikes themselves by virtue of an overloaded preamplifier, there is nothing you can do but to use mikes which will handle the sound levels you expect to encounter during recording.

It may be that the dynamic mikes do not produce as much signal as the condenser mikes do. This would mean, of course, that they would have less tendency to create the overload situation within the mixer or recorder. I noted with some interest, however, that in the take involving the use

of the dynamic microphones, that you did not use the mixer. Thus, it may well be that the mixer is more susceptible to overload than is the tape recorder. To check this, why not make a recording using two condenser microphones feeding into the input of the tape recorder without using the mixer? If overload still takes place regardless of the setting of the volume controls on the tape recorder, you will know that either the early stages of the tape recorder are indeed overloaded or that the preamplifiers in the microphones themselves are being overloaded. While this latter possibility can occur, I have not seen it very often.

The fact that your meters sometimes "pin" when sopranos sing into the condenser mikes does not have much to do with the fact that you are using such mikes or that you are in a particular concert hall. It simply means that this is a characteristic of what happens when trying to record sopranos, especially when they are close to the microphones.

If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 401 North Broad Street, Philadelphia, Pa. 19108. All letters are answered. Please enclose a stamped, self-addressed envelope.



If you've never heard music on BASF tape before, turn the page and see how it sounds.

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Audioclinic

Joseph Giovanelli

Controlling Power Line Transients

Editor's Note—In the August, 1975 installment of "Audioclinic" I asked readers for their comments regarding the suppression of power line transients which can, and often do, cause interference in the form of clicks and pops in audio output signals. Many readers took time to write in regarding this serious problem. Thank you, one and all, for sharing your knowledge. Just one example of this shared knowledge is in the form of a letter written by Mr. Fred Krock of San Francisco, Calif.:

In answer to your question about controlling line transients, may I suggest General Electric's line of MOV Varistors? A common model is the V130LA 10A.

If the offending machine is known, the varistor should be applied to that machine. Otherwise, the varistor can be applied to the a.c. input terminals of the amplifier in question. When the varistor is connected to the amplifier, it also protects voltage-sensitive components from high voltage spikes on the power line which can run as high as 2,000 volts on a 120 volt power line according to General Electric Research.

If the noise is not removed by a power-line transient suppressor of this kind, it can be eliminated in almost every case by treating it as a case of r.f. interference. This is true for every type of amplifier from a hearing aid to an electronic organ, as well as all types of high-fidelity equipment.

What people often miss when faced with a line transient problem is that the transient creates r.f. energy, which is radiated from the power line or the a.c. wiring inside the amplifier, is then picked up and detected by the audio circuitry.

Curing r.f. interference is usually a case of cut and try, involving grounding, shielding, and circuit modification. The various techniques are well known. The best circuit modifications usually involve a series resistor mounted as close as possible to the tube grid or transistor base with

small bypass capacitors on each side of the resistor and ground.

In experimenting with "click" suppression, a Weller soldering gun makes an excellent transient generator. The size of the transient depends on the exact point in the power-current cycle where the switch is opened. Triggering it a few times is bound to cause some nice, large transients.

Mr. William Blair III of Morton, Ill., refers to two articles which are definitely worth reading. The first appeared in the February, 1975 issue of *Popular Science* and refers to a surge protector. This particular device is designed to eliminate extremely high voltages from entering power line-operated equipment, voltages of the sort which could be generated by the near miss of a lightning bolt or a severe power line transient. In that article the appropriate surge protection device is described.

The second article appeared in the May, 1975 issue of *Radio-Electronics*. This article describes the basic operation of the GE MOV Varistors referred to by Mr. Krock. I note that this article refers to the GE 750 as the varistor of choice for use with home entertainment systems.

Mr. Bernard J. Van Dyke of Lewiston, Idaho, tells us of his success in curing power line transients. The simple scheme he used was simply to put the audio equipment on its own separate circuit.

Mr. C. Allen, FPO N. Y. says that MIL SPEC equipment employs capacitors wired directly across switch contact in order to absorb line transients when the contacts open. In the case of a refrigerator, the capacitor is wired between the two contacts of the thermostat.

In the case of a home heating system, where thermostat contacts oper-

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ate a relay, which in turn operates a motor, capacitors might have to be placed across the thermostat contacts, and then across the relay contacts.

Because audio equipment contains power transformers and, in some cases, motors, such equipment will have inductive devices which can produce power line transients when they are turned off. Again, it is good practice to place capacitors across switch contacts.

Mr. Allen specifies values of capacitance in the order of 0.05 μF , with voltage ratings of at least 300 V d.c. (Because of the rather high voltages which can be present when the field of an inductive device collapses, I suggest the voltage rating of the capacitor should be at least 1 kV d.c.)

More on "Stuck Stylus"

Q. Concerning Mr. R. Padilla's letter of August, 1975, I own one of the better turntables, which I recently equipped with a new cartridge. Then my troubles started. I finally sat and watched the cartridge; I saw immediately that the arm was not moving well horizontally. I got out my can of WD40 and put a squirt in the appropriate bearings. Daily the motion of tonearm improves as the lubricant

gradually enters the bearings. The table was two years old when this trouble first began.

I realize that this is not a procedure to be recommended except to technicians, but it needs to be noted that trouble of this kind can occur even in the better turntables, but that it is easily remedied.—Richard Lee Hallett, Pittsfield, Mass.

I have found in my repair experience that in some automatic turntables, the "stick" is caused by friction in the reject trigger arm which is pushed by the tonearm itself. This is a common problem which seems to be caused by the anti-skate control. It can fool the best of repair men.—John Mears, Muskegon, Mich.

Bass in a Small Room

Q. Is it true that a loudspeaker can produce less bass output when in a small room as compared to a large room?—Randy S. Parlee, Greenfield, Wisconsin

A. A loudspeaker will produce just as much, or more apparent bass in a small room as in a large one. Because of the nature of room acoustics, however, the actual amount of bass heard is less in a small room than in a larger one. All of this has to do with the acoustical wavelengths of low fre-

quencies as compared to the size of the listening room. If the wavelength becomes an appreciable portion of the room size, bass will be lost from this frequency down.

AM Radio Antenna Problem.

Q. The reception on my table radio was pretty good but I wanted to improve it. I connected an external, outdoor antenna to it. This improved the sensitivity but also gave poorer selectivity, bringing in "birdies" and gargles. What causes this, and is there anything I can do to cure it? —Willard Ramsey, Newcastle, N.B., Canada.

A. You are hearing "image responses." These are other radio signals to which the set is not directly tuned, but which bear a fixed frequency relationship to the dial setting to which the receiver is tuned. The degree to which the set will produce these images depends both on the quality and number of tuned circuits in the front-end of the receiver.

Most portable and table radios have just one tuned circuit, consisting of the loop antenna and the tuning capacitor (not counting the tuned circuit of the local oscillator). The selectivity ("Q") of this circuit is amazingly high, due to the ferrite rod on which the antenna coil is wound, and be-

(Continued on page 12)



BASF sound is so clear and true, it's like the musicians are right there.

What you experience with BASF tape is simply this: the music. Pure and clear.

Why this extraordinary clarity? BASF polishes the tape. Literally. Getting rid of most of the thousands of tiny surface bumps that can cause background noise. (Get rid of most of them, you get rid of most of the noise.)

So what you're left with is sound so rich and clear, you don't just hear it. The music happens.

Which really isn't that surprising. After all, BASF invented audio tape in the first place.

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With this fascinating learn-at-home program, you do a lot more than just read about electronics. You'll conduct dozens of experiments . . . build your own laboratory equipment for testing out electronics principles . . . and also as part of this program you put together a 4-channel amplifier and FM/FM stereo tuner as you delve into advanced audio technology.



We try to make learning so interesting you look forward to receiving each new lesson. And enthusiastically dive into each new project we send you.

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You may be thinking, "I don't have any training in electronics . . . I might be getting in over my head."

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Once you've mastered the basics, we'll send you everything you need to put together these three important testing instruments:

The design console. You use it to set up and examine various kinds of circuits. It's completely modular . . . no soldering!

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The solid-state "triggered-sweep" oscilloscope. Use it to analyze modern,

HANNEL AUDIO!



state-of-the-art integrated circuits. Triggered-sweep feature locks in signals for easier observation.

These three superb testing instruments are the basis of your own home electronics laboratory. You'll use them throughout the program as you move into more advanced electronics principles and work into audio technology.

Bell & Howell's high performance 4-channel audio center you actually build and experiment with yourself!

You need practical experience with high caliber equipment to develop professional skills and understand the ins and outs of today's audio technology.

So we came up with a system that Bell & Howell is proud to have its name on:

First, there's the sophisticated outstanding 4-channel amplifier with SQ full-logic decoding and front to back separation.



35 watts per channel—Min. RMS into 8 ohms at less than 0.25% total harmonic distortion from 20-20,000 Hz, all channels fully driven.

As you build and experiment with this remarkable piece of equipment, you'll learn about matrix 4-channel and discrete—including CD-4 when processed through an external demodulator.

And with it you'll have the advanced circuitry you need to get into signal tracing low level circuits . . . troubleshooting high power amplifier stages . . . and checking the operation of tone control circuits.

Next, the advanced FM-FM stereo tuner. As you build this superb stereo tuner, you'll come to fully understand how the advanced, "state-of-the-art" features lead to such high performance. You'll learn about all solid-state construction, FET front end for superior sensitivity, crystal IF filters for wide bandwidth and the superior multiplex circuit that produces such excellent stereo separation.

A wealth of knowledge in digestible chunks.

O.K.! So now you might be thinking, "It sounds really interesting . . . but kind of complicated." And you're right. But that is why we use the "hands on" teaching approach.

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Special learning opportunities give you extra help and attention.

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And when you're done, you'll know a lot more than just 4-channel sound!

You'll have covered the complete spectrum of electronics principles, leading to a full understanding of audio technology.

And while no school can promise you a job or income opportunity, you will have occupational skills necessary to become a full-service technician. With the ability to work on the entire range of audio equipment. Such as tape recorders, cassette players, FM antennas and commercial sound systems. You'll know audio technology from the inside out. And you'll be proud of it.

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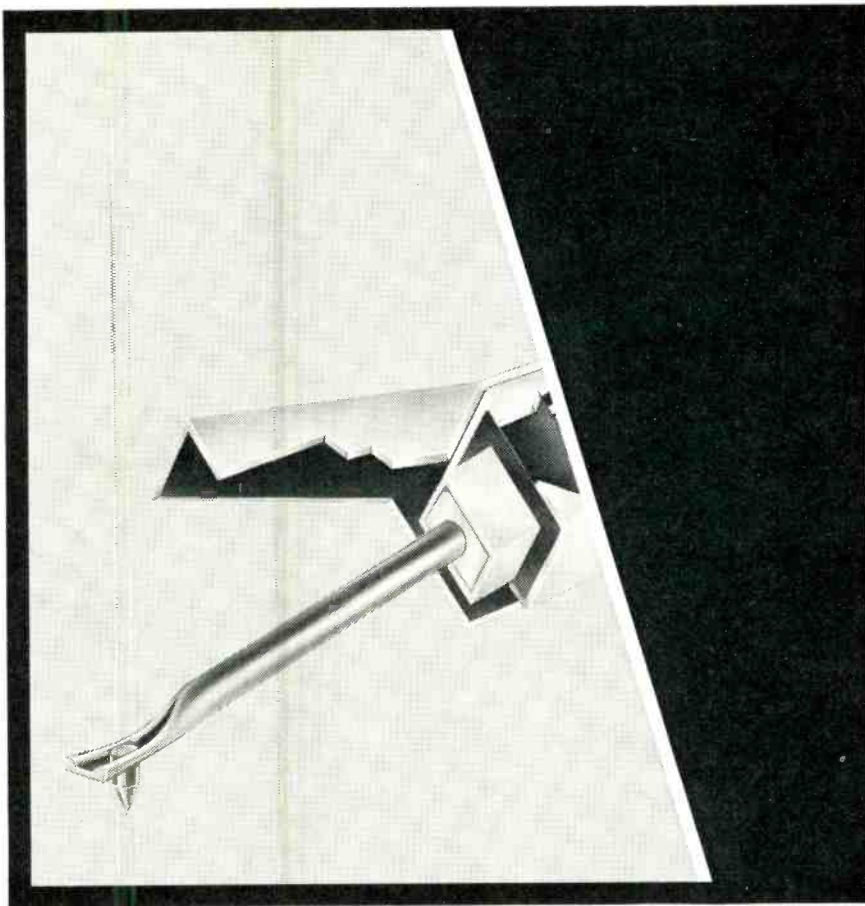
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This...protects your most expensive hi-fi investment.

Recognizing that a penny saved is a penny earned, may we suggest that trying to economize by putting off the replacement of a worn stylus could be like throwing away five dollars every time you play a record. (Multiply that by the number of records you own!) Since the stylus is the single point of contact between the record and the balance of the system, it is the most critical component for faithfully reproducing sound and protecting your record investment. A worn stylus could irreparably damage your valuable record collection. Insure against this, easily and inexpensively, simply by having your dealer check your Shure stylus regularly. And, when required, replace it immediately with a genuine Shure replacement stylus. It will bring the entire cartridge back to original specification performance. Stamp out waste: see your Shure dealer or write:



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* FREE! 1976 Stereo Directory & Buying Guide with the purchase of a Shure V-15 Type III, or the M95 series, M75 Type II or M91 series of cartridges. Simply send us your warranty card with the notation "Send Free Buying Guide" before March 1, 1976. (Offer subject to supply and may be withdrawn at any time.)

Check No. 27 on Reader Service Card

(Continued from page 7)

cause of the multi-stranded wire used in these coils (Litz wire).

When an external antenna is added, it is coupled to the built-in antenna. This reduces the selectivity of the circuit, thus lessening its ability to reject images in favor of the main signal. Remember, this circuit is the only one responsible for keeping unwanted signals out of the receiver. Further, the added sensitivity provided by the long, external antenna tends to overload the mixer, producing additional spurious responses.

The best cure for the problem is to use the original antenna, or to keep the length of the added antenna to a minimum.

One Phono Input

Q. Some Lafayette equipment which I have has only one magnetic input. Can I use aux or tape, etc. How can I arrange this?—James Golden, West Roxbury, MA

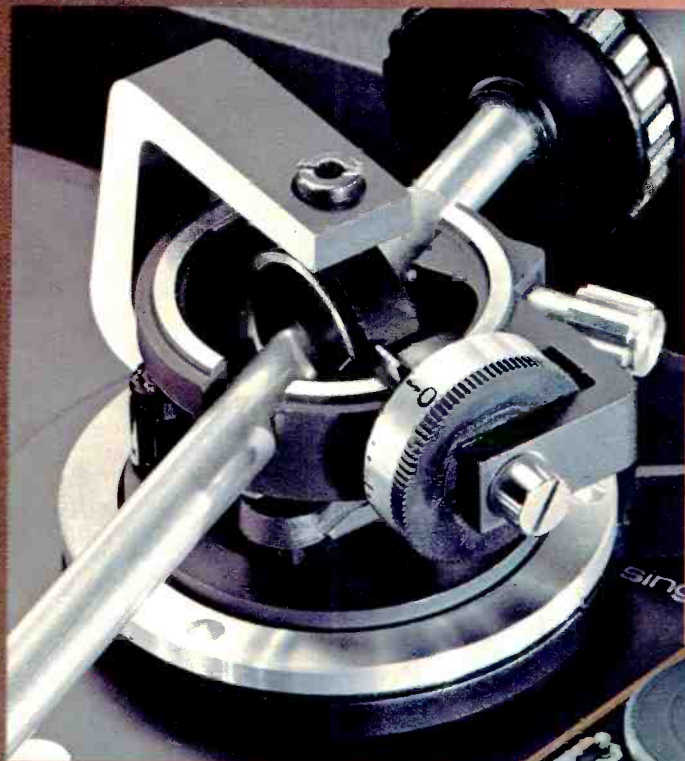
A. From your letter, one of your problems is that you have just one phono input and need to use two turntables. Your best approach is to ignore even the one input you do have, and obtain a mixer having at least three inputs. If your output is stereo, the mixer must have two channels, with three inputs per channel. Two of the inputs are for the two turntables, and the third one is for a mike, to be used for "patter" in this "record hop" application. The mixer would need, therefore, the capability of both mike and line inputs. If the mixer has only mike inputs, it can be used for line inputs with the appropriate voltage dividers to reduce the signal strength from the high level sources to be discussed later on. Mixers are often low impedance unbalanced lines. The attenuator is nothing more than a resistor placed in series with the "hot" input. Its value is generally between 100 K and one megohm, depending on the strength of the line signal and on the overload characteristics of the mixer.

There are numerous possibilities, but this should provide you with a basis for further consideration.

Because of the lack of RIAA compensation in a mixer of the kind we have discussed, the phonograph cartridge cannot be directly fed into one of the mike inputs. What is needed is a device which has the necessary gain and equalization to enable the signal from the cartridge to be suitably processed to appear at line level, like that of a tuner. A number of manufacturers produce relatively inexpensive units which do just this task. You will need one for each turntable.

The Dual 1249.

It will give you
more reasons than ever
to own a Dual.



Tonearm of Dual 1249 pivots in four-point gyrosopic gimbal, suspended within a rigid frame. Each gimbal is hand-assembled, and special gauges assure that each will conform to Dual's stringent specifications.

For several years, independent surveys of component owners—audio experts, hifi editors, record reviewers, readers of the music/equipment magazines—have shown that more of them own Duals than any other turntable. This is quite a testimonial to Dual's quality performance, reliability and fully automatic convenience.

We believe the new 1249 will add even more serious music lovers to the roster of Dual owners, as it provides every feature, innovation and refinement long associated with Dual turntables plus some new ones. And all in a newly designed chassis that complements the superb design and meticulous engineering of the 1249.

The low-mass tubular tonearm pivots in a true four-point gyrosopic gimbal suspended within a rigid frame. All tonearm settings are easily made to the exacting requirements of the finest cartridges. The tonearm is vernier-adjustable for precise balance; tracking pressure is calibrated in tenths of a gram; anti-skating is separately calibrated for conical, elliptical and CD-4 styli.

Tracking is flawless at pressures as low as a quarter of a gram. In single-play, the tonearm parallels the record to provide perfect vertical tracking. In multi-play, the Mode Selector lifts the entire tonearm to parallel the center of the stack.

All operations are completely flexible and convenient—and they are foolproof. The tonearm can be set on the record manually or by using the viscous-damped cue-control or by simply pressing the automatic switch. You also have the options of single-play, continuous-repeat, or multiple-play.

The dynamically-balanced cast platter and flywheel are driven by an 8-pole synchronous motor via a precision-ground belt. Pitch is variable over a 6% range and can be conveniently set to exact speed by means of an illuminated strobe, read directly off the rim of the platter.

Of course, if you already own a current Dual, you won't really need a new turntable for several years. However, we would understand if you now feel you must have nothing less than the new 1249. Less than \$280, less base.

Still, we should advise you of two other models in our full-size, belt-drive series. The 601, single-play, fully automatic, less than \$250. (CS601, with base and cover, less than \$270.) The 510, single-play, semi-automatic, less than \$200.



United Audio Products, 120 So. Columbus Ave., Mt. Vernon, N.Y. 10553

Exclusive U.S. Distribution Agency for Dual

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Dear Editor:

Better AM Sound?

Dear Sir:

As Chief Engineer of the dominant AM radio station in our area, I take a great deal of pride in our sound. How that signal travels through miles of telephone lines, processing equipment, transmitter, out to the antenna, is important to me. According to the FCC this is where my responsibility ends. But does it really?

I know we are broadcasting within 2 dB up to 8 kHz. How many AM receivers do you know of (reasonably priced) that "hear" much higher than 4 or 5 kHz? Since it's difficult to get wide bandwidth in receivers without sacrificing selectivity, how about a receiver with a two- or even three-position bandwidth switch? This would give audiophiles a choice between selectivity and fidelity. After all, selectivity is rarely a problem when listening to urban signals.

I want to do my job well, but it would be much more rewarding if someone else did too.

Paul Swartzendruber
WTON
Stauton, VA.

Any other broadcasters out there care to comment?—Editor

Marantz 9 Modification

Dear Sir:

A number of people have written to Audio about modifications made to Marantz Model 9 tube-type power amplifiers, which have been mentioned from time to time in the amplifier reviews. The modification is a

simple one, which amounts to a switch bypassing of the input tube that is used as an input level control buffer and phase inverter.

To make the modification, first remove the bottom screen of the amplifier. With the amp positioned upside down, locate the phase toggle switch. Note that two wires come from the phase switch and terminate on the front-end board which is adjacent to the side of the amp and partitioned off by the shield. One of these wires is the plate signal of V1A and *doesn't* have a 24 kOhm, 1/2-watt resistor associated with it on the front-end board. Remove this wire from the unit.

Connect a 6.8 kOhm, 1/2-watt 10% resistor from the now empty terminal of the phase switch to the top or wiper of the input volume control. The top of the volume control is an outside terminal with the inner conductor of a shielded wire connected to it. The wiper is the center terminal. The preferred connection is to the top of the control or actual input in order to avoid a slight high frequency loss with the control set 6 dB down.

The action of the low-cut filter is retained with the phase switch set to *Normal*. When the switch is set to *Reverse*, V1A is bypassed, giving an audible improvement in the amplifier's sound. No difficulty has been encountered in modifying four amps thus far. Any other further improvement or new modification will be reported in the future.

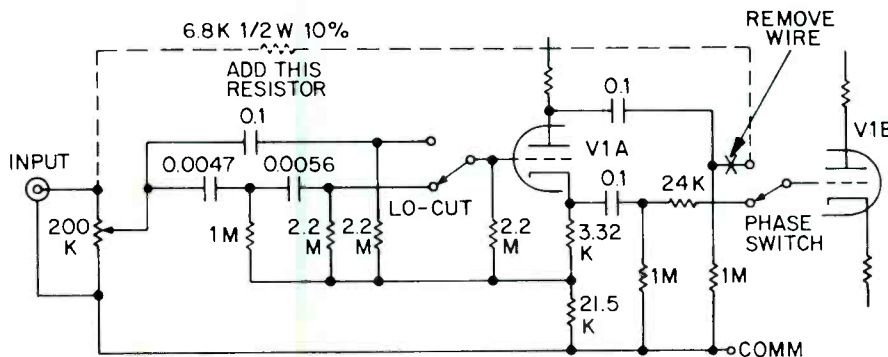
Bascom H. King
Geoffrey T. Cook

TIM Distortion — An Addendum

Dear Sir:

Since it has been impossible for me to answer in detail the many letters I have received in response to my recent article (February *Audio*) on TIM distortion in power amplifiers, I would like to make several statements which may clarify some questions which many readers have communicated to me. Although the slew rate, power bandwidth, and TIM distortion can all be related to the transient and high-frequency performance of an amplifier, it is impossible to predict one from the other in general. However, a poor slew rate or power bandwidth will usually always indicate TIM distortion. The complex relationships between these three parameters is determined by the specific design of the amplifier.

Let us consider two hypothetical amplifiers. Suppose each exhibits a nominal distortion level of 0.01%. Let the two amplifiers have a feedback ratio of 80 dB and 28 dB, respectively. It follows that the inter-loop distortion level is 100% for the first and 0.25% for the second. Which amplifier represents the best design effort? Now suppose the first amplifier is heavily lag-compensated and that it will produce full power at 20,000 Hz at 0.1% THD. Since the open-loop gain at 20,000 Hz is decreased markedly compared to its low-frequency value by the lag-compensation capacitors, it follows that the feedback factor has also markedly decreased. If the increase in distortion at 20,000 Hz compared to the low-frequency distortion does not match the decrease in feedback factor, it follows that the lag-compensation capacitors are filtering out the high-frequency distortion harmonics inside the loop. Now consider a high-level, high-frequency signal in conjunction with a lower frequency signal. The low-frequency intermodulation products between the two signals will not be filtered out by the lag compensation networks. This distortion mechanism will produce TIM. As a final consideration, let us look at the damping factor. Suppose it is 1000 for the first amplifier and 100



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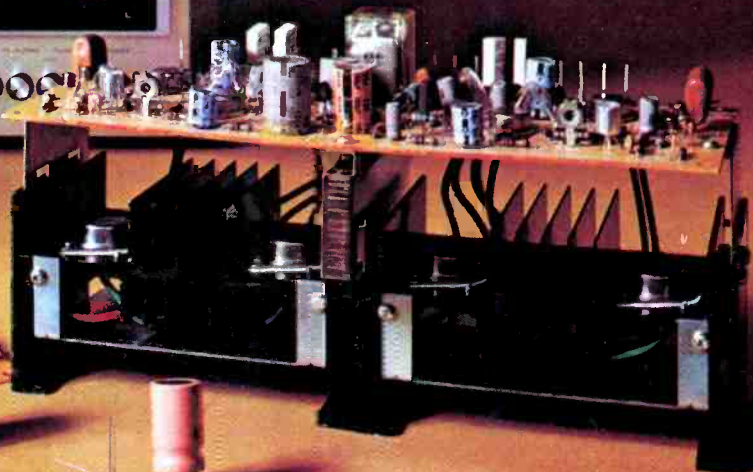
KR-7400... 63 watts per channel, Min. RMS, 8 ohms, 20-20k Hz, with no more than 0.3% Total Harmonic Distortion



KR-6400... 45 watts per channel, Min. RMS, 8 ohms, 20-20k Hz, with no more than 0.3% Total Harmonic Distortion



KR-5400... 35 watts per channel, Min. RMS, 8 ohms, 20-20k Hz, with no more than 0.5% Total Harmonic Distortion



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Great sound since 1923

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Why any cartridge (even ours) with an elliptical stylus must be considered just a bit old-fashioned.

As a premium stylus, elliptical designs have only one real advantage over a Shibata stylus: lower cost. Which is why we still offer them.

But when it comes to performance, a Shibata stylus is far, far better. It provides the small scanning radius needed to track highs (up to 45 kHz for CD-4), but without the penalty of requiring extremely low stylus force settings.

In fact, even when tracking at up to 2

grams, a Shibata stylus is easier on your records than an elliptical stylus trying to track at 1/2-gram! New records last longer, old records sound better, and you can play every kind of two or four-channel record made.

All Audio-Technica Universal Series cartridges have genuine Shibata styli. Anything less would be false economy for you... and out-dated technology for us. Prove it to yourself today.



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for the second amplifier, both measured at 50 Hz. Suppose the open-loop bandwidths of the two amplifiers are 100 Hz and 40,000 Hz, respectively. At 20,000 Hz, the damping factor of the first amplifier will be 5, while it will be 100 for the second. This represents an increase in output impedance in the first amplifier by a factor of 200, while that for the second remains constant. Will this effect be audible with high frequency transient signals when electrostatic speakers are being used whose input impedance decreases with frequency?

There are many more contrasts which we could make between amplifiers with narrow and wide open-loop bandwidths. I hope these examples have answered some questions and provoked further thought on the subject.

W. Marshall Leach
Assistant Professor

School of Electrical Engineering
Georgia Institute of Technology

Defective Albums

Dear Sir:

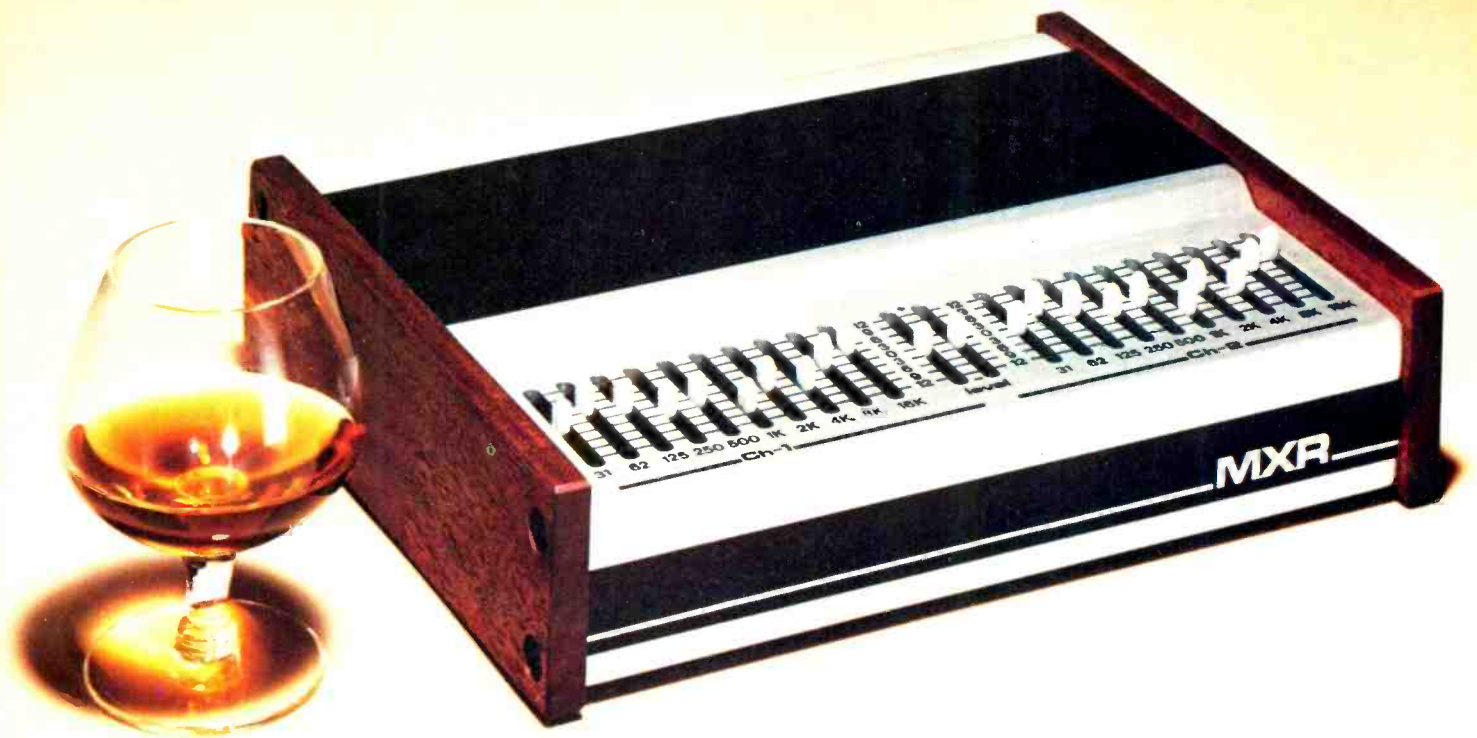
Several of my audiophile friends and I have over the years purchased records which were obviously re-sealed and had serious defects.

On visiting a number of large record stores in the Bay Area of California, I have noticed back-room heat sealers being used, ostensibly to seal records from companies or distributors which had not previously sealed their products in shrink-wrap; however, I suspected that a fair number of returns are unethically resealed and sold again. Since the manufacturers will give credit for defective discs, there is no reason for a store to argue with a customer about a defective album or to re-sell it.

Therefore I would suggest to the industry that it become a mandatory practice for the store to immediately and without argument accept a returned defective record and write "defective" in felt marker on the label and jacket, or to use some kind of punch to identify the album permanently.

I spend many hours each month in record dealers, and find very few customers who are returning their purchases; the small, critical minority who do demand quality should therefore be treated courteously and honestly.

Stephen R. Waldee
Broadcasting Technical
Consultant
Los Gatos, Calif.



To Your Taste

Even the most perfect of high fidelity systems cannot escape those little inconsistencies that nag the ear. Room acoustics, speaker inadequacies, or even recording quality can produce listening environments that are less than optimum.

Then, too, each person has his own tastes in frequency response that can vary from time to time, or recording to recording.

Presenting the answer to your frequency response problems: The MXR two channel ten octave-band equalizer. Ten bands divide each channel's frequency response in one octave increments.

Boost or subtract from the tonality of an octave spread in either channel. A gliding touch of a slide control tailors the frequency response of your system to your room acoustics. Add punch to a bass line. Or brighten up a flute solo. Precisely; repeatably.

Uniquely affordable and elegantly appointed, the MXR two-channel equalizer is crafted in hefty brushed aluminum, with simulated leather and solid oiled black walnut. Its design and circuitry will compliment any modern hi-fi system with gentle elegance and imperceptible distortion.

Its extreme dynamic range allows for application in many situations, and it is therefore made available in a professional version with phone jacks, and a home stereo version with pin jacks and tape monitoring capabilities.

It is instantly adaptable to your system and available at leading dealers at the incredibly reasonable price of \$199.95.

MXR
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Behind The Scenes

Bert Whyte

YOU ARE a music lover. You're in Carnegie Hall, and a great conductor and symphony orchestra are "storming the heavens" with the glorious finale of Mahler's magnificent *Resurrection*, Symphony #2. Your heart is racing, your sensory impressions are approaching the fission level as you are caught up in the visceral excitement, the exhilaration, the rapture, the spirituality, and sheer emotional uplift of a superb performance of this great music. With several thousand people, you have been a participant in a stirring musical drama. You have had a shared experience, that at least for some brief moments has transformed you emotionally, and transcended the mundane aspects of life.

If it is possible to take a cold, detached, clinical view of such an experience, we can separate the sound we heard into various elements. About one hundred-odd performers were deployed on a raised stage, in a more or less traditional disposition of sections or "choirs" of strings, woodwinds, brass, and percussion. These instruments were variously bowed, plucked, blown into or struck. The produced sounds are of differing frequencies and pitch and formed into complex combinations, according to the musical notations in the score and varying in intensity as indicated by the score's dynamic markings. It has been theorized that due to the disposition of the instruments on the stage and the overlapping dispersion patterns of the various instruments, that an overall sound with a spherical wavefront is produced. This wavefront is projected into an enclosed space (the concert hall), which according to the reflective and absorptive characteristics of the ceiling, walls, and floor, has a specific period of reverberation. Depending on the position of a particu-

lar seat in the hall, the auditor may perceive this wavefront as a combination of direct and reflected sound or as a sound which is almost totally reflective. While the quality of the sound the listener hears is subject to these variables, there are also somewhat more subtle effects to be considered, such as the tonality and timbre of an individual instrument, which can vary as a function of the intensity levels at which it is played. All these acoustical and musical elements, plus the important sense of participation in an emotion-dominated event, add up to the totality of the concert hall listening experience.

A Real Concert Hall?

Acknowledging this, can we take an assemblage of audio components, and with the recorded music available to us on phonograph records and tapes, hope to duplicate the concert hall listening experience in the home listening environment? In short, can we reproduce the "concert hall sound" so beloved by the copywriters of hi-fi advertisements?

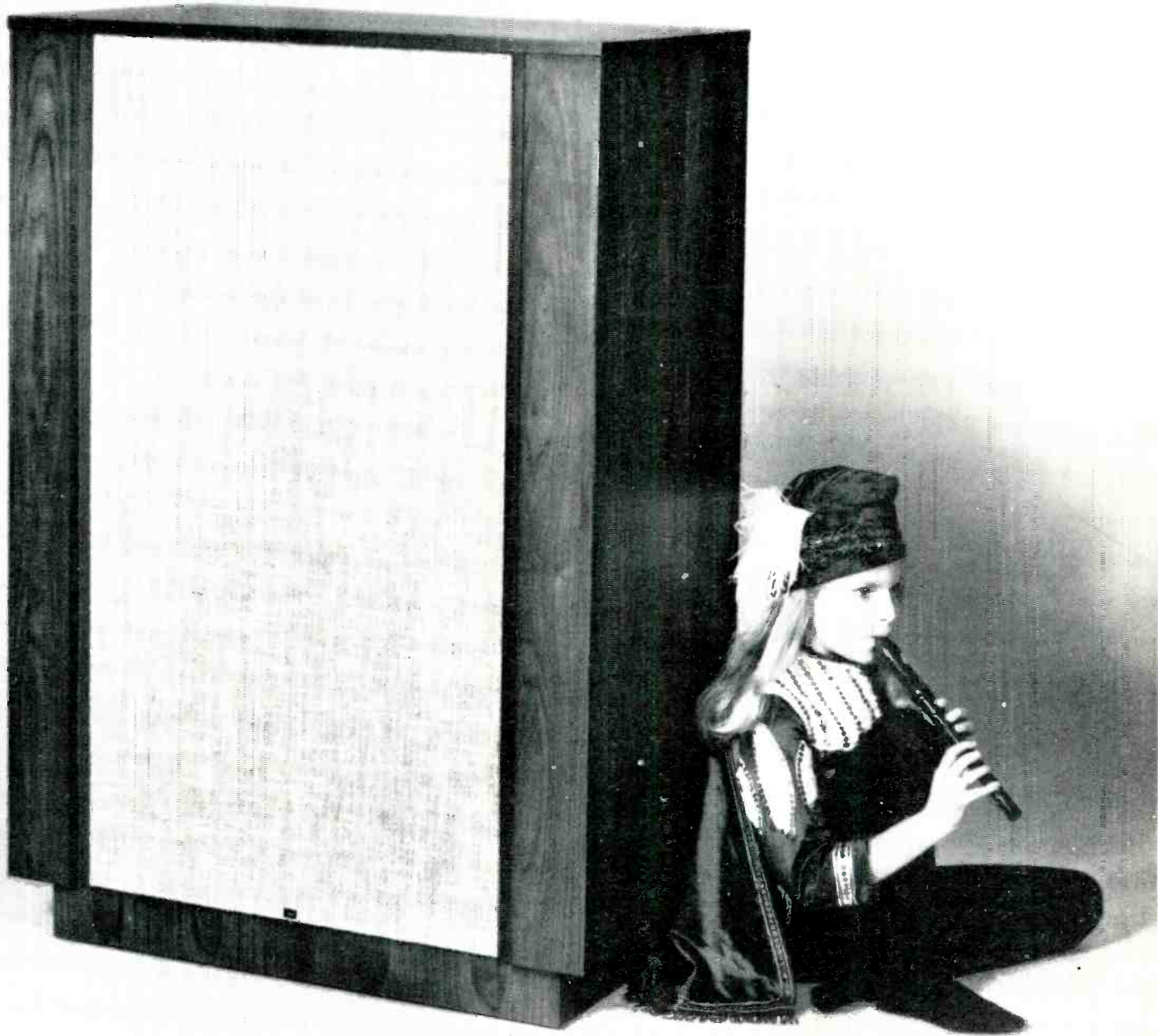
In the strictest sense, we should answer this question with a resounding and unequivocal "NO!" If we want a sop for our ego, we can qualify this by stating that we can't yet meet this criterion. . . as of January, 1976. However, there are some interesting aspects to this idea of "concert hall sound" in the home. Consider, for example, the many thousands of people who own high quality audio systems and, because of reasons of geography and accessibility, have never attended a live symphony orchestra concert. In spite of this, these people know and love classical music, and many have substantial libraries of disc and tape recordings. We cannot condemn these people for having no "refer-

ence" point of live music. For these people, the message is, indeed, the medium. Another group has attended live concerts, but they own very high quality audio systems that they contend give them aural satisfaction *beyond* a concert hall sound, and that the combination of system plus recordings should be regarded as an art form unto itself. Still another group is the most sophisticated of all. They know music and attend concerts frequently, and they own elaborate component systems, with which they try to achieve the psychoacoustic equivalent of the concert hall listening experience. Lastly, there are the so-called "purist" groups, who are so heavily equipment-oriented, that often the performance values of their equipment systems are of prime importance, rather than the simulation of concert hall sound.

It should be noted here that we cannot condemn out of hand those who feel that a recorded presentation of certain types of music is better than the same music heard in the live situation. For example, even if one could have the ideal seat in the ideal concert hall, such is the incredibly complex scoring of the Battle Scene in Richard Strauss' *Ein Heldenleben* that the microphones do indeed give us a more finely detailed picture of the sonic turmoil going on.

For our purposes, let us admit that we cannot achieve facsimile reproduction of concert hall sound, but that we want to create the best possible illusion of this sound. The *Audio* equipment directory has ample evidence of the almost limitless combinations of components that would make good audio systems. However, let's stay with the absolute top, state-of-the-art, money-is-no-object components. There is little argument that preamplifiers and power amplifiers

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are the most technologically advanced products in the audio system. We have units with ruler-flat frequency response and phase linearity, with harmonic and intermodulation distortion levels that are vanishingly low, hum and noise that are inaudible. Turntables cannot be faulted for rotational accuracy and stability, and their rumble is inaudible. We can always make use of a new arm and phonograph cartridge, but we presently have units which give superlative performance. The top tape machines are near flawless in their response. Loudspeakers are legion, and there always seems to be an "ultimate" unit coming along every few weeks. Nonethe-

ing the sound field of the concert hall. In its purest form, that of a four-channel discrete tape, classical music is recorded with the rear channels picking up the ambient sound of the hall. Halls vary, of course, and so do the techniques of the recording engineers, but in general the rear microphones are rarely more than 33-35 feet from the front mikes, which affords a delay of 33-35 milliseconds which is approximately the sound fusion limit of the human brain (more than this and you perceive an echo). Under the right circumstances, the ambient sound played through rear channel speakers in the living room can give a quite convincing illusion of

ments of a similar nature with the Delta T electronic delay unit.

You may recall that in the March, 1975, issue of *Audio*, I reported on my trip to the AKG factory in Vienna and described their BX20E reverberation unit and the AKG electronic delay unit. For some months now, I have been living and experimenting with one of these BX20E reverb units, thanks to the nice people at North American Philips, who distribute AKG products in this country. Taking a leaf from the AKG book, I have been feeding the delays from the Cooper Time Cube into the BX20E reverb unit; the delays approximate the first-order reflections in a hall; I then set the reverb unit at its minimum of 2 seconds (the BX20E is remotely adjustable from 2 to 4.5 seconds). The output of the BX20E feeds into my rear channel pre-amp, and I merely adjust the gain control for the desired level of delay plus reverb. This permits great flexibility in dealing with various stereo recordings, containing varying amounts of hall ambience. As a means of creating the illusion of a concert hall perspective, this combo of UREI Time Cube and AKG BX20E reverb is absolutely sensational. There are none of those disturbing "boingggg" colorations in the BX20E, and the sound is very clean. I get a completely random, non-coherent sound in my rear channels, which closely resembles the sound field of the concert hall. I tried running a matrix synthesizer signal through the BX20E, but the results were rather weird. You just can't believe how much realism this delay/reverb treatment lends to a stereo recording. Many of my friends actually prefer this sound to any of the quadraphonic equivalents of the particular stereo recordings.

Fabulous sound all right...but as usual the rub is the expense of all this. UREI Time Cube runs about \$900, while the AKG BX20E is a mere \$3,150! As I related to you, in the March, 1975 article, I actually had in my hand a small, basic, but effective, AKG "mini-reverb" unit, which is expected to sell for under \$300. A number of people are purported to be hard at work getting an electronic delay unit on the market for under \$1000. AKG has also introduced the much smaller, lighter BX10 reverb unit in this country, and it sells for \$1350. Admittedly, the whole scheme is still a lot of money, but since this absolutely revitalizes a stereo collection and puts you right in the front row of state-of-the-art sound reproduction, if you have the wherewithal, it's worth every nickel. ☺

"You can't believe how much realism delay/reverb treatment lends to stereo... but, as usual, the rub is the expense."

less, there are a few top models whose performance is widely admired. Several combinations of these super components will give us audio systems of the very highest quality.

In a concert hall, we hear hacks and coughs and sneezes, and program rustling, and people whispering, along with the music. But we certainly don't hear hiss and hum! Thus, along with our basic components, we will rid our tapes (and to an extent) discs of various noises by utilizing noise reduction devices by Dolby, Burwen, dbx, JVC, and Phase Linear.

In our pursuit of the concert hall illusion, we now have an audio components system that will give us clean, virtually distortionless sound (assuming the highest quality source material), wide in frequency response and dynamic range, noise-free tapes, and quiet discs with low "tick counts." We have taken a giant step toward the approximation of concert hall sound...but there is something missing. This is, of course, the acoustic perspective, the reverberent sound field of the concert hall.

Creating the Illusion

Quadraphonic sound came into being, basically, as a means of recrea-

tion of concert hall acoustics. Another technique, known as tetraphonic sound, utilizes two microphones in the front channels in a normal stereo configuration, and two microphones in the rear, but they are farther apart than in the quadraphonic technique, usually no more than 15-18 feet from the front mikes and normally in the cardioid position. In playback, front channels are normal, while about a third of the room length from the front wall, a "rear" speaker is placed on each side and angled in toward the listener. This gives a very realistic, broad "proscenium" effect, and is preferred by many people to the rear ambience of quadraphonic sound. The bother is that this type of speaker placement is even more of a decor problem than the "4-square" approach and comes off poorly with the ladies, even when it is possible!

The Dynaco technique and the synthesizer functions of the QS and SQ matrix systems are well-known methods of enhancing the reproduction of stereo music. I have also reported on the excellent enhancement of acoustic perspective I obtained by delaying the front-channel stereo signals 14 and 16 milliseconds, through the UREI Cooper Time Cube. Also the experi-

THE END OF THE DOUBLE STANDARD.

OUR LEAST EXPENSIVE RECEIVER HAS THE SAME LOW DISTORTION AS OUR MOST EXPENSIVE RECEIVER.

IM Distortion Comparison

YAMAHA	Brand "A"	Brand "B"	Brand "C"
CR-1000	.1%	.15%	.3%
CR-800	.1%	.3%	.5%
CR-600	.1%	.5%	.8%
CR-400	.1%	1.0%	1.0%

With most manufacturers, price determines quality. However, in the above chart, you can see how Yamaha alone offers the same quality (low distortion) throughout our entire line, regardless of price.

At Yamaha, we make all our stereo receivers to a single standard of excellence.

A consistently low intermodulation distortion of just 0.1%!

A figure you might expect only from separate components. Maybe even from our \$850 receiver, the CR-1000.

But a figure you'll surely be surprised to find in our \$330 receiver, the CR-400.

So what's the catch?

There is no catch. Simply a different philosophy. Where high quality is spelled low distortion.

You'll find Yamaha's single-mindedness particularly gratifying when compared to the amount of distortion other manufacturers will tolerate throughout their product lines. (See chart.)

Particularly gratifying and easily explained.

Less of what irritates you most.

While other manufacturers are mostly concerned with more and more power, Yamaha's engineers have concentrated

on less and less distortion.

Particularly intermodulation (IM) distortion, the most irritating to your ears. By virtually eliminating IM's brittle dissonance, we've given back to music what it's been missing.

A clear natural richness and brilliant tonality that numbers alone cannot describe. A new purity in sound reproduction.

A musical heritage.

Our seeming preoccupation with low distortion, in general, and the resulting low IM distortion, in particular, stems from Yamaha's own unique musical heritage.

Since 1887, Yamaha has been making some of the finest musical instruments in the world. Pianos, organs, guitars, woodwinds, and brass.

You might say we're music people first.

With our musical instruments, we've defined the

standard in the *production* of fine sound. And now, with our entire line of receivers and other stereo components, we've defined the standard of its *reproduction*.

Four different receivers, built to one standard.

Between our \$330 CR-400 and our \$850 CR-1000, we have two other models.

The \$460 CR-600 and the \$580 CR-800.

Since all are built with the same high quality and the same low distortion, you're probably asking what's the difference.

The difference is, with Yamaha, you only pay for the power and features that you need.

Unless you have the largest, most inefficient speakers, plus a second pair of the same playing simultaneously in the next room, you probably won't need the abundant power of our

top-of-the-line receivers.

Unless you're a true audiophile, some of the features on our top-of-the-line receivers might seem a bit like gilding the lily. Selectable turnover tone controls, variable FM muting, two-position filters, even a special five-position tape monitor selector.

However, you don't have to pick one of Yamaha's most expensive receivers to get a full complement of functional features as well as our own exclusive Auto Touch tuning and ten-position variable loudness control.

The End of the Double Standard.

Just keep in mind that all Yamaha stereo receivers, from the most expensive to the least expensive, have the same high quality, the same low distortion, the same superlative tonality.

It's a demonstration of product integrity that no other manufacturer can make. And, an audio experience your local Yamaha dealer will be delighted to introduce you to.



International Corp., P.O. Box 6600, Buena Park, Calif. 90620

Check No. 33 on Reader Service Card

Audio ETC

Edward Tatnall Canby

NO DOUBT about it. The single inventory "stereo/quadrasonic" disc now adopted by British EMI (see last month's column) points the reasonable way out for all quadrasonic discs. One type of disc, one release per catalogue item. No more separate stereo and quadrasonic versions, denying the very compatibility which the ads promote.

Note quickly that I do not mean one quadrasonic system. Not that—not yet. We can have a single inventory, while the battle of the systems continues until consumers determine the outcome. Via single inventory, quadrasonic will follow the course of every major technical innovation in disc history, each of which has reverted to the classic single sales "channel," one disc for all. Not merely after the LP, after the battle of the speeds (each speed going its own way and the 78 to oblivion), after stereo; also earlier, around 1900, when an impasse of conflicting discs was resolved via patent pooling into the combined and soon standard lateral-cut acoustic disc.

History says that specialized disc types, no matter how good, tend to lose out. The dead weight of financing and sales is too much, even for a big company. To be viable, any new system today must not only have that initial compatibility, but it must ultimately *merge right into the old*. And that, soon! For our already elderly quadrasonic, the time has definitely come. Merge or die.

The new twist, of course, is that this time there will remain two or three alternative quadrasonic systems offer-

ed from various sources, all extremely compatible with stereo. And all within the single inventory concept. Perfectly possible—let's take one thing at a time. First, make the necessary sonic compromises for combined stereo/quadrasonic, basically minor ones in the long run, to my mind, and this for each of the systems—then get them all on the single inventory basis. Domino theory, we can hope. Back to the main stream and to simpler sales. Then let the systems fight it out. Thus if, say, EMI puts out a single release of the Tchaikovsky's Fourth in SQ stereo/quadrasonic, maybe RCA will put out Tchaikovsky's Fifth, also one release, with CD-4—call it QuadraStereo. (Trade mark courtesy of E.T.C.) Everybody who wants that Fifth buys that record. There is no other. Single inventory.

Single Inventory, Double Quality

Each disc, whatever the system, must—and this is the test—be good enough in stereo to rate as *the* stereo release of a given recording. Each must also be good enough to be *the* quadrasonic version. The compatibility that this requires covers a lot of ground, and must exist on two distinct levels: the purely sonic or aesthetic (last month) and the mechanical/electrical. There is surprisingly little overlap, when you come down to it. The first has to do with recording techniques and with playback sonics, the second comes in between, in the disc itself and its production and reproduction. Now without question the matrix approach on the mechanical level lends itself ideally to the single inventory disc, as EMI has so

wisely understood (and CBS hasn't). Mechanically/electrically, there are no problems. Not so you'd ever notice them, anyhow.

A hundred million present styli and their cartridges can't see any difference at all between stereo and matrix four-channel. The four-way message is, so to speak, in invisible ink. It isn't there. Until you get your signal inside one or another of the decoder/logic circuits, the disc is *literally* a stereo disc. This factor alone puts EMI's SQ and, incidentally, all the other matrix quadrasonic systems, on a very nice inside track for the single inventory. (QS, you will note, has been moving in this direction for some time via some of its labels.) So—for matrix, only the aesthetic problems of stereo/quadrasonic compromise remain. And not much compromise needed there, as I suggested last month.

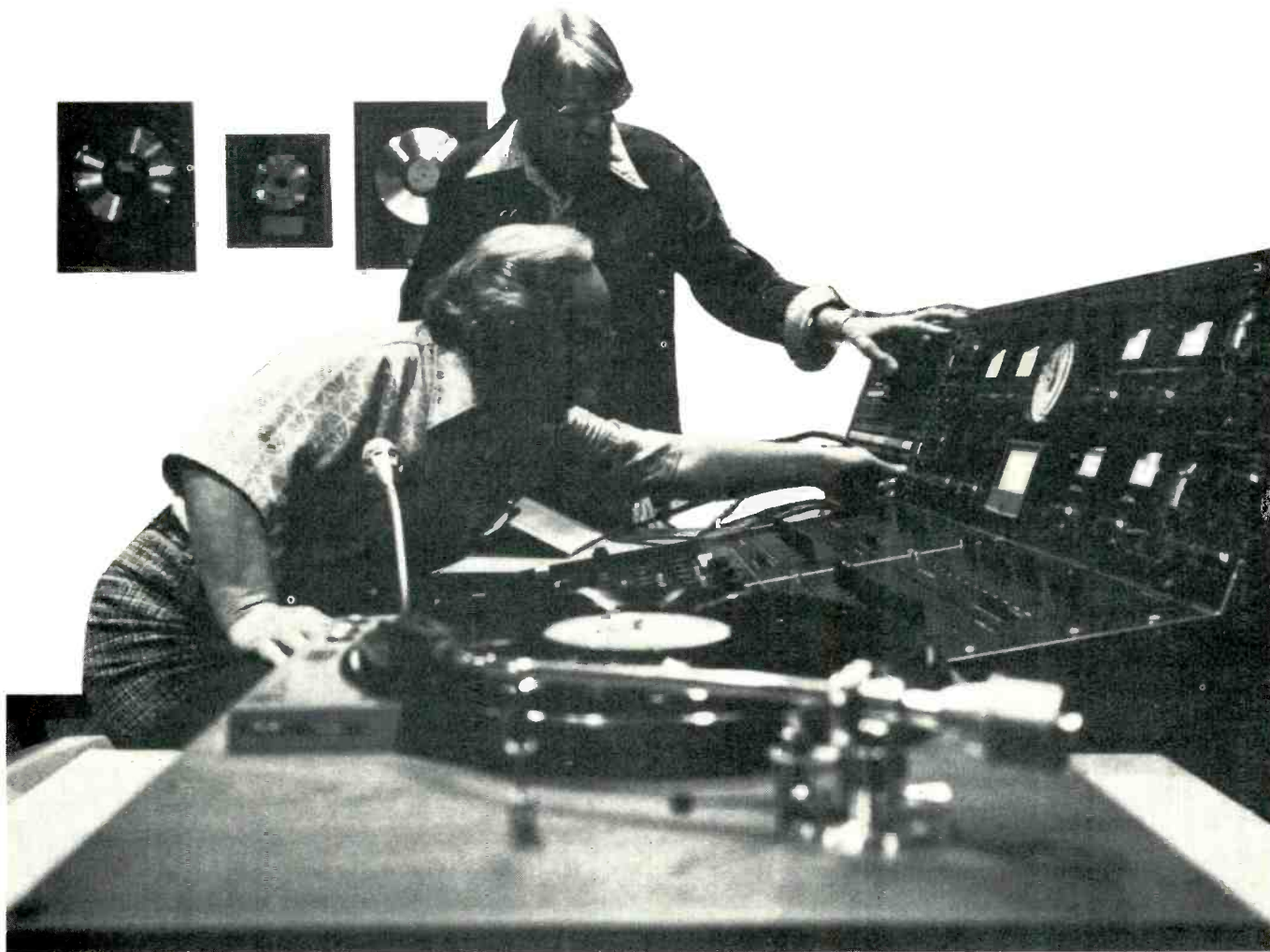
But if you do have problems in the mechanical/electrical area, in the production, in the playback especially, then you can forget the sonics and aesthetics—your quadrasonic goose is already half cooked.

Forecast for CD-4

Look, then, at the other main type of quadrasonic disc sound, the CD-4 record or QuadraDisc. Can it in fact turn QuadraStereo once again, and this time for good? (RCA tried the single inventory back at the beginning, bravely and much too soon.)

Well, yes. But the story is the same old story. CD-4 just needs a bit more time. Under its outward show, the CD-4 system, as most of us know, has been waging a marvelous engineering

Creation of the new Calibration Standard filled a need...the acceptance of Stanton's 681 TRIPLE-E is unprecedented!



It was no accident!

The Recording Industry needed a new calibration standard because it had been cutting discs with higher accuracy to achieve greater definition and sound quality.

So, the engineers turned to Stanton for a cartridge of excellence to serve as a primary calibration standard in recording system check-outs.

The result: the new calibration standard, The Stanton 681 TRIPLE-E.

The rest is history!

Major recording studios adopted it...as did many of the smaller producers. Radio stations across the world put the 681 TRIPLE-E on all of their turntables, both for on-the-air broadcasting and for disc-to-tape transfer.

And, audiophiles by their purchases have voted it the outstanding stereo cartridge available.

The Stanton 681 TRIPLE-E offers improved tracking at all fre-

quencies. It achieves perfectly flat frequency response beyond 20 kHz. Its ultra miniaturized stylus assembly has substantially less mass than previously, yet it possesses even greater durability than had been previously thought possible to achieve.

Each 681 TRIPLE-E is guaranteed to meet its specifications within exacting limits and each one boasts the most meaningful warranty possible. An individually calibrated test result is packed with each unit.

As Julian D. Hirsch of Hirsch-Houck Labs wrote in Popular Electronics Magazine in April, 1975: "When we used the cartridge to play the best records we had through the best speaker systems at our disposal, the results were spectacular"

Whether your usage involves recording, broadcasting, or home entertainment, your choice should be the choice of the professionals... the STANTON 681 TRIPLE-E.



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

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battle against incredible odds, trying to perfect an inherently difficult medium launched before it was ready (like all the rest of the quadrasonic systems). Progress has been astonishing, all things considered, and is progressing. CD-4 is more alive than ever. But this system, you understand, was by far the most revolutionary in the sense that it required the most fundamental changes in our existing home equipment, not to mention the agonizingly long development behind the scenes at the professional level after the original launching. The matrix concept floundered and struggled, too, but there the problems were entirely in the aesthetic area, matters of audible quadra-sonics.

Time! If only CD-4 could quietly junk all its past and re-cut according to its present advanced abilities, the battle for compatibility would be already won, at least on the professional level. But this isn't quite practical, as things stand. It is foolish to overlook or underplay CD-4's technical difficulties. Gets nobody anywhere, not even RCA, which doesn't usually mention them. Bert Whyte's soberly optimistic and very detailed account of present CD-4 technology at the pro level, in the November *Audio*, seems

to me by its very optimism to give an excellent picture of CD-4 history. Bert enumerates each of those horrendous difficulties we have heard about and shows what has been done to meet the challenge, that is, to produce a disc which is genuinely compatible with and equal to an equivalent in stereo, not only in the hi-fi sound quality but in that crucial element, the length of play. When all those new Whyte-described recordings get onto the production line, the single inventory CD-4 disc should roll right off the proverbial log. A single release, across the board, and never two versions of the same recording.

Beyond the professional comes the home equipment. Right now that equipment doesn't totally relish the CD-4 disc and still can do it damage. Those tiny ripples, the pair of FM-modulated carrier signals at 30 kHz, just have to be there, and they still get rubbed down and damaged even when you can't hear them (though a damaged FM ripple can still carry a good signal thanks to FM itself, which doesn't hear the static). But the best thing that CD-4 has done for us is to promote a new generation of improved cartridges and styli, now spreading through the audio field,

which can indeed safely play the CD-4 disc—and play stereo better than before.

Time, again! I would suppose, even so, that most new equipment to be bought this year, level for level, will do only nominally low damage to the improved CD-4 groove, which is tougher than ever; and many hi-fi owners will have the new styli and the wider-range CD-4-capable cartridges.

Ah, but what of the CD-4 sound quality and the length of play? The picture there is not to be glossed over, since of necessity it includes the past as well as Bert Whyte's optimistic present. For all the hoopla, a good many CD-4 discs have at best been indifferent in sound quality, the doctoring of the signal elaborate and often (in the past) only too audible, especially at the dangerous inner grooves—where composers are loudest. Level, too, has been noticeably low, which is actually more of an inconvenience (given good surfaces) than a fault. Psychologically disappointing, without a doubt, and a high level is the opposite, as the pop people know. But the most difficult (past) problem, a compound of all the others, is the length of play. If Bert is right, it has been solved—the CD-4 can match any old stereo.

For instance, take Mahler, into which RCA has boldly plunged—the longest symphonies anywhere. Dual inventory, of course. The Mahler First and Fourth (Levine) appear each on a single stereo disc, maximum length. In the alternative QuadraDisc version, the two symphonies are together in one album—on three discs. That is the extent of compromise recently required in order to “ensure,” as the British say, that an approximately equal sound quality will apply to both versions, and especially for the quadrasonic version played in stereo on two-channel equipment. You can't build a single-inventory disc on that basis—though, to be sure, Mahler is an extreme. You can't ever build it, whatever the length of play, until you can guarantee that your quadrasonic disc is going to sound just as good in stereo as a plain stereo disc, minus those groove ripples.

I'd say in all soberness that maybe as of just this minute the CD-4 disc can't quite make it, across the board, over into the single inventory. But it surely will, very soon. A little more time, please. When CD-4 does just that, it will have it made. I gotta believe, and so do you.

The aesthetics of stereo/quadrasonic in terms of CD-4 vs. matrix? A juicy subject, and I'll be right back, next month. *W*

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See the wide range of class mates, eight integrated amplifiers and four matching tuners, that Sansui has to offer you at your nearest Sansui franchised dealer.

*The value shown is for informational purposes only. The actual resale price will be set by the individual Sansui dealer at his option.

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the audio amateur ?

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What's New in Audio

Celestion Loudspeakers



Rola Celestion Ltd. of England has long been known in Europe and in Canada for its high quality speakers and is now expanding its distribution in the U.S. The UL8, shown here, is typical of the new UL series and includes a dome tweeter for frequencies above 200 Hz, an 8-in. mid-bass radiator, and an 8-in. ABR (auxiliary bass radiator). This last is a passive unit which increases the effective size of the enclosure, which is 23 in. H x 11 in. W. x 9 1/4 in. D. Claimed response is 70-20,000 Hz ±3 dB. Power handling is 25 watts continuous rms, 50 watts peak music power. Sensitivity is 12 V rms pink noise input for 96 dB output at one meter. Air-core inductors are used in the crossover networks for minimum distortion. Shipping weight is 27 1/2 lbs. Price, \$249.50.

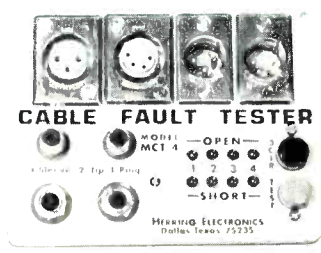
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3M Cassette Edit/Repair Kit

Cassette-repairing or editing has been very tricky because it usually involves disassembly of the cassette which has a number of very small parts not easy to reassemble correctly. This kit permits splicing/editing most broken tapes without opening the cassette shell (if the tape is still hooked to the hubs). Six adhesive-tipped polyester picks for retrieving tape ends lost inside the cassette housing and six pieces of 150-mil splicing tape, cut to correct length, are included. For editing, a 5-in. long slot along one edge of the block holds the tape securely for either 45° or 90° cuts. One end of the kit is shaped to drive the cassette hub manually.

Check No. 82 on Reader Service Card

Audio Cable Tester



Crossroads Audio Model MCT-4 is a compact cable fault tester that provides quick testing for opens and shorts in most common audio cables. It tests all conductors simultaneously in cables using three-pin and four-pin Cannon microphone connectors, as well as those with RCA phono plugs, and two- and three-conductor phone plugs. Shorts or opens are indicated by LEDs on the front panel of the MCT-4, which is priced at \$89.95 plus \$1.00 postage and applicable sales tax. Crossroads Audio, Inc., Box 19671, Dallas, TX. 75219.

Check No. 83 on Reader Service Card

TEAC A-400 Cassette Deck



This front-loading cassette deck includes Dolby noise reduction and a new d.c. servo-controlled motor said to be unaffected by line voltage fluctuations. *Fast Forward* and *Rewind* are controlled by one rotary lever switch while *Play* and *Record* are handled by a second rotary lever switch. In addition to the two volume-averaging meters, the unit has peak-indicating LEDs. Also included are separate bias and equalization switches and automatic stop. The A-400 is priced at \$329.50.

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The end of the war between art and engineering.



*Console shown is optional.

There is performing and there is engineering. Art and signal. Both are important and both can suffer when you have to do both. Especially when your music and the machine that records it are making heavy demands on your concentration.

Our new 1140 lets you focus more on your music and worry less about how it's getting there.

Take sync. The 1140's simplified automatic sync control is a more logical approach to the function than anything you've used before. It frees you from that "Where the hell am I" frustration when you're building tracks.

It also lets you punch in (and when you punch in you're automatically switched from sync to source).

Sync level is the same as playback level, too, in case you don't have a third arm available for gain control.

The 1140 has built-in bias with the bias controls up front so you don't have to tear the electronics apart every time you change tapes. Plus a 200 kHz bias frequency for further noise reduction and one of the few heads around capable of erasing those exotic new formulations.

Then there's program memory, motion-sensing circuitry for anti-

spill tape handling, peak level indicators and an optional floor-standing console that makes the 1140 even easier to work with.

For all that and more the 1140 costs \$1199.95, about 45¢ more than Teac's A3340S. But if you spend that extra half-a-buck with us, you can spend more time with your music.

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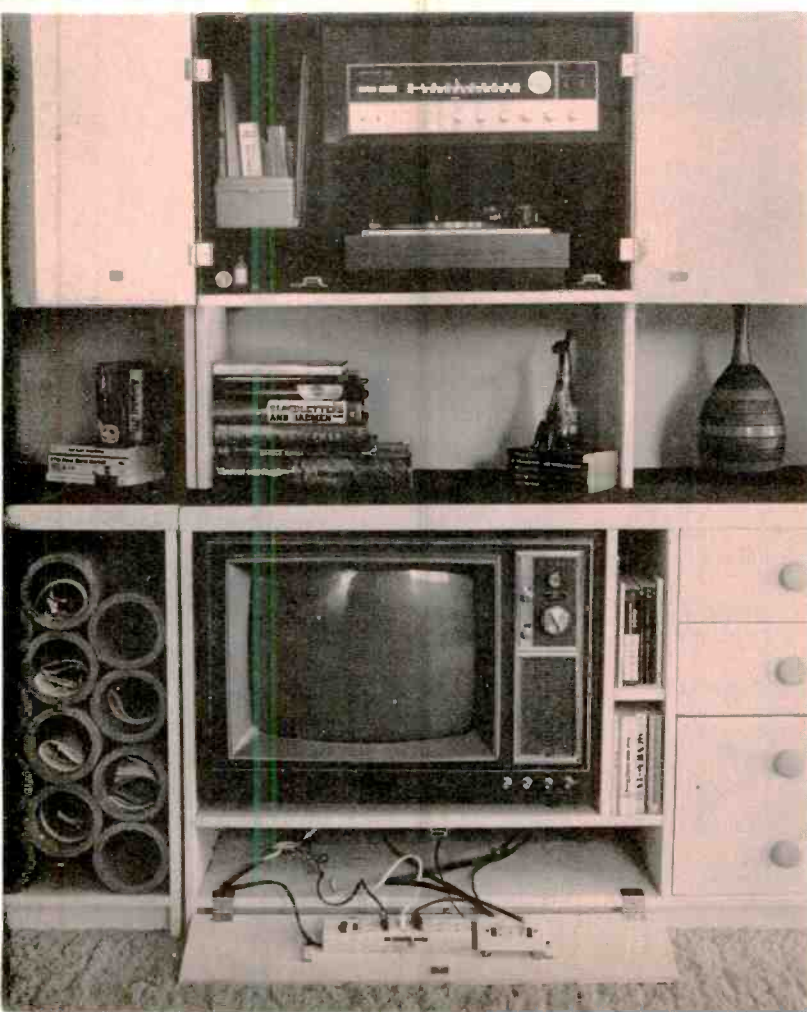
0.04%
 ±3 dB, 35-22K
 65 dB WTD
 No
 No
 Yes
 No
 No
 \$1199.50

DOKORDER 1140

0.04%
 ±3 dB, 30-23K
 60 dB WTB
 Yes
 Yes
 No
 Yes
 Yes
 \$1199.95

Features and specifications as published by respective manufacturers in currently available literature.

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The wall-installation ensemble, belonging to the author's friends (top & lower-left), looks built in, yet can be easily moved. Center doors conceal tuner and turntable when not in use; false-front drawer at base hides the multiple a.c. outlets. Author's installation (lower-right) is as efficient, but trickier to move to a new location.



Photos: Alan Axelrod

Designing A Custom Installation

Paul Seydor

IF YOU'VE often glanced enviously at custom stereo installations while paging through audio or decorating magazines, perhaps you are also less than fully satisfied with the present arrangement of your system, especially if it appears as just so many black or gold anodized boxes stacked one on top the other with electronic spaghetti tangled up around them. You might be surprised, however, to discover that a custom installation is neither so difficult nor so expensive to make as you may fear.

I designed and built both installations pictured here with absolutely no previous experience or training in carpentry and woodwork. My own installation, the display panel built into a closet doorway, cost under \$30 (excluding tools), which is less than most of the decorative cases manufacturers sell to dress up individual components. The other installation, a home-entertainment ensemble that I made for a close friend and his wife when they redecorated, was more expensive, but still only a fraction of the cost of an equally commodious store-bought ensemble like those sold by the "custom" manufacturers.

No tools more complex than a screwdriver, a level, a 1/4-inch electric drill, and a light-duty sabre saw were required. (My drill and sabre saw are both Black and Decker models, costing under \$10 each). I needed the sabre saw to cut out the holes for flush mounting; all the rest of the cutting was done to my specifications by the lumber yard where I purchased the wood (most lumber yards offer this service, provided you buy the wood from them and ask only for straight, squared-off cuts).

The trick, of course, is to do *all* your designing, planning, and measuring on paper before you order the wood or start cutting. The first thing to do is to interview yourself. Exactly what functions must the installation serve (merely to organize and display the equipment attractively, or to be a complete home-control and entertainment center, or just to

hide the equipment when it isn't in use)? You will have to make a thorough appraisal of the present state and future development of your sound system. Do you have the equipment you want to use for some time to come or are additions and replacements imminent? What about four-channel? Be fairly thorough but realistic in this appraisal, yet don't cramp your system's possibilities for expansion if your enthusiasms take you in that direction.

You will also want to appraise your living conditions, primarily to determine a location for the installation. Probably you will want to install the source and signal-amplification components in the same room as the speakers. If this room is a multi-activity room, like a living room or a den, you should select a location *not inconveniently* out of the way but also try to avoid high-traffic areas. Chair-side accessibility to controls is a nice idea, but hardly practical if you regularly use your coffee and end tables for serving snacks and drinks, or if your children occasionally turn the living room into a gymnasium.

Type of Installation

Deciding upon a location is, of course, difficult without simulta-

This drawer from author's closet installation holds spare wire, signal cables, tools, etc. (top two drawers were removed for photo). Square lathing was used instead of slides; drawers were made from 1/2-in. A.D. plywood.

neously considering what kind of installation is going to go there. Here are three basic installation designs that can, with some modification, be accommodated to a broad variety of listening rooms:

(1) A complete installation, that is, an installation built right into the existing structure of the room. Any closet or doorway of marginal utility will do. I built mine into a large, gloomy walk-in closet that had been strategically ill-placed between the living room and the kitchen. If you own your home, you can build an installation right into a wall (though not an exterior wall). Since this is an extreme measure, you should proceed very cautiously, paying close attention to what is on the other side of the wall (a walk-in closet would be ideal) and being fairly certain that you're committed to the present arrangement of the furniture.

(2) The wall-ensemble, shown here, became the focal point of the living room and looks almost built-in. It functions as a total audio-visual center, as a storage and display unit, and as a general room-organizer. The construction itself is modular, breaking down for easy portability into three bottom units, three top units, and two cabinets (one for components, the

other for liquor). Usually it is a good idea to keep speaker systems out of the source- and signal-component installation, because of potential acoustic feedback and inadequate spread between the speakers. This rule was broken here, as the floors were sturdy enough (a prerequisite for any floor-standing installation), the ensemble massive enough, and the span wide enough that acoustic feedback and insufficient speaker separation weren't a problem.

(3) A free-standing column, about six-feet high, two feet or more square, one side of which serves as the display panel for flush mounted components, the other sides of which serve as whatever you design them for—shallow shelves to display knick-knacks, plants, books, and so forth, or bare sides for hanging pictures. This design has many virtues, especially for apartment dwellers, as there is no need to mar walls to set it up, and it solves the problem of rear-access to the components. Simply cut a large hole in the side of the column opposite the back of the components, and when you're not using the hole to get at the components, cover it with a suitably large print, painting, or wall-hanging.

Rear access to equipment is, of course, the most vexing problem with custom installations. If you have little interest in equipment as such, and your installation will be a "once only, thank goodness *that's done*" affair, then you shouldn't be overly concerned with designing in quick and easy access. If, however, you enjoy trying out the latest preamplifier or tape deck, then you'll want to plan something that won't involve wholesale destruction everytime you want to patch in a new piece of equipment. Apropos of which, you might want to consider making up a patch panel for this purpose. (That's going to be the next addition to my installation).

You should be aware of two potential problems, which I discovered almost too late when I built the first of these installations. Hum fields from power supplies tend to be more potent and pervasive in the vertical than in the horizontal plane. If components are to be in a stacked configuration, then you will want to know in advance just how close they can be to one another and you can check this easily enough. Turn the volume control to a slightly higher setting than you ever listen to music at, do the same with the bass tone-control (you might want to turn the treble all the way down), then hold your turntable



You make a tape with time and thought. Carefully chosen selections recorded in the sequence that most pleases you. The musical coherence and perception is yours, a personal expression. And when the time is right to share



that experience with someone you care for, having to stop and turn the tape over can break the mood you worked to create. Interruptions like that don't happen with the A-4300. You

can enjoy continuous music on both sides of a tape with the automatic reverse function. And with automatic repeat, a favorite tape will play as long as you like. Whether you want the music up front or in the background, the A-4300 can give you solid music for the better part of an evening.



Check out the A-4300, and listen to it for as long as you like. Just call (800) 447-4700* for the name of your nearest TEAC retailer. In Illinois, call (800) 322-4400.

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when you don't want the music to stop
TEAC A-4300

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directly above the amplifier, and have someone measure how close you can lower it toward the amplifier until you begin to hear hum that wasn't there before. Next, leave the turntable in place and repeat the test with the amplifier held above it. Do the same with tape decks, if you have them.

Since you will have a ruler out, measure each piece of equipment in all dimensions. Be certain to do this yourself rather than trust the measurements provided in owner's manuals and advertising literature, which I've often found to be only approximate, and even when precise don't always account for protruding knobs, jacks, and antennae, or the heads of screws used to fasten the protective case to the chassis.

What Goes Where

With your preliminary questions answered, a general idea of what kind of installation you would like and where it is to be located, and your no-hum distances and equipment dimensions in hand, you are ready to sit down with pencil, paper, and ruler.

(1) *Layout of components.* No matter what kind of installation you decide upon, you should let convenience and ease of operation determine the equipment layout. Look at

the kinds of knobs that are used for controls. Note especially where their indicator markings are placed (some knobs, for example, are marked only on the edge, not on the face, which means that the component cannot be placed above eye level, otherwise you won't be able to tell the setting). Take a good look at the placement of all meters, tuning dials, and indicator lights. As your installation will likely be located several feet from your listening chair, there are doubtless some things you'll want to know—volume and tone control settings, whether the system is on at all—without having to get up and walk all the way over to the installation. By all means, do some experimenting here, arranging your components in various configurations and at various heights to see where they can be most conveniently operated.

Perhaps the best advice I can give here is by way of explaining the rationale behind my own layout. I wanted the installation to be a control center, with each component placed for upmost convenience of operation, within, of course, the limitations imposed by location and available space. The manual turntable, used for most critical work, was placed at shoulder height, for ease of sighting during

cueing. The automatic unit was placed lower, because it is automatic and is not much used for dubbing. The tape deck was placed highest, allowing the meters and control settings to be seen from anywhere in the room, and putting the knobs and joystick comfortably at arm's length—not too close, yet not so far that I have to stand on tip-toe to reach them.

The preamplifier was given a center location because, with the power amplifier, it forms the heart of the system. The best reason, however, to place this main control component near the center of any configuration is that it is the only component that will be connected to every other component; thus a central location permits you to work within the lengths of the signal cables provided (especially important for turntables and tone-arms). I put my amplifier up front because I often refer to the meters. If your amplifier has none, or if you don't use them, you can leave it off a display altogether, tucking it out of sight wherever you find most convenient.

I have no tuner in my system. But an ideal placement for one is at eye level, where you can look directly at the tuning dial. This was the placement chosen for the receiver in the other installation shown here.

(2) *Turntables.* In any display panel there is no way you can flush mount a turntable (or some, though comparatively few, tape decks). Instead, you will have to cut a window into the panel for access to the turntable. The width of the window should be determined by the width of the turntable's base. (If you own a changer and plan to move up to a manual, you should make this window wider than you now need, as changers tend to be more compact than most manuals.) The vertical dimension of the window should be at least ten inches for free and easy operation of a manual or a changer used in the manual mode and 12 inches for a changer used in the changer mode. More height is desirable if you can afford it.

To enclose a turntable window when it is part of a display panel, make a four-sided (top, back and sides) plywood box and then set it, unfastened, on the same shelf as the turntable, its front edge pushed flush against the back of the panel. The advantage to leaving it unfastened, at least in my installation, is that when I'm working behind the panel I can simply lift the box out of the way and thus have access to the turntable from both front and back.

This close-up of a turntable opening shows how the night-light functions. In this installation, no discrete dust cover is used, and an unused disc serves to keep dust off the platter.



Ten years after the revolution.



1966

In 1966, Sony brought you the world's first commercially available turntable with a DC servo motor. This effectively slowed motor speeds from 1800 to 300 RPM, producing the lowest rumble figures measured till then. The servo system also drastically reduced wow and flutter, thus giving you a chance to hear what 33-1/3 records sound like at 33-1/3. Quite a revolution.

But we haven't been sitting on our laurels since then. Introducing the PS-4750.

Overlooking the fact that the PS-4750 is so pretty we could sell it through interior decorators, here are its technical innovations.

It has a direct drive servo motor that gives you incredibly low rumble, wow and flutter levels.

Plus total immunity from line voltage and frequency variations. That's because the PS-4750 has a unique system that, in essence,



1975

consists of a sensitive magnetic head (with eight gaps instead of the normal one) which monitors platter speed by picking up a magnetic coating on the outside of the platter. This speed data goes through a small computer connected to the motor, instantly compensating for variations.

The PS-4750 is also ultra insensitive to outside vibrations (which causes intermodulation distortion and acoustic feedback). Sensitivity to outside vibration shows as "Q." And the PS-4750 has a platter and case made of SBMC, a Sony developed compound which has one third the "Q" of aluminum or zinc.

We've even done something

about the resonance caused by warp in the record itself. Those round doohickies on the platter are rubber suction cups that actually provide greater contact surface, reducing the longitudinal vibration caused by warp. The end result is a cleaner sound.

So, all in all, our engineers think the PS-4750 is pretty nifty. But don't take our word for it. Just stop to your Sony dealer and show your independence by listening for yourself.

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In some installations you may not have room to use the dust cover of your turntable. In my small-town location, I've discovered that if a turntable is used at all frequently, a dust cover doesn't need to do much of a job of keeping dust off. Furthermore, the only dust you really have to worry about is dust on the platter itself, for the prevention of which I recommend cutting out a platter cover from wood, cardboard, or other stiff material. I keep a worn-out record on each platter when the turntables aren't in use. Such a cover does a superior job of keeping dust away where it counts, and I recommend the use of one even if you do use the turntable's dust cover. A good cleaner is naturally best.

(3) *Lighting.* For most installations ambient lighting from elsewhere in the room will be sufficient for normal

semble. In order to achieve a finished appearance, the receiver was framed with a plexiglass escutcheon large enough to cover the front opening of the compartment.

(5) *Structure, Support, and Shelving.* In any kind of free-standing installation, you will probably have to back at least some portions of the cabinets for sturdiness. At the same time, I recommend that you try to relieve a display panel, if you are planning to have one, of the burden of supporting any equipment weight. There are two good reasons for this. You can use 1/4-in. thick plywood for the panel, which will be the easiest in which to cut out mounting holes with the calibre of sabre saw I referred to earlier. And if someday you have to cut a new display panel, the job will be easier and less expensive.

"Such projects are a challenge and an education because you will meet engaging problems and have to learn new skills to solve them."

operation of your system, since meters and tuning dials are illuminated. With turntables installed in hutches or compartments, however, you probably will need more lighting. I cut a hole in the left-hand side (that is, the side opposite the tonearm) of each turntable hutch, fastened an extension cord into the hole, and plugged in a "nite-lite," which provides enough light to find selections on discs yet its seven-watt bulb presents no heat problems. Other ways to tackle lighting are goose-neck and spring-loaded lamps. However, watch out for high-intensity types as they radiate hum.


(4) *Ventilation.* Heretical as this is no doubt going to sound, I've found that in most installations where transistorized amplifiers are used, heat build-up isn't a serious problem. However, if heat-producing components are to be installed in extremely tight enclosures (say, with less than two inches of space around the top and sides), then you should install a whisper fan. Too, since the FTC amp power rule, many amps now have their own fans. Other, or additional, ways to provide ventilation is to cut holes in portions of the compartment that the component, when set in place, will hide (the bottom, the bottom back), or to leave off the back of the compartment altogether. This was done with the receiver in the wall-en-

No matter what kind of installation you design, the equipment itself will probably rest on shelves or framing. You have the option of making them either adjustable or non-adjustable; the former permits greater flexibility, the latter greater sturdiness. Just how much of a trade-off you can afford to make between these will depend upon such factors as the size, weight, and number of components, and the size of the installation itself. Small cabinets should be sturdy enough with just a back; larger cabinets will benefit from a back and from shelves or braces that are firmly fastened to the sides. For shelves, sides, tops, and bottoms, 3/4-in. plywood is recommended. It comes in a number of grades and finishes, and depending on the styling you have in mind you will have to select accordingly (for example, if you want a wood-stained appearance, you will have to buy a veneered plywood). The salesman at your local lumber yard can advise you best here and, as well, offer suggestions on the exact shelving hardware you will need. For backing, 1/4-in. masonite is ideal—easy to cut and inexpensive.

(6) *Subsequent modifications.* The adaptive capacity of any custom installation is always going to be inherently limited. Your success in modifying it for later additions or replacements will be determined by how prescient and ingenious you were when

you first designed it. Try not to crowd components too close together, for example. Chances are if you replace, say, your present preamplifier with a newer model, the newer one is going to be larger, so you will want to have some room for enlarging the mounting hole. A more ticklish problem is when the replacement component is smaller than the original. The best way to cope with this is to do what was done to the receiver in the wall ensemble here: simply make an escutcheon that will frame the faceplate and be large enough to cover the portions of the mounting hole that would have shown. And come the day when you have made so many replacements or acquired so many additions, you can just spent a rainy Saturday cutting out a whole new display panel, which will be easy and inexpensive if you followed the advice already offered of not making it support any weight as such and of using 1/4-in. wood.

In many ways, the biggest obstacle to a project like this is overcoming the inertia required to get started. One of the first things to do is go to a library, take out some decorating and stereo publications, and look at the custom installations featured from time to time. Then spend an afternoon browsing through the home improvements section of a good, well-stocked lumber yard. You will familiarize yourself with the kinds of materials available, find booklets that contain lots of valuable construction and assembly tips, and be able to ask the salesman questions (I've found they are eager to help, and most of the time their suggestions resulted, for me, in less work and less expense.)

Beyond that, there's not much more that I can do to help you get started. I found both projects to be consistently engaging and equally a challenge, an education, and a delight—a challenge because you will be presented with a series of thoroughly practical problems that you must solve to meet a number of different requirements, an education because to solve the problems you will have to master some skills and learn some things that you probably didn't know before and that you will find valuable long after you've completed the project, and a delight because when finished, you will have an installation that blends your equipment more functionally and harmoniously into the rest of the room, yet that showcases it when you want it to claim the lion's share of attention. Surely no audiophile, professional or amateur, could ask for anything more. 

Four questions you must ask about any multiple-play turntable.

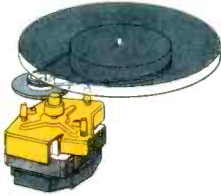
1. Does it perform as well as any single-play turntable?



There are some who believe that a single-play turntable is somehow inherently better than a multiple-play unit. All right—the Z2000B *is* a single-play turntable. Its capacity to function as a multiple-play unit offers convenience with no compromise of performance. The *automatic* mechanism which gently indexes the arm, lifts it at the end of play, returns it to

the arm rest and shuts off the motor—is completely disengaged during record play. A 2-position control sets the proper vertical tracking angle for single or multiple play. The Z2000B can truly be called the automated, single-play turntable with multiple-play capability.

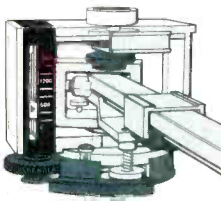
2. Does it have belt-drive and variable speed?



Garrard engineers have attained remarkable results by combining the world famous Synchro-Lab motor and an inventive belt/idler drive combination. A 5 lb., die-cast, dynamically balanced platter is rotated via a flexible belt. Not only are the tiniest fluctuations of speed smoothed out, but an extraordinary -64dB rumble is only one example of the im-

pressive specifications achieved. A variable speed control corrects out-of-pitch recordings and an illuminated stroboscope provides optical confirmation. The Z2000B combines all of these elements to achieve the main goal of Garrard engineering: superior performance at reasonable cost.

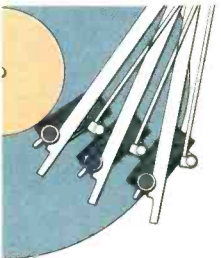
3. Does it handle records gently?



All responsible turntable manufacturers are concerned with protecting your records. With Garrard, it's an obsession. The Z2000B boasts an array of features designed solely to prolong the life of your records. In addition to the exclusive, articulated tonearm, it incorporates an exceptionally accurate magnetic anti-skating device. Cueing is viscous damped in

both directions. The ingenious built-in automatic record counter keeps track of how many LP sides the stylus has played. And unlike some of the highest priced changers that support records only at the center hole, the Z2000B supports them at the hole *and* edge, and the release mechanism operates at *both* points. Protection for your records indeed!

4. Does it eliminate tracking error?



The grooves of a record are cut by a stylus that travels in a straight line. Conventional playback tonearms move in an arc. The difference between these two paths is called "tracking error." Simply stated, tracking error launches a cycle of distortion and record wear. In good design, the error is averaged over the record so that distortion is minimal. But such

compromise was unacceptable in the Z2000B. What Garrard engineers did about it was summed up by High Fidelity Magazine which described the Zero Tracking Error Tonearm as "...the best arm yet offered as an integral part of an automatic player." The Z2000B is the *only* automatic turntable in the world without tracking error.

The Garrard Z2000B. Yes. Yes. Yes. Yes.



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Garrard

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New Tests And Standards For Tuners and Receivers

Leonard Feldman

SEVENTEEN years after the Institute of High Fidelity (IHF) published its first definitive standards for FM tuner measurements, the home entertainment industry has produced a new set of standards which takes into account the tremendous advances which have occurred in the interim. The early 1958 standards (IHFM-T-100) pre-dated stereo FM broadcasting by fully three years, and so, quite naturally, the major difference between the old and new standards is the latter's incorporation of a whole list of specifications and measurements relating to stereo FM performance. But calling for full disclosure of stereo performance is only one aspect of the new standard's up-dating. We have already discussed

the transition from voltage (or micro-voltage) to less ambiguous power or wattage as a means of specifying signal strengths delivered to the antenna terminals of a tuner or receiver. (See *Audio*, Dec., 1975, p. 47.)

It is of extreme significance that, for the first time, three major industry associations have put their seal of approval on the new standards. In addition to the IHF, the other sponsors of the newly adopted standards include the EIA (Electronic Industries Association) and the IEEE (Institute of Electrical and Electronic Engineers). In fact, the new standard, printed in a 35-page manual, bears a double identification number. It is designated as IHF-T-200, 1975 by the IHF and STD-185-1975 by the IEEE. Copies of the

complete standard are available from either organization at a cost of \$6.00, and the addresses are 489 Fifth Avenue, New York, N.Y. 10017 for the IHF and 345 E. 47th Street, New York, N.Y. 10017 for the IEEE.

One of the outstanding contributions to specification writing of the older standard was the notion of "usable sensitivity." This specification spelled out the signal strength required to produce a program output level (at full modulation) which contained 3% *combined* noise and distortion. As the incoming signal applied to a tuner's antenna terminals increases in intensity, both background noise and distortion at the output of the tuner decrease—but not necessarily at the same rate. Since both constitute an "annoyance factor" added to the desired program material, the idea of specifying that signal strength which resulted in a diminution of both noise and THD taken together was a good one. What was *not* good was the 3% criterion, since today 3% of noise, distortion, or a combination of both is hardly regarded today as "high fidelity." Yet, it is this often-mentioned IHF sensitivity figure which has dominated the list of FM tuner and receiver specs, and it is the one which most prospective purchasers use in judging competing products.

While the new standard still includes this spec (calling it "usable sensitivity"), it has added a much more important measurement—50-dB quieting sensitivity. This spec represents the number of microvolts (or, more properly, the power in dBf) of signal strength required to yield program output from the tuner or receiver

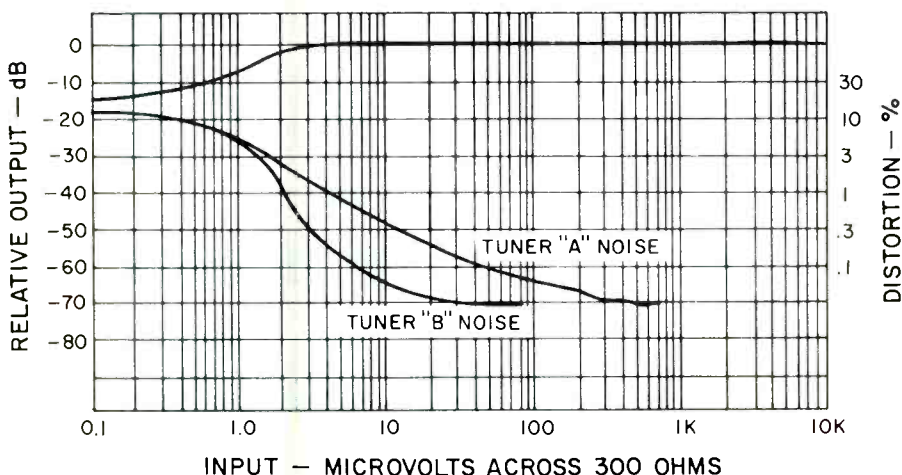


Fig. 1—FM quieting characteristics of two tuners that have approximately the same "usable sensitivity" but widely different "50-dB quieting sensitivities."

The AR-10 π can do two important things other speakers can't

The most important thing a speaker system has to do is transmit what is on the record to your ears without altering it. The second most important thing is to do it anywhere.

1. An accurate speaker

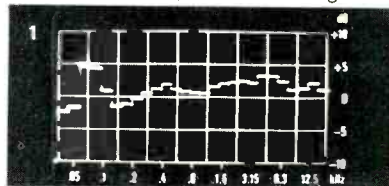
The AR-10 π is able to transmit the sound from a record to your ears with greater accuracy than any other speaker system. We don't build speakers whose sound an engineer, a marketing director, or even a product committee thinks sound 'pleasant.'

We do build speakers whose accuracy is measurable. The final result may, or may not, sound 'sizzling' or 'dim,' 'dull,' or 'brilliant.' It may not even sound 'realistic.' This will depend entirely on what counts most: what's on the record.

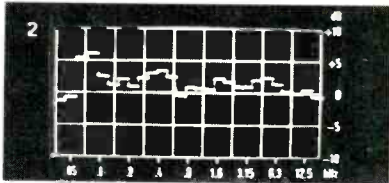
The AR-10 π is the latest result of our 22 years of applying scientific objectivity to the design of loudspeakers. It is as accurate a speaker as we can make.



The graphs below show energy response from a single microphone position (or listening position) in one particular listening room.



Graph 1 shows the performance of the AR-10 π when placed against one wall of the room, in which position it is said to be radiating into a '2 π solid angle'. The balance of high- and low-frequency energy represents the results that could be ex-



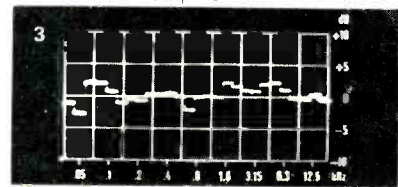
2. Accurate anywhere

Ordinarily the balance of highs to lows changes as a speaker system is moved from a corner to the middle of a wall or to the middle of the room. This is because room position has a significant effect on the bass energy radiated by a loudspeaker, but very little effect on the highs. It is primarily for this reason that most speaker manufacturers give very explicit advice about where their speakers can and cannot be placed.

But the AR-10 π can be placed in a corner, against a wall, or even in the middle of a room and its designed-in accuracy will not be compromised. The AR-10 π takes care of the problem by means of a single three-position switch that 'normalizes' performance in each of the three basic positions. It is no longer necessary to restrict the speaker to one kind of room position for optimum results.

pected from a high quality loudspeaker designed for 2 π operation. However, moving the speaker to a position on the floor, with its back still against the wall (creating a ' π solid angle'), gives the results shown in Graph 2.

Note that the average level of bass energy is significantly increased with respect to that of the high frequencies. Simply resetting the AR-10 π 's Woofer Environmental Control to the ' π ' position restores the proper balance, as indicated in Graph 3.



Similarly, moving a conventional speaker into the middle of a room will result in too little bass energy. Resetting the WEC to its '4 π ' position preserves the speaker's designed-in balance.

The AR-10 π is an accurate loudspeaker. And it's accurate anywhere. There's never been a speaker like it.

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which is 50 dB greater in amplitude than residual background noise. This lower level of background noise (compared with "3%" which is about -30dB) is more typical of what can be expected from reasonably good disc recordings or tapes played on home equipment and does qualify as hi-fi reproduction.

Figure 1 shows how two tuners, each having identical "usable sensi-

tivity" (1.7 μV or 10 dBf) may have markedly different "50 dB quieting sensitivities." Tuner "B" is obviously superior to tuner "A" in this respect, requiring only 3.0 μV (14.9 dBf) to produce 50 dB of quieting.

Distortion Measurements

Since the "50 dB quieting sensitivity" measurement involves only residual noise, the standard requires

that a statement regarding total harmonic distortion at this signal input strength be made, in addition to the distortion measurements made at the more usual "strong signal" conditions (formerly 1000 μV , now 65 dBf, which corresponds to about 977 μV when using the 300-ohm input terminals of a tuner or receiver). Furthermore, THD must now be stated for three audio frequencies—100 Hz, 1 kHz and 6 kHz—instead of at 1 kHz alone, as was formerly the practice.

Unaltered Measurements

Aside from the new reference levels of signal strength (45 dBf, where 100 μV was previously the reference; 65 dBf for measurements formerly made at 1000 μV), the following publishable specs remain virtually the same as they were in the old standards: Capture Ratio; Alternate Channel Selectivity; Ultimate Signal-to-Noise Ratio; Frequency Response; IM Distortion; AM Suppression; I.F., Image and Spurious Response Rejection, and Frequency Drift. More sophisticated techniques for making these measurements are detailed in the standard itself, but the basic idea of these disclosures remains the same.

Adjacent Channel Selectivity

A new measurement included in the standard is that of adjacent channel selectivity. The specification previously listed by most manufacturers called "Selectivity" was, in reality, alternate channel selectivity. That is, it was a measure (in dB) of a tuner or receiver's ability to reject signals spaced 400 kHz away (or two channel widths removed) from the desired signal frequency. Selectivity (be it adjacent channel or alternate channel) is largely a function of the band-pass characteristics of the i.f. section of the FM tuner. If the ideal i.f. bandpass filter could ever be designed, i.f. response of a tuner or receiver designed for FM reception would appear as shown in Fig. 2 and would measure exactly 150 kHz in width. Then an adjacent or an alternate channel signal would be attenuated by an "infinite" amount. In the real world of physically realizable designs, the i.f. response curve appears more like that shown in Fig. 3. While this band-pass response still shows excellent attenuation of the alternate channel (400 kHz removed from center), here to an extent of about 90 dB, attenuation of signals removed only 200 kHz in frequency from the desired signal are attenuated by a mere 20 dB or so. Therefore, as

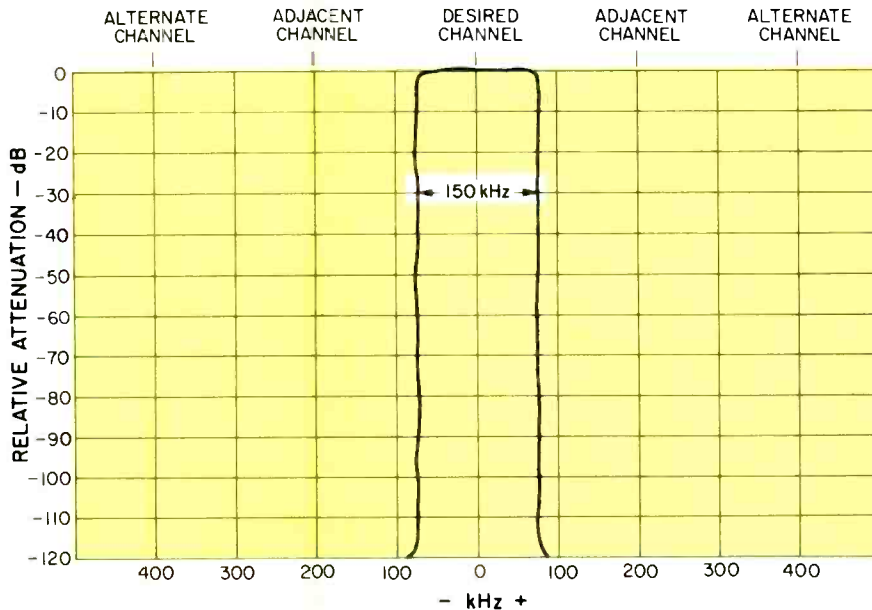


Fig. 2—If this idealized i.f. response could be achieved, adjacent and alternate channel selectivity would be identical and "infinite."

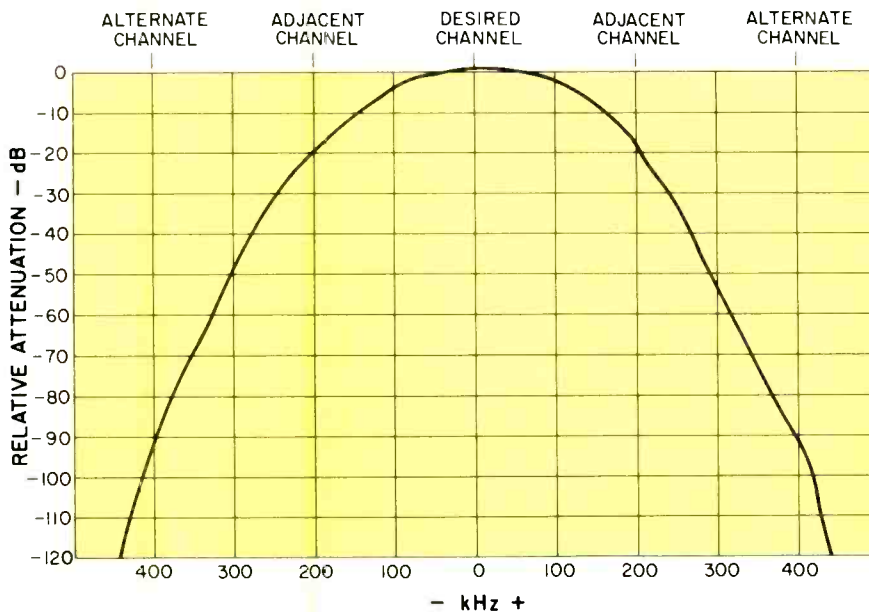


Fig. 3—In actual practice, adjacent channel rejection will be far poorer (fewer dB) than alternate channel rejection.

"The Sony TC-756 set new records for performance of home tape decks."

(Stereo Review, February, 1975)

Hirsch-Houck Laboratories further noted, "The dynamic range, distortion, flutter and frequency-response performance are so far beyond the limitations of conventional program material that its virtues can hardly be appreciated!"

The Sony TC-756-2 features a **closed loop dual capstan tape drive system** that reduces wow and flutter to a minimum of 0.03%, **logic controlled transport functions** that permit the feather-touch control buttons to be operated in any sequence, at any time without spilling or damaging tape; an **AC servo control capstan motor** and an eight-pole induction motor for

each of the two reels; a record equalization selector switch for maximum record and playback characteristics with either normal or special tapes; mic attenuators that eliminate distortion caused by overdriving the microphone pre-amplifier stage when using sensitive condenser mics; tape/source monitoring switches that allow instantaneous comparison of program source to the actual recording; a mechanical memory capability that allows the machine to turn itself on and off automatically for unattended recording.

In addition, the TC-756-2 offers 15 and 7½ ips tape speeds; Ferrite & Ferrite 2-track/2-channel stereo

three-head configuration; and symphase recording that allows you to record FM matrix or SQ* 4-channel sources for playback through a decoder-equipped 4-channel amplifier with virtually non-existent phase differences between channels.

The Sony TC-756-2 is representative of the prestigious Sony 700 Series — the five best three-motor 10½-inch reel home tape decks that Sony has ever engineered. See the entire Sony 700 Series now at your nearest Superscope dealer starting at \$699.99.

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manufacturers begin to quote adjacent channel selectivity as required by the new standard, don't be too shocked if you see numbers as low as 20 dB or even worse.

Adjacent channel selectivity has taken on new importance in recent years for two reasons. First, the very fact that tuners are more sensitive than they used to be means that many of them can pick up more distant signals, some of which may only be 200 kHz removed in frequency from the strong, local station signal. (The FCC tries to separate station frequencies by 400 and even 800 kHz in given geographical locations, but when stations are many miles apart, the stations may be only one channel width apart in frequency or may even occupy the same frequency.)

The second justification for mentioning adjacent channel selectivity has to do with the very popularity of FM in recent years. With so many stations on the air, it is much more likely (especially in populated metropolitan areas) that stations will be found closer together on the FM dial than they used to be. Improving adjacent channel selectivity from 20 to 25 dB may be more significant than the difference between two sets having alternate channel selectivities of 80 and 90 dB.

**Required Stereo
Performance Disclosures**

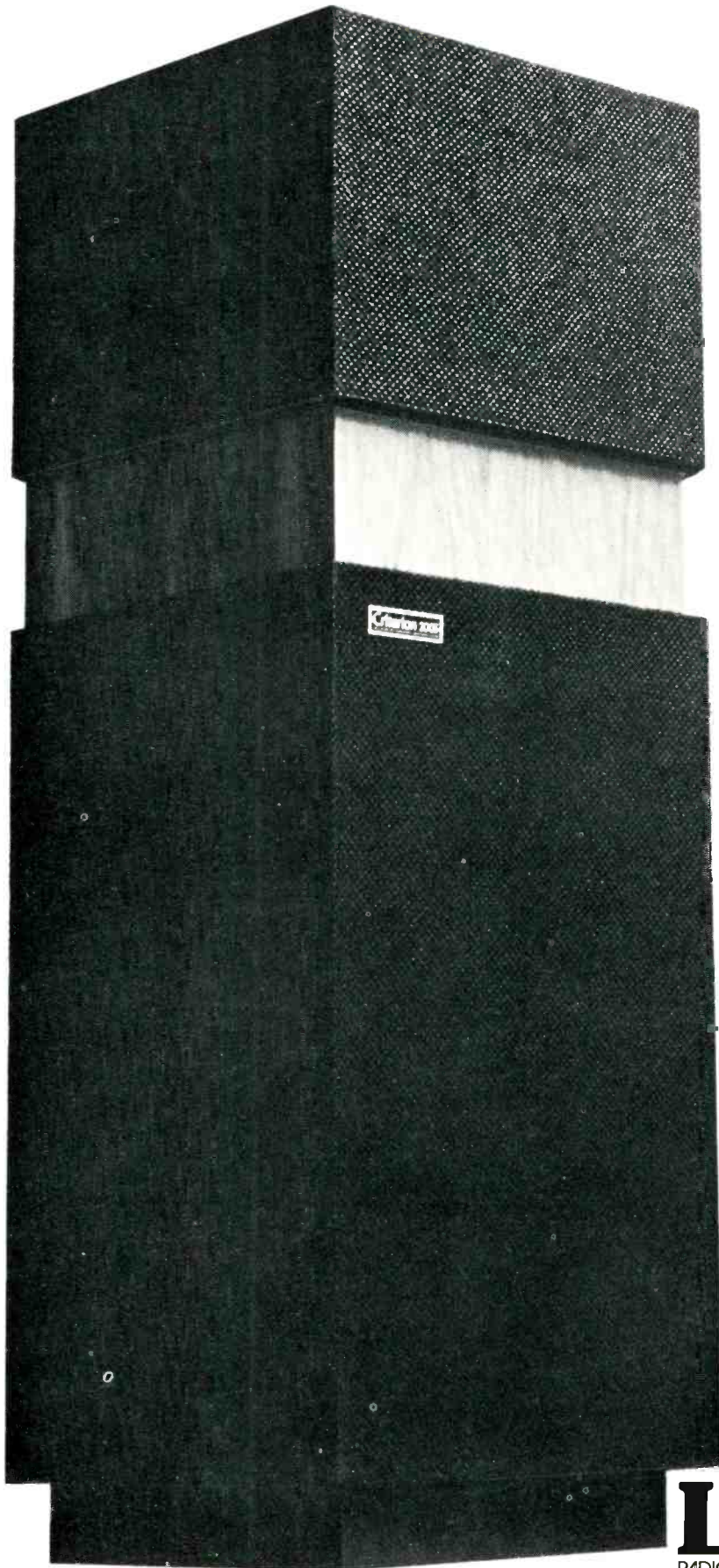
Even before the advent of the new standard, many manufacturers began publishing some of the stereo performance characteristics of their products. It is no surprise to find statements of separation capability for tuners sold almost from the very first days of stereo broadcasting. Channel separation is, after all, what the public associates most immediately with stereo. As anyone who has ever read our tuner test reports knows, however, separation is usually better at mid-audio frequencies (1 kHz or 400 Hz) than at the frequency extremes, and now manufacturers will have to tell us separation capability at 100 Hz, 1 kHz, and 10 kHz if they wish to comply with the requirements of the new standards.

Some tuner and receiver makers have also seen fit to tell us about harmonic distortion present when the set receives a stereo signal. Invariably, the figure is always worse than for mono, but again, most disclosures have involved the one mid-frequency, 1 kHz. Now, as in the case of mono, distortion will have to be listed for audio frequencies of 100 Hz, 1 kHz and 6

kHz. The 6 kHz mark was chosen as the highest frequency at which THD must be reported (in mono and stereo) because the harmonics of much higher audio frequencies would fall outside the FM audio pass-band and THD information at such frequencies would be meaningless.

But more important than THD and separation figures for stereo reception are the measurements that will now have to be reported that duplicate all the sensitivity measurements made for mono performance. In other words, "stereo usable sensitivity" must now be listed, as must "stereo 50 dB quieting sensitivity," "distortion at stereo 50 dB quieting sensitivity," and "stereo signal-to-noise ratio at 65 dBf." As you might have guessed, all of these numbers are likely to be "poorer" than those you are accustomed to seeing for mono performance. For example, while "usable sensitivity" may typically be about 2.0 μ V (11.2 dBf) in mono operation, it can range from about 5 μ V (19.4 dBf) to 10 or more μ V (25.4 dBf) for stereo. Even more surprising, most stereo tuners do not reach the 50-dB quieting point until signals strengths of 30 μ V (34.9 dBf) or more are applied to the antenna terminals. Small wonder that manufacturers were reluctant to talk about these numbers before the standard was formalized and approved!

Whenever stereo signals are received and decoded by a tuner or receiver, frequencies of 19 kHz and 38 kHz are generated or amplified within the circuits of the receiver. While the presence of such signal components at the output of the tuner or receiver would not be audible to humans, high levels of these sub-carrier product signals have been known to affect the quality of tape recordings made of FM programs, since such high frequencies can "beat" with the tape recorder's bias frequency to produce audible tones and squeals in playback of the resultant recording. The ability of the tuner or receiver to attenuate these super-audible frequencies will be listed as "sub-carrier product ratio," in dB, and the higher the number the better. The same thing applies to "SCA rejection ratio" which is the ability of the tuner or receiver to suppress 67-kHz products at the output of the tuner section. This 67 kHz is often used as an additional FM modulated sub-carrier to transmit over the main FM carrier private point-to-point communications, such as background music, special news services, and the like. While such programming cannot be heard on conventional tuners or



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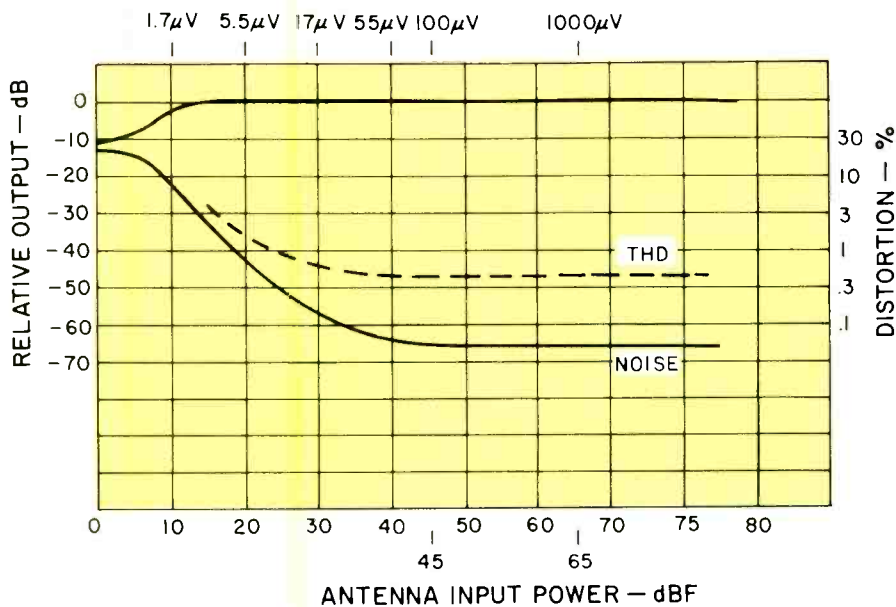


Fig. 4—New quieting and THD curves can be calibrated linearly along both axes, simplifying interpretation.

Table I—New required specifications for tuners, and sample results of three classes of product.

SPECIFICATION (UNIT OF MEASURE)	MODERATE	GOOD	SUPER
Usable Sensitivity (dBf)	Mono/Stereo 19.4/31.4 (5 μ V)/(20 μ V)	Mono/Stereo 11.2/19.4 (2 μ V)/(5 μ V)	Mono/Stereo 10.0/14.9 (1.7 μ V)/(3.0 μ V)
50 dB Quieting Sens. (dBf)	34.9/40.95 (30 μ V)/(60 μ V)	19.4/39.4 (5 μ V)/(50 μ V)	11.2/34.93 (2.0 μ V)/(30 μ V)
S/N Ratio @ 65 dBf (977 μ V) (dB)	60 / 50	70 / 60	75 / 70
Muting Threshold (dBf)	30 / —	5 / —	3 / — (may be variable)
Frequency Response, 30Hz-15kHz (—dB)	2 / 3	1 / 1	0.2 / 0.5
THD @ 50 dB Quieting (%)			
100 Hz;	1.0 / 2.0	0.4 / 0.8	0.1 / 0.2
1 kHz:	1.0 / 1.5	0.3 / 0.5	0.1 / 0.15
6 kHz:	2.5 / 6.0	0.5 / 2.0	0.2 / 0.4
IM Distortion (%)	2.0 / 5.0	0.6 / 1.0	0.3 / 0.5
Capture Ratio (dB)	3.0 / —	1.5 / —	1.0 / —
Adj. Chan. Selectivity (dB)	10.0 / —	18 / —	25.0 / —
Alt. Chan. Selectivity (dB)	50.0 / —	70 / —	90.0 / —
Spurious Response Ratio (dB)	60.0 / —	85 / —	100.0 / —
Image Response Ratio (dB)	55.0 / —	80 / —	100.0 / —
IF Response Ratio (dB)	50.0 / —	75 / —	95.0 / —
AM Suppression Ratio (dB)	40.0 / —	50 / —	60.0 / —
Frequency Drift (kHz)	50.0 / —	25 / —	10.0 / —
Stereo Separation (dB)			
100 Hz:	— / 20	— / 35	— / 40
1 kHz:	— / 25	— / 40	— / 45
10 kHz:	— / 25	— / 25	— / 35
Subcarrier Product Ratio: (dB)	— / 45	— / 60	— / 70

Notes: (—) indicates that no published spec is required for this category, in mono or in stereo, as indicated. (μ V) readings in parentheses under dBf readings correspond to equivalent "old" or "terminated" microvolts referred to a 300-ohm antenna input circuit. New power figures (dBf) are based upon "available power at antenna terminals" using "open circuit" microvolts properly terminated with dummy antenna network to match antenna terminal input impedance.

receivers (special sets are leased to subscribers of such services), the modulation of the 67 kHz can sometimes be heard as a sort of "swooshing" interference to regular stereo FM programming, and the better the set, the higher its rejection capability of these SCA signals, measured in dB.

Simpler Graphs

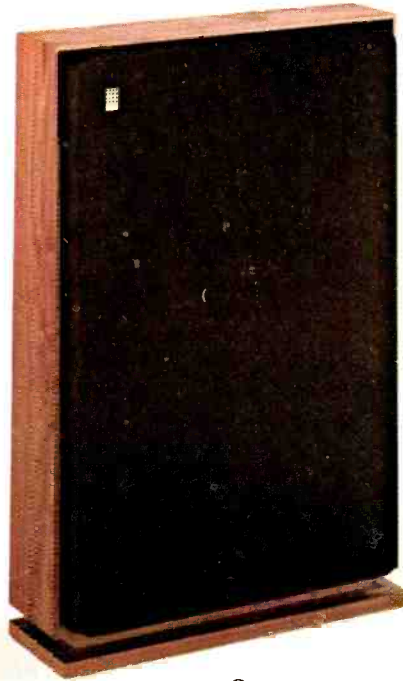
Because all signal strengths are now listed in dBf, graphic plots such as those used in *Audio's* equipment reports relating to tuners and the tuner sections of receivers will be easier to interpret. Referring back to Fig. 1, you will note that the signal strengths (in microvolts) are plotted on log-type graph paper. That is, the distance from 1 μ V to 10 μ V is the same as from 10 μ V to 100 μ V. Since the dB scale itself is a logarithmic progression, by labelling the horizontal axis in dB, the divisions along the horizontal axis can now be spaced linearly. A typical example is plotted in Fig. 4 and will henceforth be used in all future test reports of FM products. We will continue to add parenthetic notations along the horizontal axis giving a few spot values in microvolts (referred to 300-ohm antenna inputs and based upon the old standard) until our readers become accustomed to the new dBf notations.

The other graphic presentation which we use to describe FM performance—channel separation and distortion versus audio frequency—remains unaltered since it is easier to interpret when a logarithmic horizontal axis is used, in which each octave of the audio spectrum occupies the same horizontal axis distance.

A Typical Complete Disclosure

Table I summarizes all the specifications that the IHF has asked its members to publish for a complete disclosure of FM product performance. (The standard itself lists a few others which the IHF considers as less important, such as AFC correction factor, AFC offset error, and minimum volume hum and noise.) As an aid in becoming acquainted with the new specifications, we have listed "typical" results for three fictitious tuners—a low priced one of modest performance, a mid-price one of good performance, and a super FM tuner that represents near state-of-the-art performance. Where applicable, we have listed equivalent (old) microvolt values alongside the new, preferred dBf readings.

The impossible dream.



Since 1871 electrostatic speakers have been but a promise; today the Koss Model One has made them a reality.

Unlike most ads, this ad wasn't written for everybody. In truth, it was meant for a very small number of discerning audio enthusiasts who have dreamed an impossible dream about electrostatic speakers. And who have continually been disappointed.

For those who have dreamed the impossible, Koss has developed a full-range electrostatic speaker that reproduces the lowest to the highest octaves of music with an authority never achieved in previous electrostatic speakers. Once you've heard it, we think you'll agree. Until you do, let us tell you why.

First, the Koss Model One isn't another hybrid. The bandpass of 30 Hz to 250 Hz is reproduced by an electrostatic woofer that features over 19 sq. ft. of diaphragm surface area. No other speaker, electrostatic or dynamic, has ever reproduced the clarity and power of the lowest audible octaves like the Koss Model One. Impossible? Just listen to it.

Second, the Model One represents, to our knowledge, the first 4-way design ever offered in electrostatic speakers. This design approach has allowed Koss to offer the world's first electrostatic woofer capable of playing at concert hall levels. In addition, a unique midrange panel was designed specifically to avoid the bigger-than-life spacial distortion plaguing other large-panel speakers. In other words, a violin sounds like it is normal-size rather than as big as a

cello. The treble and tweeter panel designs were also critically matched to the wavelength requirements of their respective bandpasses. The resulting smoothness of response and uniform dispersion of energy from top to bottom establishes a new precedent in naturalness and clarity of reproduced sound.

Third, a major design breakthrough has been achieved in the Model One crossover system. And we think it's a uniquely patentable system. Instead of the expected plurality of additional coils, capacitors and resistors normally needed to achieve a 4-way crossover, the Model

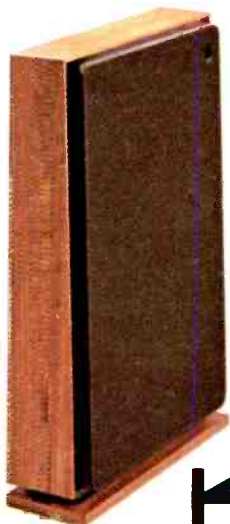
One uses no other components than those needed to drive the separate acoustic panels. In other words, step-up transformers which provide the drive voltage to each of the four bandpasses also function as the crossovers. This unique transformer design eliminates the need for additional bulky, expensive, distortion-producing components that, until now, made a reasonably-priced but high performance full-range electrostatic system impossible.

Fourth, another innovative design feature of the Model One is the use of a frequency-sensitive attenuator that protects the speaker from unwanted sub-sonic signals below the 30 Hz level as well as potentially dangerous DC voltages from the amplifier.

And fifth, there's a patented Auto-Charge Bias Supply that eliminates the need for an AC cord. Imagine an electrostatic speaker system without the old "AC umbilical cord"! Or for that matter, without the obvious electrical dangers. If that isn't worth hearing, what is?

Your Audio Specialist will be happy to show you the fulfillment of the electrostatic promise. We don't think you'll be disappointed in what you hear. Nor in what you buy. But then, the Koss Model One isn't for everybody.

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Roselle, Ill. 60172

Infinity's Model 500 DSP basic amplifier was misprinted as a tube type in the October Directory. It is, in fact, a Class-D, digital signal processing switching amplifier, using micro-electronic aerospace circuitry.



White Bicentennial

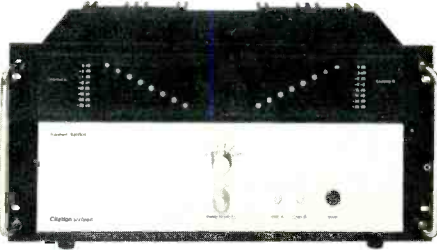
Amplifiers															NOTES			
MANUFACTURER	MODEL	FTC power/chan., 8 ohms, watts	Freq. range for rated power, Hz - kHz	Highest THD from 0.25W to rated power, %	Highest IM from 0.25W to rated power, %	S/N phono, re 10 mV input, dB	Phono sensitivity, in mV, phono 1, phono 2	Phono overload, in mV, phono 1, phono 2	Mike input sens., mV	High level input, V	Headphone output level, V	Headphone load impedance	Output impedance ohms	Damping factor, 1, kHz	Dimensions, in inches	Weight, lbs. (net)	Price, \$	
HARMAN-KARDON	A401	20	20-20	0.5	0.12			None		8	4	30	13x11x5 1/4	14	185.00	2	2	2 phone jacks.
	Citation 12(B)	60	20-20	0.2	0.15				None	4	40	40	12 1/2 x 13 x 6	30	295.00	30		
	Citation 16(B)	150	20-20	0.05	0.05					4	4	300	19x14x9 1/4	55	795.00	55		LED display; bridgeable

Preamps															NOTES	
MANUFACTURER	MODEL	Frequency response Hz - kHz, ± 2 dB	Rated output, V	THD at rated output, %	IM at rated output, %	S/N ratio, phono, dB re 10 mV input	Phono sens., mV, phono 1, phono 2	Phono overload, mV, phono 1, phono 2	Mike input sens., mV	High level sens., V	Tape max. impedance ohms	Tape min. output level, V	Dimensions, in	Weight, lbs.	Price, \$	
HARMAN-KARDON	Citation 11	2-250 ±1	6	0.05	0.05	72	2.5/2.5	200/200	0.15/0.3	20k		16 1/4 x 12 x 5	20	395.00		5-step EQ; speaker switching from power amp.

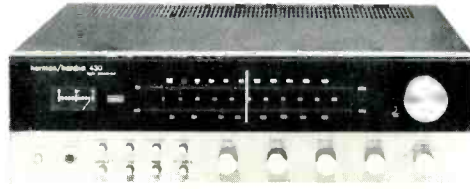
Tuners															NOTES			
MANUFACTURER	Model	IHF sensitivity, µV, mono/stereo	Capture ratio, dB	Att. chan. selectivity, dB	AM suppress., IHF, dB	Signal for 50 dB quieting (µV), mono/stereo	Stereo sep., 1 kHz, dB	Stereo sep., 10 kHz, dB	THD mono, 100% mod, 1 kHz	THD stereo, 100% mod, 1 kHz	Tuning indicator(s) type, how many	S/N ratio, max., at 200 µV, mono/stereo, dB	Max. output level, V	De-emphasis (µS)	Dimensions, in	Weight, lbs.	Price, \$	
HARMAN-KARDON	Citation 15	2.0	1.5	60	60	45	0.25	0.35	2 Mtrs.	70	2	75	16x13 1/4 x 5	30	395.00		395.00	Quieting meter.

Receivers															NOTES						
MANUFACTURER	Model	Ave. power/chan. into 8 ohms, mW, as per FTC rule	Max THD 0.25 W, rated power, %	Max. IM 0.25 W, rated power, %	Freq range for FTC-rated power, Hz - kHz	S/N phono, re 10 mV input, dB	Phono sens., mV	Phono overload, mV	IHF sens. tuner, mono/stereo microvolts	Capture ratio, dB	Signal for 50 dB quieting (µV), mono/stereo	THD mono, 100% mod, 1 kHz, %	THD stereo, 100% mod, 1 kHz, %	De-emphasis µS	Att. chan. selectivity, dB	Tuning aids, no. & type	S/N ratio, mono/stereo, dB	Dimensions, in	Weight, lbs.	Price, \$	
HARMAN-KARDON	330B	18	0.8	0.5	50-20	55	3	70	2.5	3	1.0	1.5	75	50	1 Mtr.	60	15 1/2 x 13 x 4 1/4	21	199.95		
	430	25	0.5	0.12	20-20				1.9		0.6	0.7	75	50	1 Mtr.	77	17 x 14 1/2 x 5 1/2	24	319.95		

NOTES: (1) All models solid-state except where mod. no. is preceded by (T).
(2) (K) indicates kit price; (W) wired.
(3) All models FM/AM except FM-only where preceded by (F).
(4) (Q) with mod. no. means 4-channel.



Citation 16



Harman-Kardon 430



Rabco ST-7

Turntables																				SPEEDS				
MANUFACTURER	MODEL	Speed (see letter code)	Wow & flutter at 33 1/3 % (W RMS)	Run time in dB (DIN 'B')	Motor type	Platter size (dia., in.)	Speed adjustment, ±%	Drive system	Speed accuracy 33 1/3, ±%	Dimensions, in inches	Weight, lbs. (net)	Model (for separate arm)	Overall length, in	Pivot-stylus dist., in.	Vertical bearing type	Lateral bearing type	Stylus force adj. method	Max tracking error, deg/in	Anti-skate adjustment?	Arm resonance Hz.	Sylus force range, gms.	Weight, if separate arm, oz.	Price \$	NOTES
RABCO (HARMAN-KARDON)	ST-7	B	0.04*	-68	DC servo	11%	5%	Belt	0.3	16% x 16% x 6%	22		6%	**	***	Bal & wgt	0	No	0-3			400.00	*NAB, **rolamite, ***driven arm.	
																								A 33 45, 78 B 33 45 C 33 only D 16, 33, 45, 78 E 16, 33, 45 F - Cont. variable

Cassette Decks																				NOTES	
MANUFACTURER	MODEL	If cassette, 'X' if cartridge state no. tracks	Channels, 1, 2, or 4	Freq. Response, Hz-kHz, ± dB (standard tape)	Freq. response, Hz-kHz, ± dB	Wow and flutter, % (W RMS)	S/N ratio, dB, w/o Dolby	S/N ratio, dB, with Dolby	C/D, bias & equal?	LN bias & equal?	Mic. mixing? no. inputs	Memory rewind?	Does unit record?	VU meters? (number?)	Peak level indicator (s)?	Dimensions, in.	Weight lbs. (net)	Price, \$	NOTES		
HARMAN-KARDON	HK2000	X	2	40-15 ±2	30-17 ±2	0.07	53	58	yes	yes,2	yes	yes	2	yes	15% x 10% x 5%	16	400.00		(D) after price indicates Dolbyized. (Q) with model number indicates 4-channel.		
	HK1000	X	2	40-13 ±2	30-15 ±2	0.13	53	58	yes	yes	no	yes	2	no	15% x 10% x 4%	12 1/2	288.00				

Speakers																				NOTES	
MANUFACTURER	MODEL	Enclosure type	Woofer dia., in.	Woofer resonance (in system)	Midrange dia., in.	Midrange type	Tweeter dia., in.	Tweeter type	Level control(s) M=Mid, T=tweeter	Auxiliary freq. response, Hz-kHz, ± dB	Sens for 1 W input, dB SPL, 1 mtr. on axis, 100 Hz-10 kHz	Power handling capability continuous watts	Crossover frequencies, Hz.	Impedance, nominal	Dimensions, inches	Woofer finish	Grille material, color	Weight, lbs.	Price, \$	NOTES	
GTE SYLVANIA	GTE 210	Ac.sus.	10	42	-	-	1 1/2	Dome	M,T	33-15 ±3	89	50	1500	8	24x15 1/2 x11 1/2	Wal.	Cloth, tan	51	119.95		
	GTE 312	Ac.sus.	12	38	4%	Cone	3/4	Dome	M,T	30-25 ±4	90	150	500, 3500	8	17x27 x11 1/2	Wal.	Cloth, tan	72	179.95		
	GTE 412	Ac.sus.	12	38	4%	Cone	1 1/2	Dome	2T,M	30-25 ±3%	91	150	500, 2k,8k	8	18 1/2 x 28 1/2 x12 1/2	Wal.	Cloth, tan	92	249.95		
KUSTOM ACOUSTICS	Monolith	*	(16)	30-36	(8)	Cone	(8)	Dome	-				1200	775, 3500	8/2	90x48 x24	Var.	Cloth, var.	670	2900.00	*Tapered acoustical line.
	Colossus	*	(8)	29-34	(4)	Cone	(4)	Dome	-				600	775, 3500	4/1	72x36 x20	Var.	Cloth, var.	460	1695.00	*As above.
	Titan	Trans. line *	(2)	15	(2)	Cone	(2)	Dome	M,T				300	775, 3500	4	48x30 x18	Ethony Var.	Cloth, var.	294	1489.00	
	Labrynth	*	(4)	29-34	(2)	Cone	(2)	Dome	-				600	775, 3500	8/2	48x30 x18	Var.	Cloth, var.	318	1295.00	*As above.
	TDS	*	(2)	32-37	(2)	Cone	3/4	Dome	-				300	775, 3500	4	36x23 x16	Var.	Cloth, var.	143	849.00	*As above.
	TSM	*	(12)	18	5	Cone	3/4	Dome	M,T				250	775, 3500	8	48x15 1/2 x14	Var.	Cloth, var.	108	749.00	
	STL	Trans. line *	12	30-36	5	Cone	3/4	Dome	M,T				250	775, 3500	8	36x16 x13	Var.	Cloth, var.	95	559.00	*As above.
	SMT	*	12	30-36	5	Cone	3/4	Dome	M,T				250	775, 3500	8	36x16 x13	Var.	Cloth, var.	95	559.00	*As above.
ST-3	*	12	29-33	5	Cone	3/4	Dome	M,T				250	775, 3500	8	35 1/2 x 15 1/2 x12	Var.	Cloth, var.	83	449.00	*As above.	
SJM-2	*	12	29-33	-	-	3/4	Dome	T				250	1800	8	27x17 x11	Var.	Cloth, var.	63	329.00	*As above.	
FSM-2	*	12	31-36	-	-	3/4	Dome	T				250	1800	8	30x16 x13	Var.	Cloth, var.	65	299.00	*As above.	
WHITE ELECTRONICS	Triple Shot	Dual port	(12)	-	-	(5)	Dome	-		30-20 ±2	87	150	1200	8	46x16 x8	Oil. fruit. Vinyl wal.	Foam, blk. Foam, blk.	100	349.50	*Glass cones.	
	Shot Glass	Port. col.	(4)	-	-	3%	Dome	T		40-20 ±2	87	50	1200	8	28x8 x8%			25	159.50	*Glass cones. Also available as Bicentennial model w. peekaboo grille & red, white, & blue woofers.	

Equipment Profiles

Lux Model T-310 AM/FM Stereo Tuner



MANUFACTURER'S SPECIFICATIONS

FM Section
IHF Sensitivity: 2.2 μV . **Sensitivity for 50 dB S/N:** 2.2 μV . **S/N:** 75 dB. **THD:** Mono, 0.1%; Stereo, 0.12%. **Selectivity:** 70 dB. **I.F. Rejection:** 99 dB. **Image Rejection:** 90 dB. **Spurious Rejection:** 95 dB. **AM Suppression:** 55 dB. **Capture Ratio:** 1.5 dB. **Stereo Separation:** 1 kHz, 45 dB; 100 Hz to 10 kHz, 30 dB. **Muting Threshold:** 5 μV , variable. **Stereo Threshold:** 5 μV . **Frequency Response:** 20 Hz to 15,000 Hz, +0.2, -1.5 dB.

AM Section
IHF Sensitivity: 14 μV . **S/N:** 50 dB. **I.F. Rejection:** 85 dB. **Image Rejection:** 80 dB. **THD:** 0.5%.

Dolby and Output Characteristics

Output Level: 1.8 V for 100% modulation. **"0" Dolby Level:** 900 mV. **AM Output Level:** 1.5 volts for 100% modulation. **Dolby Tape Play THD:** Less than 0.1% from 20 Hz to 20 kHz, at 0 Dolby level. **Dolby Tape Play S/N:** 80 dB.

General Specifications

Dimensions: 19 in. W by 6 in. H by 11 in. D. **Weight:** 20 lbs. **Suggested Retail Price:** \$595.00.

Having visited Japan on several occasions, I can attest to the popularity of Lux Corp. products with Japanese audio enthusiasts. The better audio shops which I visited invariably used a Lux amplifier as a "standard of comparison" or for playing special program material which they wanted to demonstrate. Some years ago, Lux teamed up with an American-based company and attempted to distribute a special

line of products intended for the more general audio market (as opposed to the top-performing and top-priced units the company sells in its own domestic market, as well as in Europe and Asia). More recently, Lux formed an American company, which is called Lux Audio of America, Ltd., and the Model T-310 is the first product we have had a chance to measure and test from this new company. As we understand it, the new company plans to market the very same products which are so acclaimed in Lux's home market (except for modification to U.S. voltages and frequencies used in FM). Based on our measurements and use of this first product, we expect that Lux audio equipment will become as highly regarded in this country as it is in Japan.

The Lux T-310 tuner, like all of the company's components, comes complete in a rosewood cabinet which compliments the rich looking, bronze-gold colored front panel beautifully. A large dial at the right of the panel has a linearly calibrated FM dial, and AM dial scale, and an illuminated dial pointer. Below the scales and to the left are a signal-strength meter (which also doubles as a calibrating meter for the Dolby noise reduction circuitry that's built in) and a center-of-channel FM tuning meter. At the right are two jewel-lights which tell the user whether AM or FM has been selected and at the extreme right of the dial scales is a stereo indicator light in the form of an inverted candelabra. A massive tuning knob is coupled to an effective flywheel at the lower right of the panel.

The left section of the panel includes a push-button power on/off switch, a selector switch, three three-position toggle switches, and a pair of momentary push button switches. The selector switch has positions for AM, FM/Stereo, stereo-only, and mono. The first of the three toggle levers selects variable or fixed interstation muting or turns off the muting entirely. Interestingly, this is the first tuner we have encountered which also provides interstation muting on AM. The second lever introduces a noise-filter circuit for either AM or FM, while the last lever switch is

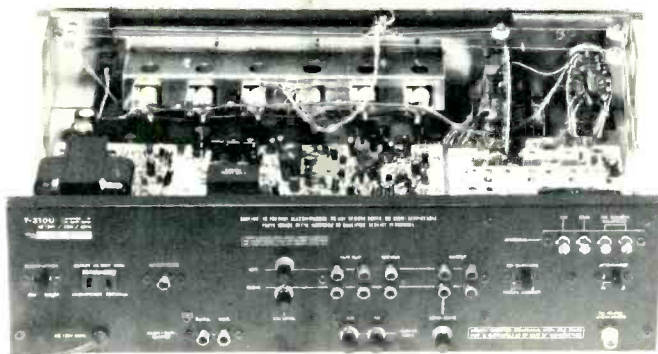


Fig. 1—Rear panel.

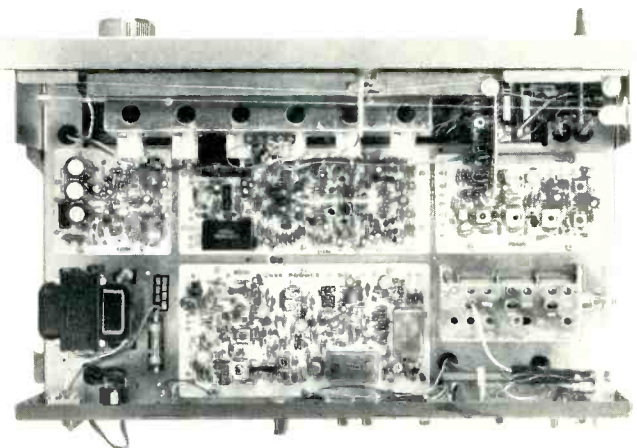


Fig. 2—Interior view.

used to selectively decode Dolbyized FM broadcasts or to make the entire Dolby circuitry available for use with tape recorders in recording and playback.

The rear panel of the T-310, shown in Fig. 1, resembles a preamplifier more than a tuner, and, in fact, in many ways this unit offers control features ordinarily found only in separate control preamplifiers. For example, there are fixed and variable main-output jacks (the latter controlled by an output level control on the rear panel), dual pairs of tape-playback jacks intended for connection to tape-deck outputs and to the monitor jacks of an integrated amplifier, record-out jacks, and a four-channel detector output jack. Left and right Dolby calibration potentiometers are also accessible from the rear panel, as are threshold controls for both the AM and FM muting circuits. A de-emphasis switch selects 25 microsecond or 75 microsecond operation, the former value required for properly receiving Dolbyized FM transmissions in this country. Both the 300-ohm antenna inputs and the AM external antenna inputs are of the screw terminal type, whereas the 75-ohm FM antenna input is a co-axial connector. An antenna attenuator switch is also provided, for use in case of strong-signal overload. There are also multipath indicator jacks for connection to the horizontal and vertical inputs of an oscilloscope. A line fuse, a.c. receptacle, and dial area brightness switch complete the rear panel layout. The built-in ferrite bar antenna is located inside the chassis and is therefore non-adjustable.

Figure 2 is a close-up photo of the internal layout of the chassis of the Lux T-310. Eight major circuit board modules are used in the design, including the sealed FM front-end which contains two dual-gate FETs (r.f. amplifier and mixer) and a four gang variable capacitor. The i.f. section utilizes four ICs and an input bi-polar transistor, plus a combination of solid-state i.f. filters and conventional interstage transformers. Included in this module is the elaborate AM and FM muting circuitry which not only senses signal strength but also analyzes noise content as well as center-of-channel tuning before turning on the audio signal when the mute circuitry is utilized. This sophisticated muting circuit alone uses 14 separate transistors. Stereo multiplex-decoding circuitry consists of a single IC followed by a low-pass filter to attenuate sub-carrier output products. The AM module consists of a separate r.f. amplifier stage (a 3-gang variable capacitor is used in this circuit) and three i.f. stages plus an amplified AGC circuit. A total of seven transistors are used in the AM section. Dolby circuitry is similar to that found in other, separate Dolby add-on units and is, of course, included under a licensing agreement from Dolby laboratories. Lux elected to use discrete components as opposed to the "chips" which are now available for that purpose. A power-supply module, incorporating four transistors and two FETs for regulation, completes the circuit layout. Major components are clearly identified on each module, and workmanship and layout are such as to make servicing easy. Interwiring between major modules is neatly harnessed and dressed, and all modules seemed mechanically well anchored and impervious to damage from shipping or other rough handling.

Laboratory Measurements

It would appear that Lux intends to be one of the more conservative audio makers when it comes to published specs, as most of our results were far superior to those claimed in the owner's manual. For example, best signal-to-noise ratio in mono read 78 dB—about as good as we are able to read with our Sound Technology FM Stereo Generator. Distortion in mono and stereo was the lowest we have ever read for any tuner at any price. It measured 0.033% in

mono and 0.06% in stereo at mid frequencies, as shown in the graphic plots of Fig. 3. The 50-dB quieting mark in mono occurred at an input signal strength of only 2.0 microvolts (as against 2.2 μV claimed). IHF sensitivity measured exactly 1.7 μV as claimed. This corresponds to exactly 10 dBf, using the newly approved IHF standards which measure signal strength in terms of power rather than voltage. Ultimate quieting in stereo was an impressive 72 dB, and approximately 30 μV was required to reach that stereo quieting (35 dBf).

The standard calibration of our graph in Fig. 4 (with respect to percentages of distortion) was just not sufficiently expanded to permit accurate plotting of THD over the audio range in mono and stereo. Specifically, mono THD was well below 0.1% from 30 Hz to 10 kHz. Stereo THD readings hovered around the 0.06% mark from 30 Hz to 4 kHz, increasing to 0.5% at 10 kHz, still unusually low. Best stereo separation of 48 dB was observed for a 400 Hz signal, and separation decreased to 38 dB at 50 Hz and to 31 dB at 10 kHz—well within published claims.

Lux's conservatism extends to some of the "lesser" FM specs as well. We measured a capture ratio of 1.2 dB, as opposed to the 1.5 dB claimed, and alternate channel selectivity turned out to be 76 dB as against 70 dB claimed. All rejection figures (image, i.f. and spurious) were in excess of 95 dB. Muting threshold was at 5 μV in the fixed position of the muting switch, and it was variable from 3 μV to 30 μV when the front panel switch was moved to variable mute. Stereo threshold (switching) occurred at an input signal strength of 4 μV (17.2 dBf) and was positive and instantaneous with no semi-stereo condition apparent.

We made just a few measurements of AM performance and obtained results that were entirely consistent with published claims, with the exception of distortion which bettered spec at 0.4% for 30% modulation.

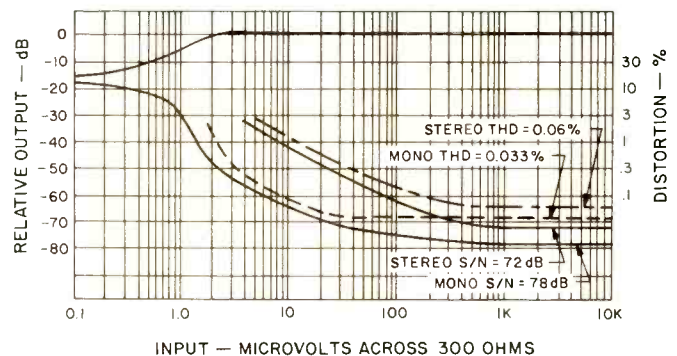


Fig. 3—FM quieting and distortion characteristics.

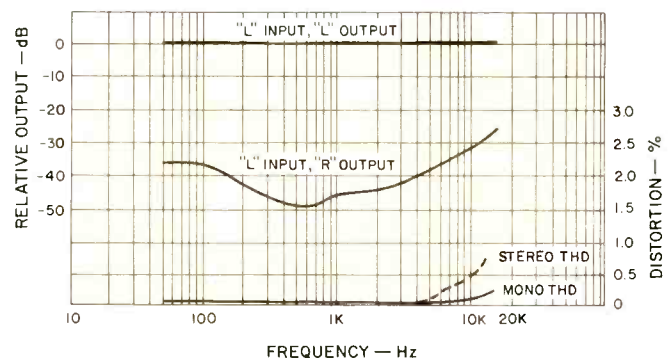


Fig. 4—Separation and distortion versus frequency.

Using our FM generator, we determined that "0" dB Dolby level (as read on the dual-purpose front panel meter) corresponded to an FM modulation level of around 45% in mono and around 40% in stereo (allowing for the 19 kHz pilot).

Listening and Use Tests

The Lux T-310 will really display its merits if you are fortunate enough to live in an area where some stations continue to practice good signal transmission and we were able to detect the tuner's superior noise-quieting characteristics and excellent sensitivity even in our listening tests, since these qualities are not dependent upon station studio practice. Proper de-emphasis and unerring frequency response were also quite evident—though it was clear from our listening tests that not all stations even take the pains to worry about these important parameters at the broadcast end. From a functional point of view, the Lux T-310 is a wonderful tuner to use. The AM muting feature has to be heard to be believed. And, of course, if you own any kind of tape equipment (open reel or cassette) that lacks Dolby noise reduction, you pick up in the T-310 an "accessory" that generally

sells for more than \$100.00 when bought separately. In that connection, it should be noted that if the Dolby feature is not something you require (because you already own an outboard Dolby unit), another version of this tuner is available from Lux. The Model T-300 performs exactly the way the T-310 does, we are told, but does not include the Dolby feature and sells for \$100.00 less than the T-310.

Since test reports are generally expected to come up with at least one criticism, we searched and searched and finally came up with one. The unit tested has the de-emphasis switch on the back of the unit, a mildly awkward place to get to in some installations, but the folks at Lux tell us that production has already been changed so that de-emphasis is automatically switched when the front panel switch is changed from FM to FM-Dolby. Properly chastened, we were (and are) ready to admit that Lux's first tuner entry in the U.S. market is a stunningly executed product that should appeal to the FM buff who seeks the finest FM reception available and has good enough broadcasters in his area to justify its incorporation into a top component system for home listening.

Leonard Feldman

Check No. 71 on Reader Service Card

Dual 601 Turntable



MANUFACTURER'S SPECIFICATIONS

Speeds: 33-1/3 and 45 rpm. **Wow & Flutter:** Less than 0.06% DIN B. **Rumble:** -63 dB, weighted. **Variable Speed Range:** $\pm 3\%$. **Dimensions:** 12-1/2 in. W x 14-3/4 in. D x 4-1/2 in. H, less cover. **Price:** Less than \$270.00.

Dual must be one of the oldest companies in the audio business, in fact they celebrate their 75th anniversary this year! The first Dual turntable appeared back in 1926 and curiously enough, it used dual motors, one a.c. powered and the other clockwork. Both could operate the turntable and the choice was up to the user. At that time, twin operation was not uncommon but usually the two motors were clockwork or an a.c. motor might be employed to wind up the spring—a method preferred by many broadcast stations because of hum problems!

The Dual line of automatic record changers have long been noted for exceptionally fine workmanship and outstanding performance. Recently two single-play models were introduced, the Models 601 and 701, the latter being a direct-drive unit costing \$400. Model 601 is similar in many respects, but it has a belt drive and a slightly different tone arm. Styling is neat and attractive in charcoal black and silver with a highly polished tonearm, and it comes complete with a walnut finish base and hinged, plastic dust cover. Although the 601 looks fairly conventional, it has some rather unusual features. For example, the two-position speed con-

trol on the left is a rotary lever type, but at the shaft end is a small concentric knob which controls the pitch—in other words, a fine speed adjustment. This does not use an eddy current wheel or tapered spindle but it actually *expands or contracts the drive spindle*. Engineers who use lathes or coil winders are familiar with this concept, but as far as I know, the 601 is the only turntable to make use of it.

On the right is another rotary lever for Start-Stop and to the right of that is a small control for single-play or repeat. Behind it is the cue lever, and further to the rear is the anti-skating control which is calibrated for conical, elliptical or CD-4 styli. The tonearm is 8-3/4 in. long, and the counterweight is elastically damped to reduce the possible effects of arm resonances. A four-point gimbel suspension is used, and the rotary dial of the stylus force gauge is calibrated from 0 to 3 grams. (Many years ago, I designed a phono cartridge and its weight was four ounces. The stylus was made of steel and held by a set screw that probably weighed more than a hundred modern styli!) The cartridge holder of the 601 has a quick release lever and an alignment gauge is supplied—a most important item. The motor is an eight-pole synchronous type, and a belt links it to a flywheel beneath the platter itself. The platter is a 12-in. aluminum casting, weighing 4-1/2 lbs, and is dynamically balanced. Speed indication is given by a strobe, which is located in a window to the left of the Start switch.

Measurements

The cartridge used for the tests was a Shure V-15 Mk III, and no difficulty was experienced in mounting it in the shell with the hardware supplied. (Nothing is more infuriating than finding out that the screws supplied with a cartridge holder are a sixteenth of an inch too short! Have you ever tried buying these tiny screws?) The first measurements were for wow and flutter, and the combined figure came out at less than 0.05% using the DIN standard. Rumble was also extremely low at -65 dB (ARLL weighting). Tracking error is quoted as less than 0.3 degrees per inch and this was confirmed. The stylus force gauge was found to be remarkably accurate, with deviations less than 5% above one gram. Vertical and lateral arm bearing friction was insignificant, the figures specified being only 7 and 15 milligrams. Arm resonance, with the Shure cartridge, was low in amplitude

Celestion



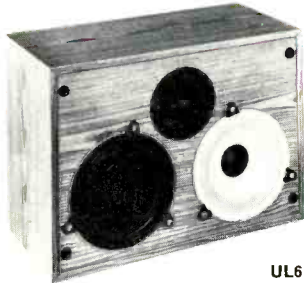
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New Celestion UL6. Compact enclosure provides 35 Hz-28 kHz overall response ± 3.5 db 80 Hz-20 kHz. Power handling 20 watts continuous RMS sine wave. Can be used with amplifiers up to 80 watts RMS per channel.



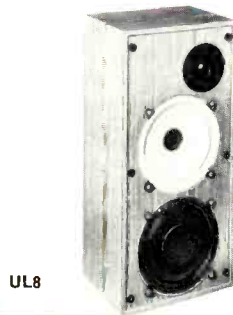
UL6

New Celestion Ditton 33. Overall response 40 Hz-28 kHz; ± 3 db 60 Hz-20 kHz. Power handling 33 watts DIN continuous.



DITTON 33

New Celestion UL8. Overall response 30 Hz-28 kHz; ± 3 db 70 Hz-20 kHz. Power handling 25 watts continuous RMS sine wave. Can be used with amplifiers up to 100 watts RMS per channel.



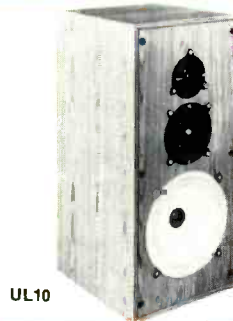
UL8

Ditton 44 Monitor. Power handling 44 watts DIN continuous. "It could take 100 watts (at 300 Hz on a steady-state basis) to produce an output of 106 db, and a power pulse of 486.5 watts (973 watts peak) to yield an output of 116 db. These figures attest to both the Ditton's robustness and to its excellent dynamic range . . ." —High Fidelity, June 1973.



DITTON 44

New Celestion UL10. Overall response 20 Hz-40 kHz; ± 2 db 40 Hz-20 kHz. Power handling 50 watts continuous RMS sine wave. Can be used with amplifiers up to 200 watts RMS per channel.



UL10

Ditton 66 Studio Monitor is top of Celestion Ditton Series and has received rave reviews worldwide. Appointed "Reference Standard" by "Revue du Son" of France. Features 16 Hz-40 kHz overall response, ultra-low distortion, high efficiency. Power handling 80 watts DIN continuous.



DITTON 66

Also available: **Ditton 15 "Bookshelf Classic"**
Ditton 25 floor standing luxury loudspeaker

The following quality drivers, used in the 8 models listed above, were totally researched, designed, and built by Celestion—Britain's most experienced loudspeaker manufacturer.

HF2000 $\frac{3}{4}$ " pressure-dome supertweeter specified for B.B.C. monitors.

HD1000 New 1" pressure-dome tweeter ensures extended treble response, excellent dispersion and complete freedom from listener fatigue.

HD700 New 2" pressure-dome midrange unit.

MD500 2" soft-dome midrange unit covers 500 Hz-5kHz with very low distortion, exceptional dispersion. Extremely powerful magnetic field ensures critical damping and high power handling.

MC5 New 5" midrange unit with low mass fibrous cone for outstanding transient response.

MC6 6" plasticized midrange unit in damped hermetically sealed transmission line.

BASS UNITS UL bass units have 1.5" voicecoil, massive magnet system and specially treated Bextrene diaphragm. Ditton bass units have specially plasticized fibrous cone to prevent resonances; neoprene roll front suspension permits long linear axial movement for low distortion bass reproduction.

ABR's Auxiliary bass radiators ensure excellent bass response, raise sensitivity, and reduce distortion to negligible limits.

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with the maximum points at two frequencies—8 and 13 Hz, a result of the decoupled counterbalance. The force required to operate the arm return mechanism was very small and not likely to bother the most fragile cartridge. Finally, the pitch control was checked, and the range was found to be +3 and -4% which is more than adequate for most purposes.

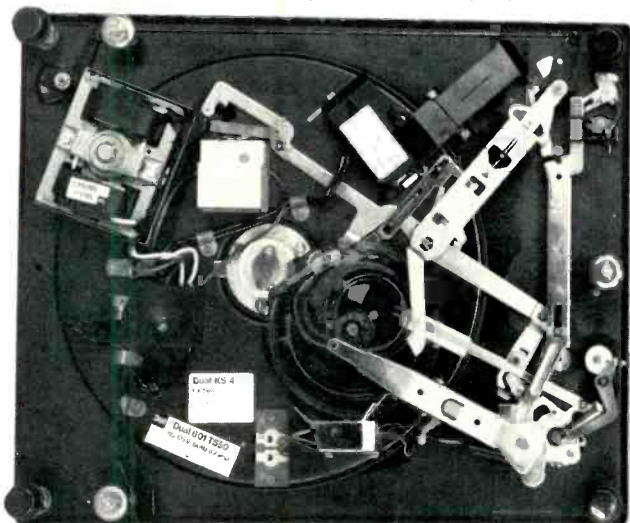


Fig. 1—View from beneath the Dual 601.

In-Use Test

Records can be played manually or automatically. In the latter mode the control switch is turned to *Start* and the arm will move to the record lead-in groove (if the selector switch is set to 45, the arm will drop to the correct position for 7-in. records). The alternative is to simply move the arm to the required position and then gently lower it with the cue lever—by which time the turntable will have reached its correct speed. The cue lever is well-damped and positive in operation with no side shifting—a pleasure to use. The whole player unit is spring mounted to the base but the tension is tighter than usual and acoustic feedback should not be a problem. The special dual-compliance arm counter weight helps a lot too, and it was surprising how much vibration could shake the base before audible mistracking occurred. Incidentally, the Shure V-15 tracked nicely down to 0.75 gram, but to be on the safe side the weight was increased to just over 1 gram. The instruction manual contains a table giving optimum settings of the anti-skating control for various tracking forces and styli, but I didn't find the adjustment that critical although it might be with CD-4 cartridges. The connecting leads were unsuitable for CD-4 use, but I understand that special low-capacity types are available.

Summing up: The Dual 601 is unquestionably one of the finest single-play turntables in its price range and it deserves the best phono cartridge to go with it. What more is there to say?

George W. Tillet

Check No. 72 on Reader Service Card

Advent Model 400 FM Radio



There are no technical specifications supplied with Advent's two-piece Model 400 FM Radio, and indeed, that's a pity, since an unsophisticated shopper might mistake this little system for "just another table radio," much as we did when we first unpacked it. As we were soon to learn, this is no ordinary radio and, though we started out to do a "quick test" of its performance, we soon discovered that it merited the full lab treatment we normally accord full-fledged, high-fidelity component receivers.

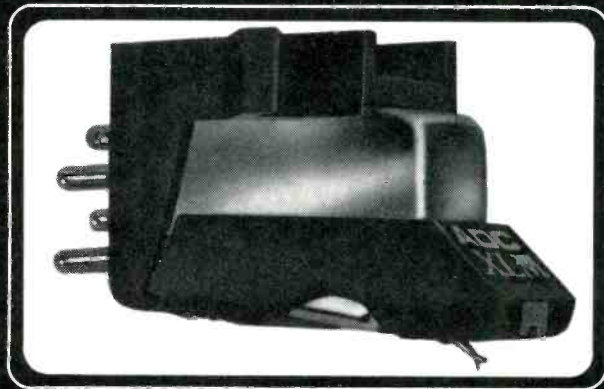
In fact, the electronic module of the system, packaged in a trim, matte-white plastic cabinet and fitted with a tastefully screened aluminum front plate, is a complete monophonic receiver that measures only 4-1/2 in. wide by 6-5/8 in. high by 6 in. deep. Its rear panel, not visible in the system photo, is equipped with antenna terminals for connection of a 300-ohm outdoor antenna (a single length of wire is supplied for use in strong-signal areas), rugged red and black spring-loaded speaker terminals (which accept the stripped ends of the 40-ft. speaker cable supplied), a tuner output jack (for connection to a tape deck's input or the input of any conventional audio component system), and an AUX input for connection of any other high level program source such as the output of a tape deck. A slide switch on the rear panel selects internal tuner signals or external AUX program source. About the only thing the little receiver lacks to qualify as a full receiver component is facilities for amplifying the

output of a magnetic cartridge. Of course, any inexpensive preamp could be added to take care of that extra gain and equalization needed. The little system is, of course, monophonic. Advent suggests that it would make an ideal addition for dorms, stores, eating places, and in homes where its most important purpose is to provide those accustomed to superior sound reproduction with a convenient means of having music wherever they want it.

While it is not obvious from the photo, the tuning dial of the Advent is a vernier type. That is, it takes three full turns of the black portion of the tuning knob for the inscribed line on the silver outer ring to span the range from 88 MHz to 108 MHz. This affords sufficient fine tuning ability and, unlike most "table radios," there are calibration marks for every MHz of the FM band. Other front-panel controls include a volume control (which turns off the set in its most counterclockwise position) and bass and treble controls. About the only thing we would have liked to see added is some visual indication that the set is turned *On*, as there is no pilot lamp on the front panel.

Those familiar with the Advent "Large" speaker and the Advent "Small" speaker might well dub the speaker supplied with the Model 400 the Advent "Tiny" speaker, since, except for its size (6-5/8 in. high by 11 in. wide by 6 in. deep), it follows traditional speaker designs practiced by that firm. It is a true "acoustic suspension" sealed enclosure containing a single long-throw, 4-1/2 in. driver, plus a specially designed LCR network which, according to Advent, shapes or contours the speaker's response to achieve "satisfying tonal balance on a wide range of source material under a wide variety of listening conditions." Note, too, that the height and depth of the speaker are the same as those of the receiver portion so that the two modules can be butted together or separated up to the limit of the speaker cable supplied. The back of the speaker contains an arrangement for storing excess speaker wire lengths if the two units are separated by less than the 40 ft. permitted by the cable supplied.

High praise for ADC MKII low mass cartridges.



"This cartridge (ADC XLM MKII) gave us some of the smoothest and cleanest high-end results we have heard from record reproduction. Heavily recorded difficult musical passages were handled with ease and overall musical accuracy was maintained."

*The Len Feldman Report
in FM Guide*

"Tracking ability at low and middle frequencies was exceptional... the high level required half the tracking force of most other cartridges... one of the best 2-channel stereo cartridges and better than most CD-4 types."
(ADC Super XLM MKII)

*Hi-Fi News and
Record Review*

ADC XLM MKII cartridges embody principles found in no other cartridges, as evidenced by our U.S. Patent. They feature a unique "induced magnet" whereby the magnet is fixed and the magnetism is induced into a tiny hollow soft-iron collar. This collar in turn moves between the pole pieces thereby allowing for a major reduction in the mass of the moving system. This LOW MASS permits the stylus to trace the most intricate modulations of the record grooves with a feather-light tracking force—as low as $\frac{3}{4}$ of a gram.

This results in super-linear pick up especially at the higher frequencies of the audible spectrum, which other cartridges either distort or fail to pick up at all. This low tracking force also assures minimal erosion and a longer playing life for the records.

This family of LOW MASS Cartridges is offered with Shibata type and elliptical diamond styli.

For detailed specifications, write ADC.

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Check No. 4 on Reader Service Card

Receiver Circuitry

With the aid of a magnifying glass, we were able to examine the schematic diagram found on the underside of the receiver cabinet. Believe it or not, all three elements of the FM front-end (r.f., oscillator, and mixer) use FETs. Interstage transformers are used for i.f. tuning of the two IC stages, which are followed by a detector-driver stage (bi-polar), a ratio detector circuit, and one stage of audio amplification ahead of the Tuner Out jack. A full negative-feedback (Baxandall) tone-control circuit is used for bass and treble controls, the output of which is fed to a differential amplifier which serves as the first stage of the power amplifier section.

Liberal use is made of diode chains in series for biasing of drivers as well as the complementary-symmetry, NPN-PNP output stage, which is capacitively coupled to the speaker output terminals. The power supply is transformer-isolated and uses a bridge rectifier system for generation of the output stage voltage. Tuner voltage is regulated electronically by a familiar transistor plus Zener diode arrangement. The receiver is internally fused in the primary of the power supply transformer. All of this, mind you, plus the companion speaker, at a suggested retail price of \$125.00!

FM Performance Measurements

After but a few cursory measurements, we decided that this little receiver deserved the full treatment, and so our usual plot of quieting and distortion is shown in Fig. 1. Usable sensitivity measured 2.9 microvolts. This corresponds to

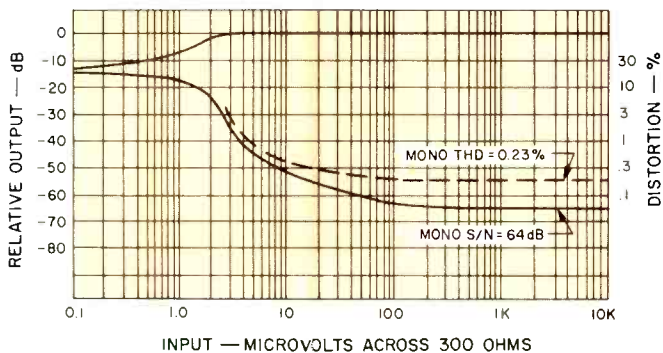


Fig. 1—FM quieting and distortion characteristics.

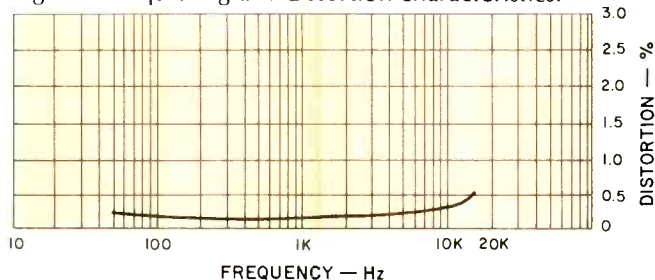


Fig. 2—FM distortion versus frequency.

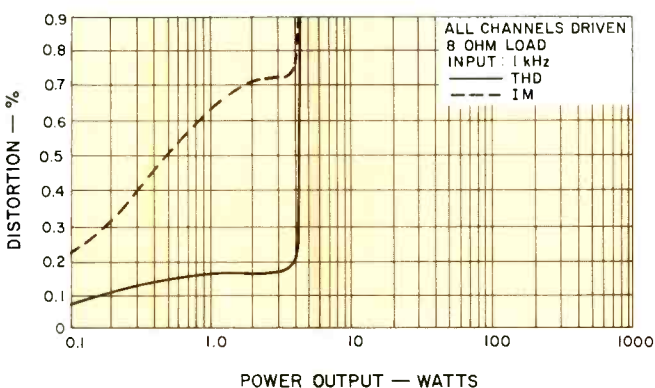


Fig. 3—Total harmonic and intermodulation distortion.

a new dBf figure of 14.64 dBf (0 dBf = 0.55 μ V across 300 ohms). Henceforth, all our tuner test reports will include the newly authorized dBf figures per the new IHF/IEEE/EIA Tuner Standards). The 50-dB quieting mark was achieved for a signal strength of 10 μ V (25.4 dBf). Maximum signal-to-noise ratio, obtained with a signal strength of 65 dBf (similar, but not quite equal to the nominal 1000 μ V measurements) was 64 dB. Even more amazing was the monophonic THD reading at the same signal strength which turned out to be 0.23%—not much more than we've measured for the very best tuners and receivers on the market!

Nor did the distortion change radically at audio frequency extremes, as can be seen in the plot of Fig. 2. Even at 10 kHz, THD was well under 0.5%, reaching that figure at the limit of the FM audio passband, 15 kHz.

Amplifier Measurements

Advent supplies no information as to the power output capabilities of the Model 400 receiver, and indeed this information is a bit academic since the company has matched the small speaker to the receiver so as to provide good sound levels under typical listening conditions. Nevertheless, we were curious and performed our usual amplifier measurements, via the AUX input. Based upon these measurements we would rate the amplifier as having a power output of 4.0 watts at mid-frequencies, as shown in the curves of Fig. 3. THD and IM reach a nominal 1.0% at an output of 4.6 watts. At levels below 4.0 watts, THD is under 0.2%, while IM tapers off more gradually. While we expected the power band to this little receiver to be rather limited, it isn't all that narrow. At a 2-watt level, distortion remains under 0.5% all the way down to 50 Hz, while at a 1-watt listening level, distortion remains under 0.5% all the way to 30 Hz or so. There would have been little point in extending power response much further in view of the frequency response limitations of the little speaker system supplied. In our subsequent listening tests, we judged the speaker as being able to produce frequencies down to about 60 Hz with relatively low audible distortion—quite a feat in itself for a 4-1/2-in. driver. Distortion versus frequency for the power levels tested is shown in the curves of Fig. 4.

Frequency response of the amplifier section is flat within 1 dB from 60 Hz to 30 kHz and within 3 dB from 47 Hz up to 37 kHz. Hum and noise, referred to full output at the AUX input jack, was measured at -63 dB, and residual hum and noise at minimum volume settings was -68 dB. Tone control range, plotted in Fig. 5, is typical of that obtained with this popular feedback circuit.

Listening & Use Tests

FM reception using the Advent Model 400 was generally excellent, though we did measure dial calibration errors of as great as 300 kHz at extremes of the band. When tuning

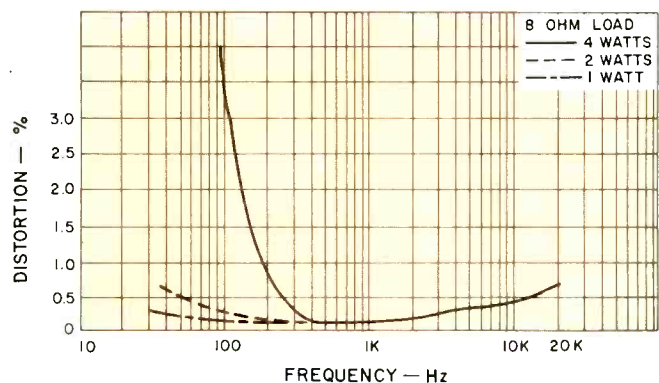


Fig. 4—Total harmonic distortion versus frequency.

**LISTEN TO OUR DIRECT-DRIVE TURNTABLE.
YOU WON'T ONLY HEAR HOW ACCURATE IT IS.
YOU'LL SEE IT.**



Your valuable record collection deserves to be heard on the best equipment. And that includes the best turntable.

The Toshiba deluxe Model SR-355 turntable has a built-in stroboscope that lets you see just how accurate it is.

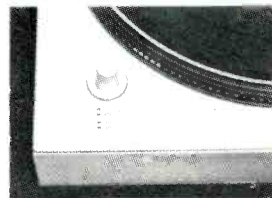
The SR-355 is a totally manual, direct drive unit. It's equipped with a DC servo-motor, an S-shaped static-balanced tonearm with damped arm elevator, stylus force adjustment, and anti-skate adjusting knob. The screw-in cartridge shell fits a universal mount. And the platter is made of die-cast aluminum.

Its wow/flutter measurement is .04% and the two operating speeds (33 $\frac{1}{3}$ and 45) have a 2% adjustment.

Sit back and enjoy your music on the Toshiba SR-355 turntable.

It may be the first time you really hear it.

The stroboscope offers
2% adjustment of the two operating speeds.



TOSHIBA

Toshiba America, Inc.

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Cartridge not included.

Check No. 32 on Reader Service Card

from station to station, there is a bit of "raggedness" that occurs as one encounters the "edge" of a channel, which made us appreciate the muting feature normally found on component receivers but not available on this unit. Users can keep volume settings low when tuning from station to station if they are bothered by this. Once tuned in properly, sound is clean and quite unlike anything you have ever heard from a "table model" radio. We were rather aware of the tonal contour of the speaker system, which is pleasant to listen to but which, in our judgment, is not flat. While we were not about to engage in lengthy speaker performance measurements, we did a quick analysis of the response of the speaker system, using a sound pressure level meter placed just a few inches from the face of the speaker system

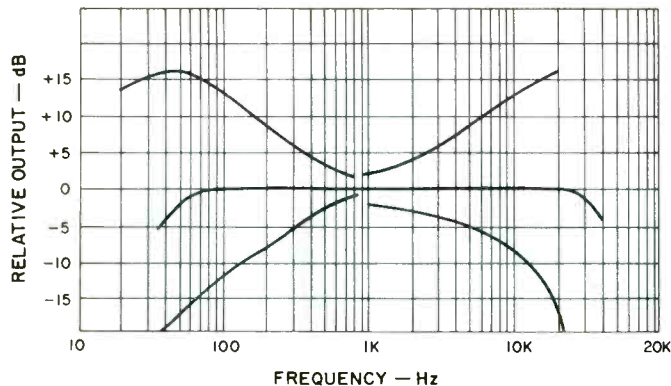
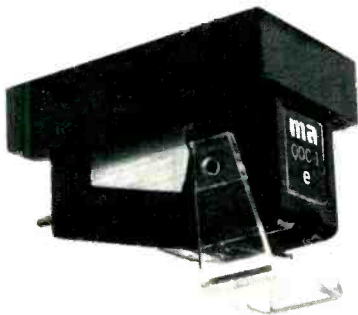


Fig. 5—Tone control range and frequency response.

Micro-Acoustics QDC-1e Phono Cartridge



MANUFACTURER'S SPECIFICATIONS

Stylus: 0.0002 x 0.007 in. elliptical diamond. **Frequency Response:** 5 Hz to 20 kHz \pm 2 dB. **Tracking Force Range:** 0.9 to 1 1/2 grams. **Channel Separation:** Nominally 30 dB at 1 kHz, nominally 20 dB at 10 kHz. **Output Voltage:** 3 mV at 5cm/sec. peak recorded velocity. **Load Recommendation:** 47 kOhms. **Price:** \$110.00. Also available as QDC-1q for CD-4, \$120.00, and QDC-1s with spherical stylus, \$100.00.

Although the electret principle is considered by many to be of recent vintage, it actually is about 50 years old. The electret principle, which in reality is dielectric absorption, was developed by the Japanese scientist, Eguchi, in 1925. Eguchi permitted melted mixtures of wax to harden in a strong electric field and found that he had obtained dielectric absorption which remained relatively undiminished over a period of years. Thus, the electret is a permanently polarized solid dielectric and the electrostatic analog of a permanent magnet. Its application in audio did not come until about 35 years later when scientists at Western Electric improved the electret to the point that it would hold its polarized charge indefinitely, thus forming the basis for its first audio application—the electret microphone.

The Micro-Acoustics QDC-1e electret transducer is an al-

and applying different tones to the AUX input, referred to 100 dB SPL level at 1000 Hz. The results are shown in Fig. 6 and are intended only to depict the general character of the speaker response and do not purport to provide absolute level or amplitude measurements.

We must say again that the Advent Model 400 FM radio is about the best sounding small unit we have ever heard. Despite having the speaker enclosure separated from the receiver section (a principle to which all of us devoted hi-fi fans subscribe), the module pair is small enough to allow one to bring this good sound into just about any size room, no matter how cramped.

Leonard Feldman

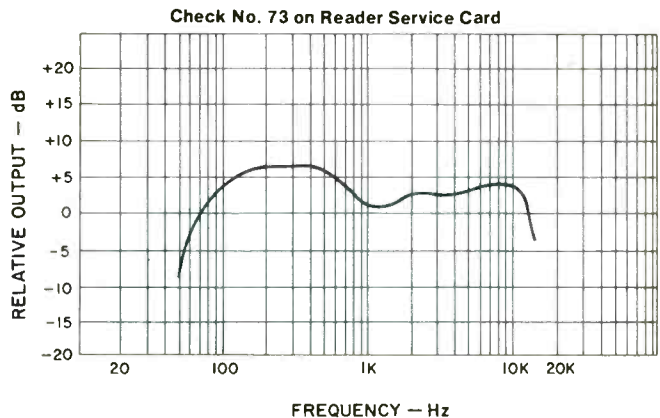


Fig. 6—Approximate amplitude response of Advent 400 speaker system, measured on-axis at six inches. (0 dB reference equals 100 dB SPL.)

most perfect device for transforming mechanical vibrations into analogous electrical signals (without the use of an external voltage source), whereby the output voltage is the exact analog of the mechanical vibrations. These vibrations are coupled from the record groove by the stylus bar and resolver (the resolver is a mechanical device used to separate the complex vibrations of the stylus into the left and right components). The resolver, in turn, is in direct mechanical contact with the left- and right-channel electret transducers, where varying pressure on the transducers generates electrical signals which are transmitted to the internal resistive network at the cartridge output terminals. The resistive network converts the cartridge from an amplitude to a velocity responding cartridge. Like all stereo cartridges, it operates into the usual 47 kOhm load present at the phono inputs of most preamplifiers. However, it will operate equally well across any load resistance, e.g., 100 kOhms. Any standard audio cables may be used between the cartridge and phono input of the preamplifier inasmuch as the frequency response of the Micro-Acoustics QDC-1e is not affected by the usual cable capacitance. The electret self-resonance (mechanical) is above 40 kHz, well above the audio spectrum, and is damped by the special damping blocks inside the cartridge. There is no electrical resonance present in an electret cartridge.

Measurements

As is our practice, measurements are made on both channels, but only the left is reported. During the test period, temperature was 70° F \pm 1° and the relative humidity 60-64 per cent.

Before any measurements are made, the optimum tracking force is determined and ordinarily used throughout evaluation. However, this was not the case with the Micro-Acoustics QDC-1e cartridge. The optimum tracking force was found to be 800 mg (0.8 g), but to track the very high levels of the Shure TTR-103 or the AEL-100 test records cleanly, the tracking force had to be increased to 1.5 g. This situation appears to be due to the fact that the QDC-1e is a

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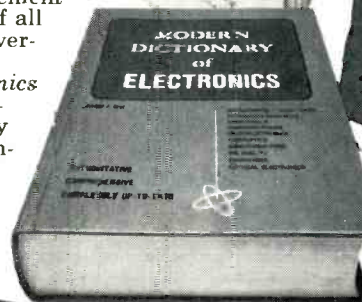
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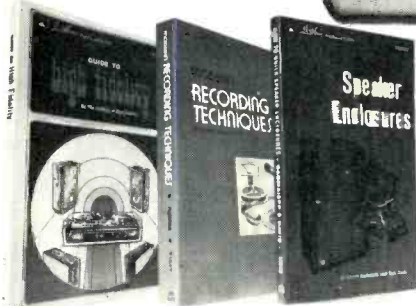
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CT13

direct-coupled device requiring a small amount of mechanical bias to effect contact between the resolver mechanism and the electrets and to cause an incremental deflection of the electrets. Therefore, the 1.5 g tracking force is the total of 1.1 g needed for actual tracking plus the additional 400 mg (0.4 g) required to couple the stylus bar to the electrets. We suggest that the tracking force be set at 1.5 g unless using a tone arm with minimal friction, e.g., the Audio-technica AT-1009 or the SME 3009, in which case a tracking force of 1.25 g may be used.

Frequency response is flat within ± 2.5 dB from 35 Hz to 11 kHz, -3 dB at 20 Hz, $+4$ dB at 15 kHz, and 0 dB at 20 kHz. Separation is 23 dB at the mid-range, 20 dB at 10 kHz, and 18 dB at 20 kHz. Channel balance is within 0.5 dB, and the trackability is good. Using the AEL-100 test record, which contains tracking velocities from 7 cm/sec to 70 cm/sec at 1 kHz, lateral cut, peak velocity, the QDC-le tracked the 35 cm/sec band. The 300-Hz test bands on the German Hi-Fi Institute "Listening and Measurement" Record No. 2 were tracked up to 70 microns (.007 cm) lateral and 50 microns (.005 cm) vertical, which is average for the better cartridges. Cartridge and tone-arm resonance, with Audio-technica AT-1009, appears to be just below 10 Hz. Compliance measured as 7.2×10^{-6} lateral and 6.3×10^{-6} vertical. Signal output was 1.09 mv/1-cm/sec. Other measurements were:

Wt. 7.18 g; tracking force 1.5 g; anti-skating 1.25 g; output 1.09 mV/1-cm/sec; IM dist. (4:1) $+9$ dB lateral, 200/4000:1.8%, $+6$ dB vertical, 200/4000:2.6%; crosstalk -23 dB; ch. bal. 0.5 dB; trackability: high freq. (10.8 kHz pulsed) 30 cm/sec; mid-freq. (1000 + 1500 Hz, lat. cut) 31.5 cm/sec; low freq. (400 + 4000 Hz lat. cut) 24 cm/sec; passed all bands of the Shure Audio Obstacle Course, Era III test record.

Test records used in the evaluation were the AEL-100; Shure TTR-107, TTR-103, and TTR-100; Columbia STR-100, STR-112, SQT-1100; Stereo Review SR-12; B&K QR-2009; German Hi Fi No. 2, and Ovation OVQS/4000.

Listening Evaluation

Although laboratory measurements of a cartridge's parameters are of great importance, obviously one cannot listen to measurements. However, our listening evaluation bore out what the measurements generally indicated, that this is one of the better stereo phono cartridges on the market.

The Micro-Acoustics QDC-le was used with the following equipment in the listening evaluation: Technics SP-10 turntable, Audio-technica AT-1009 tone arm, two Phase Linear 4000 preamplifiers, two Crown D-150 amplifiers, four Micro-Acoustics FRM-1 speakers, and the Janis Audio Associates W-1 subwoofer along with the Crown VFX-2 crossover network in a common mode configuration. The matrix quadrasonic decoders used were the Lafayette SQ-W, the Sansui X-2, and the SQ and QS positions of the Denon UDA-100.

As is our practice, a rigorous listening evaluation of the QDC-le was conducted, exceeding 40 hours of use. All the stereo and matrix quadrasonic records listed in the report on the Supex SD-900/E published in *Audio*, September 1975,

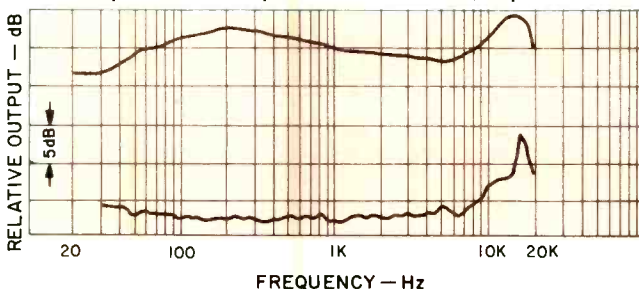


Fig. 1—Frequency response and separation of Micro-Acoustics QDC-le phono cartridge.

p. 61, and the following additional records were used in the listening evaluation of the QDC-1e cartridge.

Stereo

Lincoln Mayorga & Distinguished Colleagues—Sheffield, Lab. 1, Volume III
The Missing Link—Sheffield, S10, Volume II
Von Suppé Overtures—London, SCP 21069
 Khachaturian: *Symphony No. 3*; Rimsky-Korsakoff: *Russian Easter Overture*—RCA LSC-3067
 Rossini: *The Siege of Corinth*—Angel SCLX-3819

QS

Synergy: Electronic Realizations for Rock Orchestra—Passport Records PPSD-98009
Fireballet: Night on Bald Mountain—Passport Records PPSD-98010

SQ

Boulez Conducts Ravel—Columbia MQ 32838
E. Power Biggs Plays Scott Joplin on the Pedal Harpsichord—Columbia MQ 33205
 Handel: *Water Music* (Boulez Cond.)—Columbia MQ 33436
 Massenet: *La Navarraise*—Columbia MQ 33506
 Weather Report: *Tale Spinnin'*—Columbia PCQ 33417
 Chicago VII (2 discs)—Columbia C2Q 32810

The QDC-le cartridge reproduced all types of recorded music exceptionally well, particularly in the high frequencies, without any noticeable coloration. It is particularly good in voice reproduction, as evinced by the Rossini: *The Siege of Corinth* and the Massenet: *La Navarraise* recordings. Organ music is reproduced quite faithfully, especially the organ pedal notes. The pedal harpsichord, a difficult instrument to both record and reproduce, comes across surprisingly well in the Scott Joplin rendition by Biggs. Some exceptionally well-reproduced records are Weather Report's *Tale Spinnin'*, and the superb QS recordings, *Synergy* and *Fireballet*. The *Synergy* recording is the best electronically synthesized (Mini-Moog) music we have ever heard—particularly the *Slaughter on Tenth Avenue* rendition. The recording sounds exceptionally good in the QS Vario-matrix mode and almost as good in stereo. The bass in the *Synergy* recording is clean and clearly defined. Transient response is exceptionally good.

Micro-Acoustics claims that the QDC-le cartridge makes a recording sound indistinguishable from its master tape in a direct "A-B" test. Obviously, since few audiophiles would be able to acquire such master tapes in order to verify these claims, most will have to reserve judgment on this. However, in spite of the difficulty in verifying such claims, our measurements and subsequent listening evaluation are strong evidence that such may, indeed, be justified.

We have lived with the Micro-Acoustics QDC-le cartridge for some time, playing the gamut of monophonic, stereo, and matrix quadrasonic recorded music from our record library. Based upon our laboratory measurements and listening evaluation, we can recommend the QDC-le without hesitation to the discerning audiophile who desires a top quality cartridge.

B. V. Pisha

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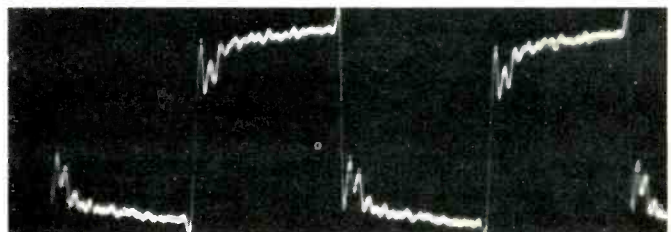


Fig. 2—1-kHz square-wave response of the Micro-Acoustics QDC-le using CBS Lab's STR-112 test record.

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★ **BROADCAST TEST RECORD STR 151** Developed especially to meet the needs of broadcast engineers, audiophiles, and other professionals seeking a convenient signal source for the testing and adjustment of all audio equipment. Tests include: phonograph pickup response and separation, speed accuracy at 33 1/3 and 45 rpm, wow and flutter, rumble and hum detection, ballistic test of V.U. meters and many others."

★ **RIAA FREQUENCY RESPONSE TEST RECORD STR 130** Provides RIAA frequency characteristics for the calibration of professional recording equipment and for testing the response of professional and consumer record reproduction equipment. This record is suitable for use with a graphic level recorder to provide permanent, visible records for precise evaluation. Spot frequency bands for use without automatic equipment are included.

★ **318 MICROSECOND FREQUENCY RESPONSE TEST RECORD STR 170** Provides pickup designers and recording studios with a high-level, easily-equalized signal for frequency response and channel separation measurements. The STR 170 employs a 318 microsecond characteristic corresponding to the "test" or "flat" mode common to most disc recording equipment. Constant amplitude recording is employed in the region below 500 Hz with constant velocity recording in the region above. The transition is smooth, in contrast with the STR 100 which employs a sharp breakpoint at 500 Hz. The record is suitable for use with a graphic level recorder to provide permanent, visible records for precise evaluation.

★ **WIDE RANGE PICKUP RESPONSE TEST RECORD STR 120** Makes possible the measurement of pickup response at frequencies far beyond the audible range, where elusive distortion elements can cause audible distortion. The low-frequency range includes glide-tones at twice normal level for the detection and elimination of arm resonance, loudspeaker cone and cabinet rattles. Other tests include: silent grooves for measuring rumble and surface noise characteristics; and standard level bands at 0 dB for overall system S/N measurements. This record is suitable for use with a graphic level recorder to provide permanent, visible records for precise evaluation.

★ **QUADRAPHONIC TEST RECORD SQT 1100** Designed for calibration, verification, and adjustment of SQ™ decoding equipment. The record provides test bands for pickup measurements, for adjustment of decoder electronics and for channel identification and balance. Each band is described in terms of recorded characteristics and its intended use.

★ **RIAA PINK NOISE ACOUSTICAL TEST RECORD STR 140** Designed for acoustical testing of systems and loudspeakers and for psychoacoustic tests on reproduction equipment. With the STR 140 it becomes possible to test loudspeakers in the room in which they will be used. Spot frequency tones with voice announcements facilitate the testing procedure. Continuous glide-tones in 1/3-octave bands cover the frequency range from 30 to 15,000 Hz and are synchronized with a graphic level recorder.

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The Column



The Basement Tapes: Bob Dylan and The Band

Columbia C2 32682, two discs, stereo, \$9.96.

There was a certain charm to the original bootleg of these recordings that somehow doesn't come across so well on the official version and I can't quite put my finger on it. Maybe the 18th generation dub of these tapes made Robbie Robertson's guitar more clanky, Dylan's vocals more urgent, the songs sound more differentiated. Perhaps the record just *felt* better coming in a plain white cover with uneven edges than in this package. Or maybe these are entirely different tapes.

Whatever the facts, this is the music that made Bob Dylan a living legend instead of just another Greenwich Village street musician. And let's not mince words—Bob Dylan is where he is because of other people's ren-

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ditions of songs he wrote, songs like *You Ain't Going Nowhere*, and *Million Dollar Bash*—and not because of his own recordings. Those other artists were bowled over by the songs because of Dylan's pure emotive strength, always his most obvious attribute. If he had sung these songs *then* in his current vocal pattern (oft referred to as spastic and full of half-stutters) they wouldn't be nearly so impressive. Here he sings unaffected, unmannered, just getting the songs across as plainly as possible. The band

plays with verve, and with restraint, when each is needed, in turn. Garth Hudson may well be the only organist in Rock 'n Roll who doesn't sound tacky and boring, proven on vinyl at last.

This is the real American music, not the self-conscious illiteracy of the Eagles. This is the music that can only be found on records by The Beach Boys, The Band, Big Star, Dylan, Todd Rundgren, and a few other Yanks who don't have to understand the American Experience—they are part of it.

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John Tiven

Sound: (Better than I expected)

Performance: A+

That Other Mile: Randall Bramblett
Polydor PD 6045, stereo, \$6.98.

I openly confess having totally mixed into one confused identity Randall Bramblett, Delaney Bramlet, Elliot Randall, and a few others. Well, Elliot Randall is on this album as a sideman, and Randall Bramblett is neither Delaney or Bonnie. Nor anyone else. He is himself and has made a fine album to prove it. With **That Other Mile**, all possible confusion ends. He, helped by some of the best studio musicians around, the Brecker Bros., Chris Parker, Eric Weissburg, Lill Lee, Hugh McCracken, to name just a few, have made a very interesting album of Bramblett originals.

Although it's an easy album to get into, it has a kind of excitement that I can't easily describe. The musicianship, production, sound, and tempos are dynamite. But the lyrics are a problem for me. I don't know if I like or I loathe them. They're a weird, catchy, strange, happy complication of the English language. Randall admits "liking to combine opposites ... mystic with funk ... integrating astrology, psychology, physiology," and a lot more. Well, I don't know. It's not all *that* heavy. In fact, I find it rather light and clever. What he is talking about, I can't be certain but it surely is kind of far out.

The music and the performance are stark perfection, full of little details and smart production. Many current pop-rock themes are touched with great precision and warmth. The recorded sound is just great, and there are lots of interesting elements vying for attention on this release. I think that it was intended that way. The fact that the weird words are so intelligible, but not up front enough to override the instruments and the artistry of the many players, is fascinating. What it all adds up to is, it's good. What it is or what to call it? I don't know. It certainly is worth a good long listen to. Put it through an SQ decoder or a QS (Vario-Matrix) decoder for a real sonic/musical treat! A basket full of fascinations.

P.S. It shows how sloppy other records sometimes are. Producer Steve Tyrell, and most of the rest of the crew, including Randall, did the same number on B. J. Thomas's **Longhorns & London Bridges** (Paramount PAS-1020).

Fred DeVan

Sound: A+

Performance: A

Jazz & Blues

Genealogia: Perigeo

Musicians: G. Tomasso, moog, double bass, bass guitar, vocals; F. D' Andrea, piano, electric piano; C. Fasoli, soprano sax; alto sax; T. Sidney, acoustic guitar, electric guitar; B. Biriaco, drums, Mandrake, percussion.

Songs: *Genealogia, Polaris, Torre Del Lago, Via Beato Angelico, Vino Veritas, Monti Pallidi, Grandi Spazi, Old Vienna, Sidney's Call.*

RCA TPL1-1080, Stereo, \$6.98.

If the names of the songs don't make you look twice, the music will make you do a lot more than that. Perigeo is a group of cultivated and polished musicians (a modest evaluation on my part) hailing from Italy. They've been up on the jazz scene since their college days in the late Fifties and early Sixties. Their astute knowledge of their colleagues, competition, overseas counterparts, etc. is perhaps a contributing factor to their musical superiority. The group has

been lauded by Italian critics as a "jazz rock band that is not limited by the strata of the two musically linguistic forms but researches and finds the synthesis."

Except for *Genealogia*, this is the first I've heard of this marvelous musical assembly. The music is refreshing, sparkling...and the recording is of surprising quality (for an RCA disc), serving only to enhance the performance. Franco Fayenz, who details the group's progress and achievements in the liner notes, reveals that Perigeo's aim is not to popularize, but one cannot help but mention Perigeo in the same breath as commercially successful Chick Corea and Herbie Hancock. Perigeo pursues avenues musically paralleling these two artists.

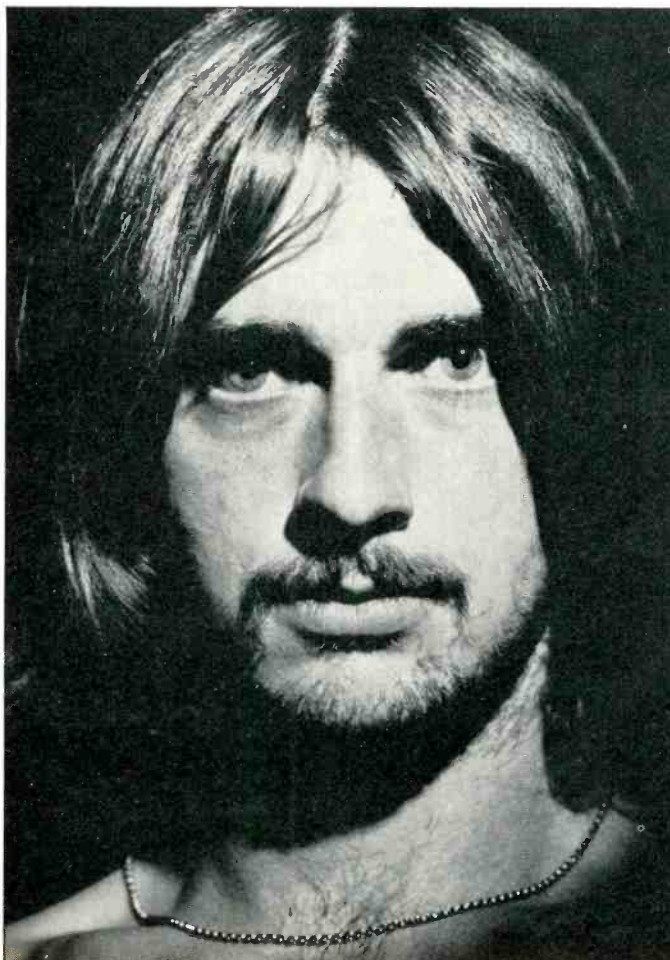
I enjoy Perigeo more than Return to Forever. You can decide for yourself. There is more variety on *Genealogia* than on any Hancock or Forever albums. Beyond variety, it's the quality

of the compositions and the way the musicians can predict and interpret one another's trends of thought.

Vino Veritas (In Wine There Is Truth) maintains a driving, challenging, galactic motion of electric guitar and keyboards. Soprano sax, bass guitar and synthesizer unisons and counterpoints are punctuated by the listening, idea-conscious, and technically competent drummer B. Bianco.

Monti Pallidi (On All the Mountain Tops Peace) is a fascinating medium tempo bossa with more rock in it than "bossa" suggests. *Grand Spazi* (Great Spaces) is so accurately titled for the feeling which it conveys, a characteristic of all Perigeo's tunes. It is a lethargic, subdued but echolike effect that follows the spacey synthesizer opening. *Old Vienna*, is a waltz of course, a jazz waltz complete with moog, electric guitar and swinging rhythm section.

Listeners who find an unresolved



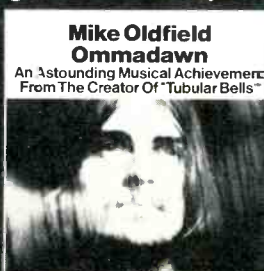
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absence of acoustic performances among most electric groups will delight in the acoustic piano improvisations with soprano sax on *Torre Del Lago* (birthplace of Puccini). The sound does, in fact, "spread a vague odor of heaven," everywhere. Also, imagine the beautiful sound of the acoustic guitar, double bass surfacing over, coming to terms with the moog on *Genealogia*—which is an energized wonder.

Perigeo's intention is to "express the urgency of a music world at one with time," that eliminates confinement or definition in one genre. "To label it jazz or rock... is secondary today. The important thing is to be convincing and this music is that!" Don't deprive yourself of this added musical perspective that exists because of Perigeo's efforts. **Genealogia** presents a sunburst of new musical feelings and experiences. Get it, now!

Eric Henry

Sound: A — Performance: A —

The Shadow Do!!: Gary Bartz

Musicians: Gary Bartz, soprano & alto saxes, synthesizer, vocals; Hubert Eaves, keyboards, synthesizer; Larry Mizell, synthesizer; Reggie Lucas, guitar; Michael Henderson, bass; Howard King, drums, synthesizer; M'tume, conga drums, percussion; Fonce Mizell, others, vocals.

Songs: *Winding Roads*; *Mother Nature*; *Love Tones*; *Gentle Smiles*; *Make Me Feel Better*; *Sea Gypsy*; *For My Baby*; *Incident*.

Prestige P-10092, stereo, \$6.98.

More pop-jazz from the Mizells (Larry and Fonce) who brought us some of Donald Byrd's most popular concoctions. The production is loaded with synthesizers, giving a big band effect at times, and vocalizing (plain and gimmicked). Bartz, who was with Miles Davis for a short while, has gradually been sliding towards this kind of fashionable mix, and only those who considered him a promising jazz talent will find it cause for concern.

Fairly pleasant, professional and lightweight stuff, geared to soul-station airplay and the disco trade. Bartz also writes lyrics, and if "She gave us you/She gave us Me/She gave us oil/And redwood trees" (from *Mother Nature*) is your cup of tea, you'll enjoy the sentiments.

Davis' sidemen Lucas, Henderson and M'tume provide rhythmic thrust, in particular the bassist.

Dan Morgenstern

Sound: B+ Performance: C

Classical Reviews

Gottschalk: Ten Characteristic Pieces for Piano. Amiram Rigai. **Musical Heritage MHS 3135**, stereo, (Mail order: 1991 Broadway, NYC 10023).

The Bicentennial in music has brought Louis Moreau Gottschalk out of New Orleans (he was born there in 1829) into current piano consciousness and in truth he was a good composer, if on the showy side, being a virtuoso pianist. He is the only one of his time, really, who merits any serious consideration for the depth and originality of his music, if you put aside the composers of memorable tunes and short items such as Stephen Foster. From today's ear viewpoint, even Gottschalk tends towards the corny now and then, and others far more so—it was the style in a new and culturally naive society! But Gottschalk has the stuff, show-off or no.

This would be an interesting and, indeed, characteristic collection, if the pianist were less bangy and hard-toned. Sorry—but I find him not very simpatico, however expert the fleet ten fingers on his hands. Gottschalk is better than this pianist makes him.

Stokowski Conducts Bach - The Great Transcriptions. London Symphony Orch. **RCA ARD1 0880**, CD-4 quadrasonic, \$6.98.

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In case you are a relative youngster, you should know that "Bach-Stokowski" is Bach for the organ, mostly, transcribed for vast modern symphony orchestra in what is best described as Wagner-Mahler style. In

those days, (the earliest transcription here was done in 1915 by the present conductor), Bach was still pretty much unknown and generally considered "mathematical"; it seemed that the

best way to bring him to the American music lover was to convert him into—well, if not Wagner, then Tchaikovsky. Which Stokowski did with bells on. Coinciding with the rise



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of classical orchestral recording, the Bach-Stokowski transcriptions were enormously popular and influential in the home environment and, in a solid sense, sparked the wider interest in classical music which has since grown a thousandfold—and has, of course, brought us Bach not only in all his diversity, but in the original music, unarranged.

The earlier, string-ier (literally) Stokowski transcriptions are by far the best, as of then and now. Imagine it—the Chaconne in D Minor for solo violin (completely unaccompanied), here played by, almost hundreds of strings, backed by brass and what have you! And such a slow tempo! Fun and games, and nice, conservative quadraphonic sound, too.

Mahler: Kindertotenlieder; Adagio from Symphony No. 10. Janet Baker; Israel, N.Y. Philharmonic, Bernstein. **Columbia MQ 33532, SQ** quadraphonic, \$7.98.

Janet Baker, Britain's current leading lady in the international singing area, does a low-keyed but lovely version of the tragic Mahler songs about the death of children, curiously reminding us of an earlier great British singer, Kathleen Ferrier, who did a recording with Bruno Walter of this very music, now available on Odyssey, Columbia's reissue label. Those who are Ferrier specialists should at once get hold of this record—if only to prove to themselves how much better their own heroine is! In contrast to Bruno Walter, Bernstein's Mahler is slower, more widely Romantic and generally less intense. Good, but not great.

The great first movement of the unfinished Tenth Symphony, the only one complete with orchestration, is turning out to be one of the big moments in Western music history (a long moment—a whole side!)—it was virtually unknown until recently, when the Symphony in toto has begun to become known in versions completed after the fact from the Mahler sketches. To my ear, the old Epic recording by Georg Szell is the ultimate, notably the long unison opening, just a single drawn-out melody. Bernstein's opening—a tough assignment, especially in the recorded medium—seems to me to flub the thing badly. Just notes. But as the movement wears on, the music picks up. The musicians begin to "take fire," and the work ends movingly as it should, with an impact like the slow movement of the Beethoven Ninth Symphony. It is on that scale of expression.

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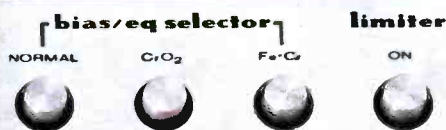
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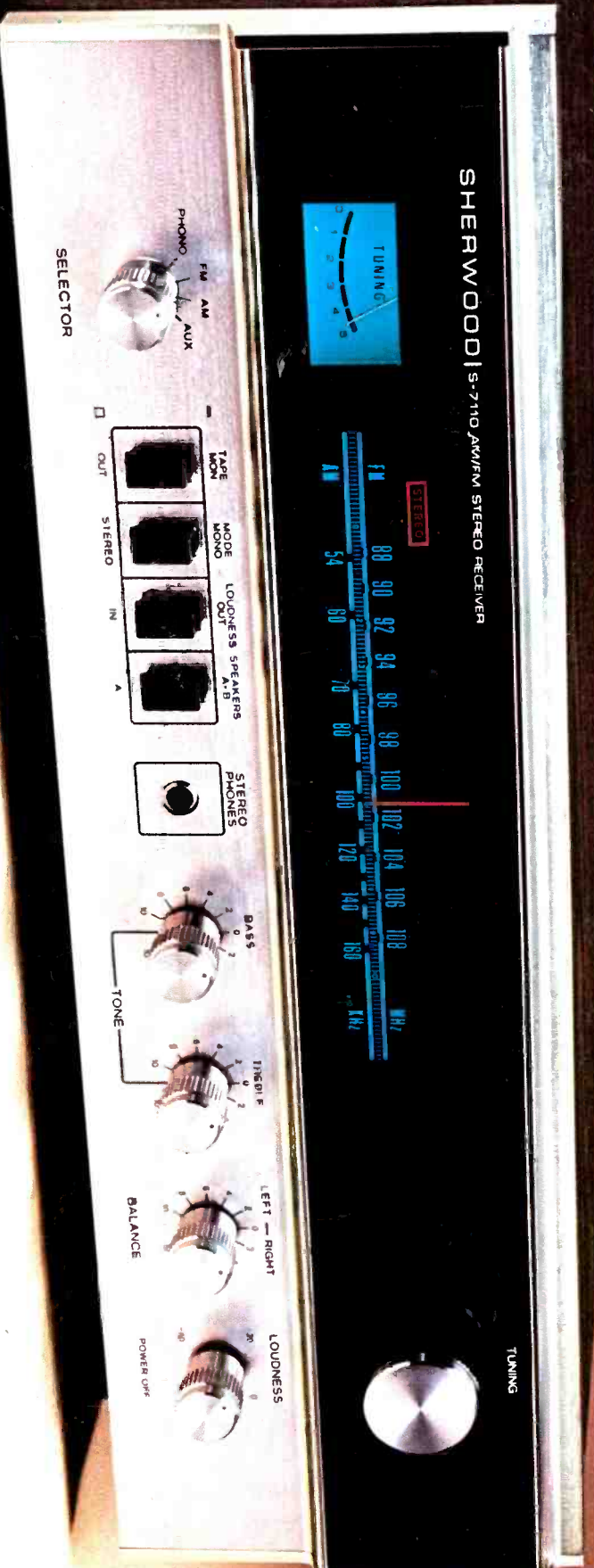
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Marantz 5220 Front Loading Deck with Dolby (Cabinet optional)

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