14 Speakers Tested

AUDIO

SEPTEMBER 1972 60¢

The Authoritative Magazine About High Fidelity

How To Build an Equalizer

ANNUAL STEREO DIRECTORY

re of everything.

Four new and completely
different AM-FM stereo receivers
with increased performance,
greater power, unsurpassed precision
and total versatility.

SX-525 AM-FM STEREO RECEIVER — 72 WATTS IHF

SX-626 AM-FM STEREO RECEIVER — 110 WATTS IHF

Pioneer has mo

SX-727 AM-FM STEREO RECEIVER — 195 WATTS IHF

SX-823 AM-FM STEREO RECEIVER — 270 WATTS IHF

Critics Agree...

You'll be reading lots about the new Pioneer receiver line in a wide variety of publications. Acclaim and enthusiasm for these receivers is evident in reviews (reprints available) now appearing in many of these publications. Here are highlights from just a few.

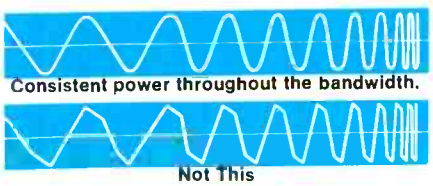
STEREO REVIEW (Hirsch-Houck Laboratories) "Pioneer's moderately priced SX-727 has a degree of operating flexibility and electrical performance previously found only in some of the most expensive receivers . . . in many areas of its measured performance it is somewhat better than much of the competition at its price level . . . stereo FM separation was among the best we have measured."

AUDIO "... (The SX-727) is a rugged reliable instrument that certainly represents state-of-the-art receiver technology in its design and performance . . . FM performance equalled or exceeded specs in just about every area . . . selectivity was excellent."

HI-FI STEREO BUYERS' GUIDE "This (SX-828) excellent performer features full power output at all frequencies . . . excellent reception of weak FM signals . . . selectivity was excellent."

Long before the current wave of consumerism, Pioneer had established its reputation for superior quality craftsmanship. This reputation has been continuously augmented by our commitment to building high fidelity components with a measurable extra margin of value. Our four new receivers — SX-828, SX-727, SX-626, SX-525 — are designed to meet a wide range of requirements and budgets. Yet each unit incorporates a significant array of features and refinements built into the top new model — the SX-828. Regardless which new Pioneer receiver you finally select, you are assured it represents the finest at its price.

Conceptual diagram



Consistent power throughout the bandwidth.

Not This

More meaningful power.

When it comes to power, each model provides the most watts for your money. This is meaningful power. Power that is consistent throughout the 20-20,000 Hz bandwidth (not just when measured at 1,000 Hz.) Especially noticeable at the low end of the spectrum with improved bass response, the overall effect is greater frequency response and low, low distortion.

Model	IHF Music Power 4 ohms	RMS @ 8 ohms Both channels driven @ 1KHz
SX-828	270 watts	60+60 watts
SX-727	195 watts	40+40 watts
SX-626	110 watts	27+27 watts
SX-525	72 watts	17+17 watts

Direct-coupled amplifier circuitry and twin power supplies improve responses.

Of course, having power to spare is important; but directing it for maximum performance is even more vital. In the SX-828 and SX-727, you will find direct-coupled circuitry in the power amplifier combined with two separate power supplies to maintain consistent high power output with positive stability. This means transient, damping and frequency responses are enhanced, while distortion is minimized. In fact, it's less than 0.5% across the 20-20,000 Hz. bandwidth.

You can't expect great music without great specifications.

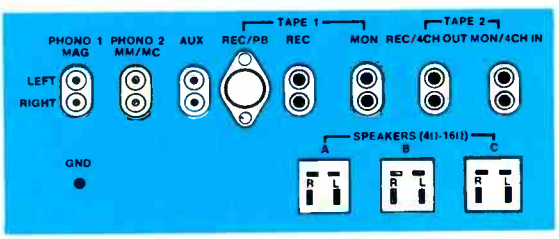
Pioneer's reputation for high performance capability is thoroughly reinforced in these four receivers. Listening to them substantiates it; the specifications tell the reasons why. Since Field Effect Transistors increase sensitivity, they're incorporated into the FM tuner section of each unit. For example, the SX-828 uses 4 FET's. You get greater selectivity and capture ratio with Integrated Circuits and Ceramic Filters in the IF stage. Here's a mini spec list.

	SX-828	SX-727	SX-626	SX-525
FM Sensitivity (IHF) (the lower the better)	1.7uV	1.8uV	2.0uV	2.2uV
Selectivity (the higher the better)	+75dB	+70dB	+70dB	+45dB
Capture Ratio (the lower the better)	1.5dB	2.0dB	2.5dB	3.0dB
Power Bandwidth	All exceed by a wide margin the usable sound frequency spectrum			

Inputs and outputs for every purpose including 4-channel sound.

Depending on your listening interests and desire to experiment in sound, each receiver provides terminals for a wide range of program sources.

Inputs:	SX-828	SX-727	SX-626	SX-525
Tape monitor	2	2	2	2
Phono	2	2	2	Phono/Mic.
Auxiliary	1	1	1	1
Microphone	2	1	1	Phono/Mic. (as above)



Outputs:	SX-828	SX-727	SX-626	SX-525
Speakers	3	3	3	2
Headsets	2	1	1	1
Tape Rec.	2	2	2	2

Someday, if you want 4-channel sound, all models have 2 inputs and 2 outputs to accommodate a unit such as Pioneer's QL-600A Decoder Amplifier. With it, and two additional speakers, perfect 4-channel sound is simply achieved.

Exclusive protector circuit for speakers.

Another example of Pioneer's advanced engineering is the automatic electronic trigger relay system designed into the SX-828 and SX-727. Since the signal is transmitted directly to the speakers because of the direct-coupled amplifier, this fail-safe circuit protects your speakers against damage and DC leakage, which can cause distortion. It also guards against short circuits in the power transistors. It's absolutely foolproof.

Versatile features increase your listening enjoyment.

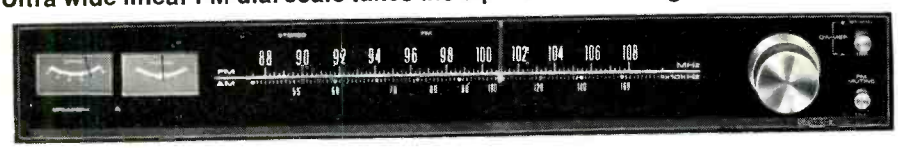
Our engineers have outdone themselves with a host of easy-to-use features. All four units include: loudness contour, FM muting, mode lights, click stop bass/treble tone controls with oversize knurled knobs, and an ultra wide linear FM dial scale that takes the squint out of tuning. Except for the SX-525, they all employ high and low filters. Enlarged signal strength meters make tuning easier than ever. Center tuning meters are included as well in the SX-828 and SX-727. Further sophistication is offered on the top two models with a 20dB audio muting switch — the perfect answer to controlling background music. As the senior member of the family, the SX-828 is endowed with speaker indicator lights (A,B,C,A+B,A+C) and a tuning dial dimmer for creating a more intimate lighting atmosphere.

Some day other stereo receivers will strive for this total combination of power, performance, features, precision and versatility. Why wait? Pioneer has more of everything *now*.

See and hear these magnificent receivers at your local Pioneer dealer. SX-828—$429.95; SX-727—$349.95; SX-626—$279.95; SX-525—$239.95 Prices include walnut cabinets.

U.S. Pioneer Electronics Corp., 178 Commerce Road, Carlstadt, New Jersey 07072

Ultra wide linear FM dial scale takes the squint out of tuning.



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AUDIO

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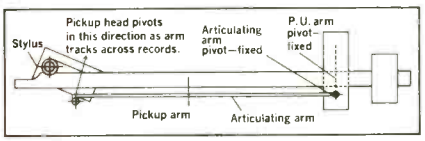
Sometimes high fidelity people lose sight of what it's all about: Sound.

The ultimate test of any piece of high fidelity equipment is what you hear.

That's why, of all the statements made by equipment reviewers about our Garrard Zero 100, the most significant were these:

"Using identical virgin records, and virgin styli in identical good cartridges, the Zero 100 on occasion sounded markedly 'crisper' than other turntables." *Rolling Stone.*

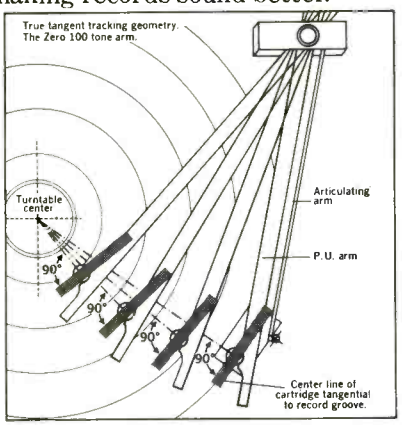
"A listening test proves to bring new life to many records, noticeably reducing distortion on the inner grooves." *Radio Electronics.*



"From about 7 in. diameter to runout, the Zero 100 delivers considerably less distortion and greater definition than with the same pickup mounted in a standard arm. The improvement in sound quality is notably impressive." *Elementary Electronics.*

"The articulated arm of the Zero 100 produced less distortion, and therefore greater definition, on high-level, musically complex passages, from the inner grooves." *Hi-Fi Stereo Buyers' Guide.*

That's what reviewers actually heard when they tested the first automatic turntable with Zero Tracking Error. This is, to our knowledge, the first time a turntable has been given credit for making records sound better.



Cartridges and other components, yes. But never a turntable — until the Zero 100.

By this time you probably know how we achieve Zero Tracking Error. The principle of the articulating arm, continually adjusting the angle of the cartridge so it is always at a 90° tangent to the grooves, is a simple one. But the ingenious engineering and the development of the precision pivots to make the principle work, took several years.

But enough from us. Let's go back to what the reviewers say about the Zero 100.

"It probably is the best arm yet offered as an integral part of an automatic player." *High Fidelity.*

"All of these features combined into one automatic turntable make news, even though some are found on other units. Only in the Zero 100 are they all put together." *Audio.*

When *Audio* talks about "all of these features" they're referring to such things as our magnetic anti-skating, variable speed control, illuminated strobe, viscous-damped cueing, 15° vertical tracking adjustment, patented Garrard Synchro-Lab synchronous motor and our exclusive two-point record support in automatic play.

But all of this gets back to our original point. It is the sound that makes the difference. After all, a $200 record player should give you a really meaningful difference. And the high fidelity experts agree that people who own a Zero 100 will hear better than people who don't.

If you'd like to read the reviews in full detail, we'll send them to you along with a complete brochure on the Zero 100 and the Garrard line. Write to: British Industries Company, Dept. I12, Westbury, N.Y. 11590.

GARRARD ZERO 100

The only automatic turntable with Zero Tracking Error.

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coming in October

AUDIO tests the leading cassette tape recorders

The Language of High Fidelity, Part V

Equipment Reviews Includes:
Revox A77 tape recorder with Dolby B
Martin Crescendo speaker system
Dynaco FM-5 tuner kit

Plus record reviews and all the regular features.

ABOUT THE COVER: Preparing the Annual Directory is a very tedious task, but the majority of our readers find it most useful. Oscar Wilde once said, "The cynic knows the price of everything and the value of nothing." Well, here are the prices *and* the specifications of a vast range of products—it will certainly help you to make a value judgment!

Audioclinic

Joseph Giovanelli

FM Receiver Overload

Q. I think that I have a problem with my receiver. I receive a number of FM stations at more than one dial location. The extra locations usually appear at some frequency where a weak station is located. I receive them both mixed together.

I wrote to the manufacturer. They sent me a new front-end assembly which did not solve the problem. I wrote again; they suggested that my problem was overloading caused by a strong, local station.

I am located about 30 miles north of Boston. I am using a good outdoor FM antenna. I do not have any strong, local stations nearby. All the stations which appear at more than one dial location originate from Boston. I wonder if what I am experiencing is normal or do I have a problem in my receiver?—Lance Boe, Methuen, Mass.

A. Because you are 30 miles from the stations which are causing your overload problem, I have to think that something is wrong with the receiver.

However, before I get into that area too much, it might be worthwhile for you to check to see if perhaps the Boston stations have their transmitters outside the city limits—**NORTH** of the city. You can see that this would mean that the stations would then be considerably closer to you than you had suspected.

Assuming that the signals are, indeed, 30 miles from you, I would not think you should have overload problems, even with a relatively good rotable antenna. Of course, if you have gone to multiple stacking and have an extremely high mast or tower, then overload is possible.

I suggest that you return your receiver to the manufacturer for a checkup, especially if it is still within the warranty period.

If your antenna is rotable, try swinging it away from the Boston area and note what happens. If the condition clears up, you can at least use the receiver. As an alternative, you can insert specially designed attenuators at the antenna terminals of your receiver. This will enable you to adjust your antenna for best reception while keeping signal strength below possible overload levels.

When stations come in together even though their frequencies are widely separated from one another, that is a sign of what is called "cross modulation." This generally does suggest some kind of overload condition. Under normal circumstances, I don't think overloading should occur.

I wonder, therefore, if AGC is supposed to be applied to the front-end of your tuner. Lack of AGC could cause this problem because without it, the front-end could be overloaded even when receiving even moderately weak stations. Check to see that proper AGC voltage appears where it's supposed to appear. If your receiver was originally a kit, check for any wiring errors which could lead to this lack of AGC. Check for splashes of solder on the foils. Check for shorted AGC bypass capacitors or resistors of improper value.

Wow and Flutter

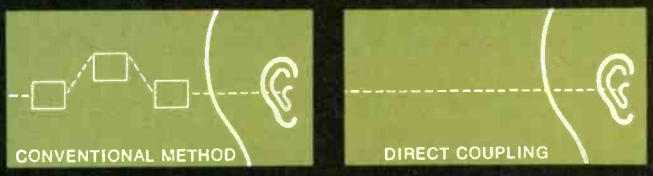
Q. What are "wow and flutter"?—Sgt. Paul Bonney, APO S. F., Cal.

A. "Wow" and "flutter" refer to speed variations which occur in tape recorders and turntables. These pieces of equipment are intended to drive the tape or disc at a constant speed, but they do not, and to the degree that they do not, there will be variations in musical pitch which are in proportion to the speed variation. If the variation is slow, it is called a "wow"; if it is fast, it is called a "flutter." These speed variations are measured in percentage which they deviate from correct speed. We would like to see variations kept to within 1 or 2 tenths of a percent and better if possible. Of course, tape machines designed for speech recording do not need the speed steadiness that is required of machines which are designed to reproduce music.

When the speed variations are extreme, there is an audible wavering of pitch, especially noticeable on sustained tones such as those produced by the piano or the clarinet. However, even when wow and flutter is below really audible levels, it can still add a quality to the sound which decreases transparency.

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

Your next receiver should have 3 things missing.



The input transformer. The output transformer. And the output capacitor. Because when you cut those three things out of a receiver, you cut down on a fourth thing. Distortion. We do it with a system called direct coupling. And Panasonic puts it in all its FM/AM/FM Stereo Receivers.

With this system the amplifier circuit is coupled directly to the speaker terminals. To improve transient response and damping. So there's less than 0.8% harmonic distortion. To help you hear only the sound of music.

The sound of the SA-6500 is really something to listen to. With a full 200 watts of power (IHF). To fill even a big room with music. And there's also a power band width of 5 to 60,000 Hz.

The SA-6500 also has two 4-pole MOS FET's. That provide 1.8μV FM sensitivity. To pull in FM stations that are too weak or too far to make it on their own. Integrated circuitry and a crystal filter improve the capture ratio. And there are low-filter, high-filter, and loudness switches. So the music comes out closer to the way it started out. And an FM linear dial scale and two tuning meters. To make the music you want just a little easier to find.

You can also find that music on the SA-6200. With 150 watts of power. Plus 2 RF stages and 6 IF stages. To provide selective station tuning. And there are PNP low-noise silicon transistors in the differential amplifier drive-stage. To give almost noise-free performance. No matter who's performing.

For less money you can still get a lot of power. From our SA-5800. With a full 100 watts. The SA-5500. With 70 watts. Or our newest receiver, the SA-5200. With 46 watts. And some of the features you'll find in our more expensive stereo receivers.

So before you get your next receiver, see your franchised Panasonic Hi-Fi dealer. He'll show you what should be missing. So you don't miss out on anything.

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Tape Guide

Herman Burstein

Multiple Recorder Hookup

Q. I am wondering whether connecting up to three tape recorders to the tape output of an amplifier would affect signal strength or quality when all three of these machines are recording? If so, can you suggest any method that would not produce a lower quality recording?—Robert L. Martindale, Arlington, Va.

A. The manner and extent in which signal quality might be affected depends on the output impedance of your amplifier and the input impedances of your tape recorders. Given a fairly low output impedance and reasonably high input impedances, there is a decent chance you might be able to drive three tape machines at once without appreciable signal deterioration. If there is signal deterioration, you can try isolating the tape machines from each other by placing suitable resistance between each machine's input and the output of the amplifier. You might try resistance values between 100,000 and 500,000 ohms. The higher the value, the more likelihood is there of significant treble loss.

Recording In Church

Q. I am going to make a tape recording of my friend's church wedding. In all of the recordings which I have listened to that were made at church ceremonies, the quality of the recording has been poor. This seems to be due to a "booming" response caused by the long distance between the microphone and the voices being recorded. I cannot move the microphones closer to the parties. Is there some way, given this limitation, in which I can get a more natural response?—Norman M. Moltar, Jr., Los Angeles, Calif.

A. A highly directional microphone—a supercardiod—may be of help. This will concentrate on sound directly from the front and will de-emphasize sounds from the side and rear, thereby helping to reduce echo. You might also use some bass attenuation and/or treble boost.

Low Voltage

Q. I have a Revox 636 tape recorder, which has plagued me for some time. The take-up reel refuses to function during recording and playback, although it functions well during rapid wind. I have taken the recorder to a local audio dealer, who adjusted the brakes twice, and have taken it to the Revox Corp. in New York several times. They say that they have tested it there for several days, that they reversed the take-up and *rewind motors, and have made a few other changes. Revox claims that it always works well there, but as soon as I bring the recorder home and put on a reel of tape, the take-up motor soon becomes sluggish and then stops. Revox also says that it would not be due to inadequate voltage since other voltages would also be affected. If I turn the take-up reel by hand, the recorder records and reproduces well.*—Joseph S. Ellison, Springfield, Mass.

A. Nothing occurs to me beyond what is already suggested in your letter, namely the possibility of a low voltage condition in your home. Have you checked your line voltage? If low voltage is indeed the cause of your problem, a suitable transformer (one that maintains output at a desired level) can be installed between the house outlet and your tape machine.

Extra Bass During Copying

Q. I own a Roberts 400X tape recorder and a Uher 20 tape recorder. When I use the 400X to copy tapes that already have over-emphasized bass, this machine further emphasizes the bass. This has happened not only when I play the tapes on my Uher, but also with a number of other tape machines used for playback. I wrote to Rheem Manufacturing about the problem and received an answer which one could interpret as a polite suggestion that I have rocks in my head. I am not crazy and I can hear. The problem is a very real one. A trip the 400X took to a local repair shop never solved anything.—M. Glen Bair, Idaho Falls, Idaho.

A. Perhaps the reason you get bass emphasis is that the 400X supplies a little too much bass—not enough to be noticeable or objectionable when copying a flat tape, but becoming so when copying a tape which itself contains too much bass. I suggest that you employ the tone controls of your audio system, if possible to adjust the bass to your liking.

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

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These 2-way, 2-speaker systems feature a heavy duty 8" bass driver, a special 3" tweeter, tube ducted port design, and superior performance with no distortion, no coloration, true pitch with zero overlap and tonal balance.

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Offer ends October 31, 1972 and is applicable only in states where not prohibited. Winning entrants will be notified by their dealer. If winning entrant has already purchased any Fairfax Speaker during this demonstration offer he will receive a refund from his dealer up to the value of the FX-100A.

Check No. 7 on Reader Service Card

Behind The Scenes

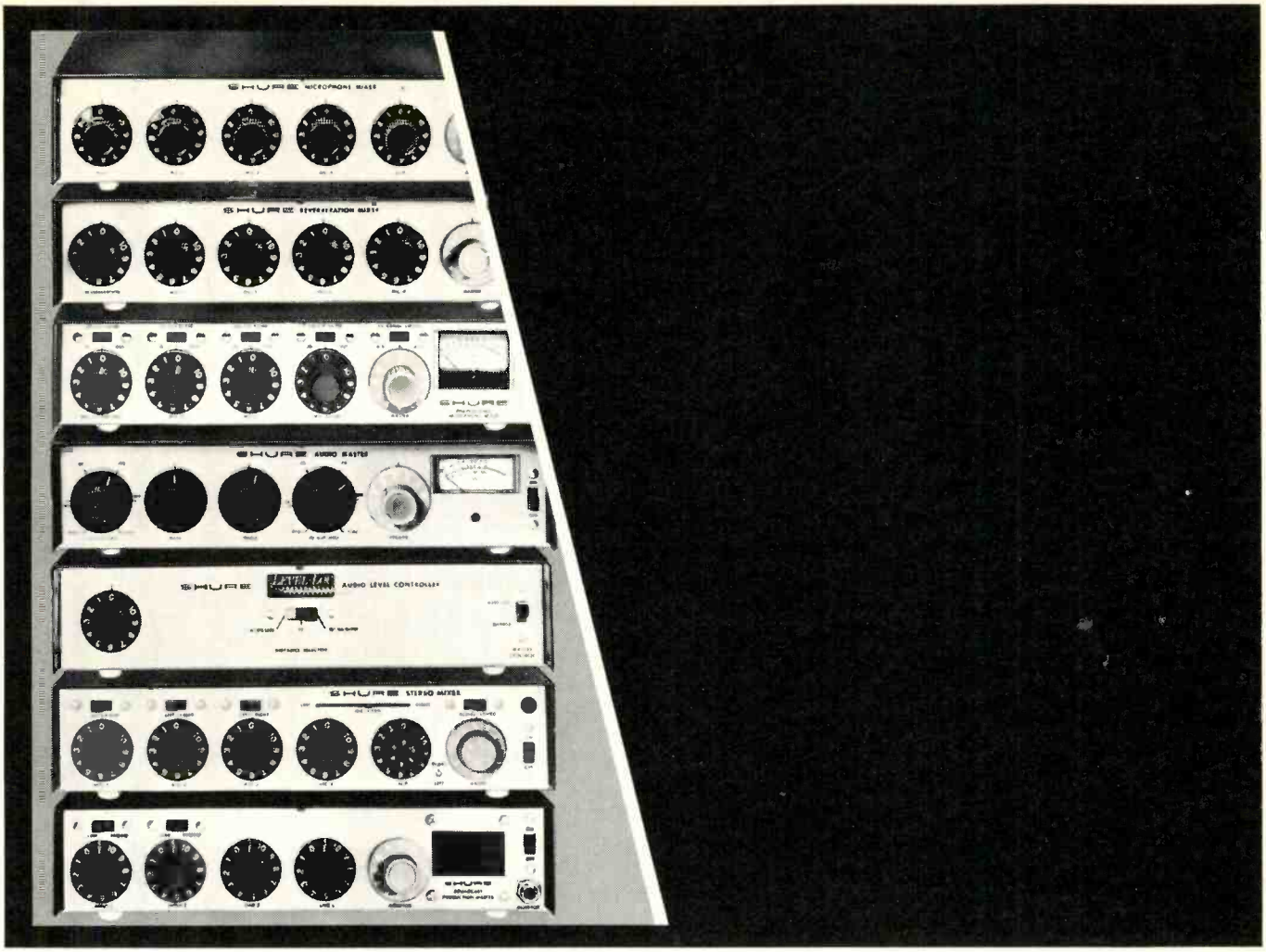
Bert Whyte

THE MIDWEST Acoustic Conference in Chicago, the Consumer Electronics Show also in Chicago and the Brigham Young Univ. Audio Seminar in Provo, Utah, have been duly attended and your peripatetic reporter is home from the quadraphonic wars, weary, but hopefully wiser. I am looking forward to a few weeks of R and R before my batman packs my kit and I return to the front lines at the Electron Show at the Royal York in Toronto late in August, followed by the AES convention and IHF show in September in New York.

When one attends these various affairs, one naturally pays attention to the business for which these meetings were convened. However, it must be noted that there are many peripheral activities at these affairs . . . mini-meetings . . . demonstrations in private hotel suites . . . perhaps just a casual chat in a corridor, or a drink and some "off-the-cuff" revelations from a panelist or exhibitor. Quite often the information garnered is as significant as the main business of the convention. It all adds up to a tremendous program input to that computer between one's ears, and one hopes that the "memory cores" will ultimately permit a reasonable assessment and evaluation of all that welter of information! Needless to say, at these meetings there were many matters of interest to a very broad spectrum of the audio community, and it is unfortunate that space will not allow detailed coverage. The term "highlights" has a certain stigma attached to it in these days of predigested, packaged information, so you will have to forgive the use of this expedient. Herewith is my report on a few of the significant developments stemming from the aforementioned meetings.

It is fairly common knowledge among regular readers of this column that I am a hard-core, uncompromising devotee of open-reel recording. For several years I have been advocating the production of Dolby B open-reel recorded tapes, with Ampex Stereo Tapes the target of my unrelenting diatribes. Ampex was chosen for this assault on the purely logical grounds that they were the largest producers of recorded tapes in all formats, the record companies who were their licensers could furnish Dolby A copy masters, and since Ampex was producing Dolby B cassettes, they had all the necessary equipment for the production of open-reel recorded tapes with Dolby B noise reduction. All it really took to start the ball rolling was an executive decision. You will recall that some months ago I gave you the name and address of the general manager of Ampex Stereo Tapes and urged you to write him, expressing your desire for Dolby open-reel tapes. During this same period my friend Larry Zide, editor of dB Magazine, was making himself equally pestiferous to Ampex anent Dolby open-reel tapes. I know from copies of letters I have seen and by reports from Ampex that quite a few readers did indeed write and give Ampex the "needle"! Well, friends, between my prodding and Larry Zide's pushing and your letters . . . would you believe that just before I left New York for the CES in Chicago I received a phone call from Mike Ayers, Ampex Stereo Tapes' personable and efficient PR man in New York? Mike said, "Okay, you and Larry win . . .drop around to the AST booth at the CES, and we'll have a present for you." Yup, you guessed it . . . lo and behold, Larry and I were given a special Dolby B open-reel demonstration tape! By gad, for once, being a pain in the you-know-what, paid off!

I was delighted to receive the tape of course, but was unprepared and surprised by the music on the tape. The unexpected bonus was that the program material was from the Deutsche Grammophon catalog. Those of us on the "inside" knew that all the Boston Symphony recordings made since DGG took over the orchestra from RCA were produced with Dolby A and in four-channel stereo to boot (in fact, I have heard part of the DGG quadraphonic "1812 Overture"). However, we also knew that back at home base in Hamburg, DGG just sat on the Dolby quadraphonic tapes. To my knowledge, not even the regular disc production was cut from the Dolby A master, but most likely from an expanded normal copy. By nature a very conservative record company, DGG was undoubtedly waiting for these new concepts to become more firmly established before they released any material. In any case, kudos to the persuasive, golden-tongued Ampex man who talked DGG into furnishing them with Dolby A copymasters. The music on the tape that was given to me consists of the opening "Mars" movement of Gustav Holst's *Planets*, conducted by William Steinberg, and the third movement of Walter Piston's *Symphony # 2*, conducted by young Michael Tilson



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Thomas. What did it sound like? Just plain sensational! It is astonishing how much cleaner the overall sound is with the Dolby processing. Complex orchestral textures become much more transparent, every note is clearly delineated. It must be said that the music could have been more carefully chosen to demonstrate the efficiency of the Dolby B system. There are many high level passages in the "Mars" piece and quite a few in the Piston *2nd,* in which, of course, the Dolby is inoperative, the circuit at that level acting as a unity gain amplifier. However there are sufficient low level passages as well as rests in the scores, which are heard blessedly free of tape hiss. I have played this tape for quite a few friends who not only lavished praise on it for its high quality, but who were excited by the implications of this tape. Ampex can draw on the Dolby master resources of such companies as London/Decca, Vanguard, and now DGG, and I am very pleased that Ampex has asked me to furnish them with a list of works from their catalogs that would be suitable for production as Dolby B open-reel tapes. If all goes according to plan, you should be able to buy open-reel Dolby B tapes by early fall of this year. I should point out that the tape played back equally well on a Revox A77 with built-in Dolby, and on Ampex and Astrocom tape decks with Dolby add-on units. With the imminent emergence of Dolby open-reel tapes, it is timely that the first pre-production samples of the Signetics IC Dolby B chip are being delivered to Dolby licensees. With such other manufacturers as Fairchild and Texas Instruments and possibly Motorola eventually entering into production of the Dolby IC chip, the price is expected to reach levels as low as $3.00 per unit and perhaps even less. This paves the way for really low cost Dolby B playback-only units, which would work right in with the new Ampex tapes, as well as the quadraphonic open-reel tapes with "fore and aft" Dolby B noise reduction, announced recently by Vanguard.

As you may know, the sale of open-reel tape decks, especially the higher-priced units above $300.00, has been showing modest but steady increase for the past several years. Sad to relate, open-reel recorded tapes have experienced declining sales. Without question the biggest reason has been the curse of tape hiss. I've said it before and I'll say it again . . . the rebirth of the open-reel format when the Dolby B tapes become available will startle the hi-fi industry and prove once and for all the vitality of this format.

At the CES, far from the madding crowds at McCormick Place, Advent was set up in a hotel suite, demonstrating the first fruits of a project announced many months ago . . . to wit, the production of high quality recorded cassettes. Unfortunately, I didn't get a chance to attend the demonstrations, but I had several pairs of surrogate ears, for which I have a high regard, who were there and they were most impressed and enthusiastic about the Advent cassettes. What Advent has done is to arrange to use the Dolby A masters from the Nonesuch Records catalog, which is fairly comprehensive and encompasses both standard classical works and a good bit of esoterica. Many of the Nonesuch tapes are of superb quality, having been recorded by Marc Aubort, former vice-president of Dolby Laboratories in the U.S. and a top recordists in the classical field with that rare combination of technical expertise and knowledge of music. Having at least partially solved the problem of high quality source material, Advent proceeded to duplicate their recorded cassettes on chromium dioxide tape at a speed ratio of four to one. This ratio is a far cry from the

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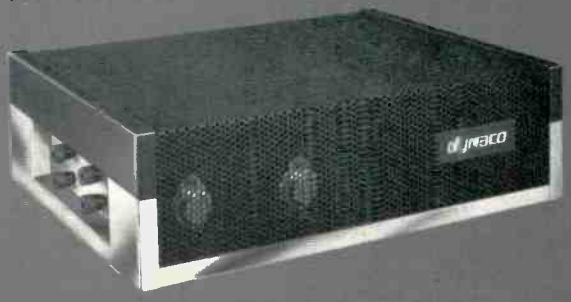

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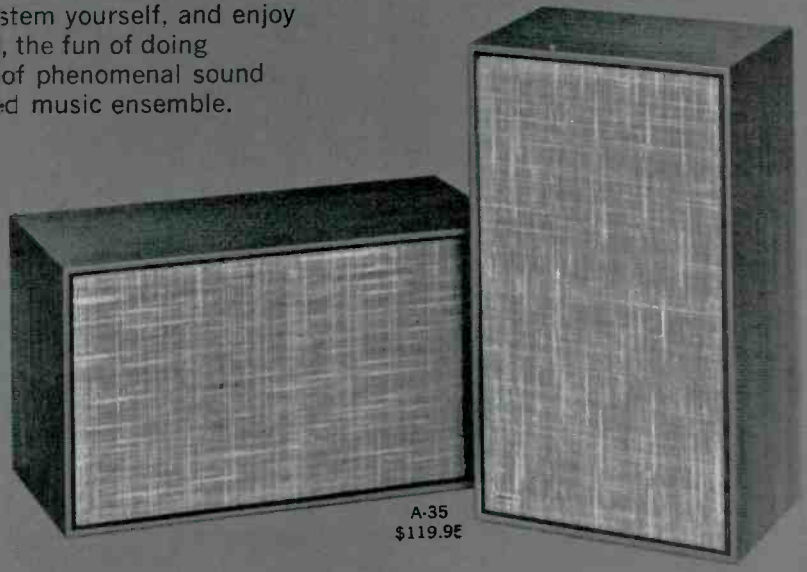

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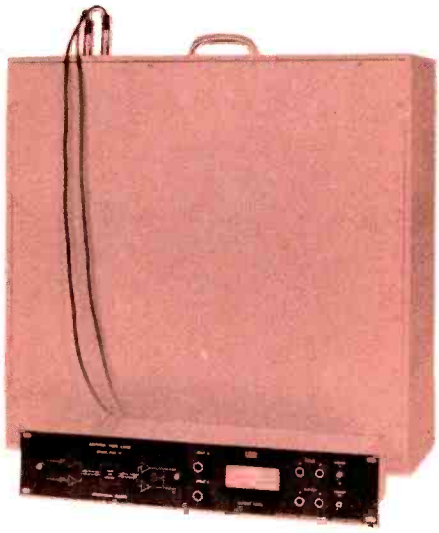
usual 32-to-1 speed of regular commercial cassette duplication. We know from considerable experience that it is possible to make outstandingly good recorded cassettes on chromium dioxide tape at a one-to-one ratio. A four-to-one ratio would seem to be the minimum duping speed that could be used commensurate with modest production quantities. Naturally, overall production would depend on how many slave units were in operation. My informants tell me the sound on these new Advent cassettes was exceptionally clean and not only markedly free of tape hiss, but with little evidence of drop-outs or modulation noise. If the high quality can be maintained consistently, Advent has advanced the case for the cassette considerably. It is to be hoped that their effort is supported and that they gain access to other high quality masters. I for one am looking forward to auditioning these exciting new cassettes.

Interesting aspects of the Midwest Acoustic Conference and the Brigham Young Univ. Audio Seminar were the demonstrations and lectures given by Bill Putnam of United Recording. Bill not only outlined the uses of time delay in pop studio recording via his Cooper Time Cube unit, but expounded on a refreshing new pop recording philosophy. Bill certainly qualifies as among the top half-dozen mixing engineers in the country, and in his lectures he commented on the strictures and limitations of present day pop recording practises. He pointed out that no matter how clever and even innovative most engineers are in their pop mixing, the end result is the inevitable two-channel or four-channel monophonic recording rather than stereo recording in its classical definition. The desires of the pop record producer (and what the producer thinks the public ought to have in terms of sound quality) is a factor of course and unquestionably is largely responsible for a large degree of the inflexible, circumscribed approach to pop recording in the studios. Bill showed that with the Haas Effect working for an engineer who uses time delay in conjunction with typical reverb devices (such as the EMT plates), you get a sort of "something for nothing" enhancement of perspective. The resultant sound has an open, spacious quality more akin to that obtained in a large hall, yet loses little of the "close-up" sense of "presence" considered so vital in pop recording. I don't think Bill is expecting to create an overnight change in recording techniques. The important thing is that there are some new tools available to engineers; there are some alternatives to current studio practices that seem to have considerable potential for the creation of exciting new sounds.



As I certainly don't have to remind you, nothing has been resolved in the battle of the matrixes or matrix versus CD-4 discrete disc. One thing was notable at these recent shows I attended as regards quadraphonic sound. Even among some staunch matrix disc supporters there was a definite "ground swell" for the idea of the combined discrete/matrix disc mentioned some months ago by Ed Canby and Len Feldman. Engineers with impressive credentials have said that this combo disc should not present any particular technical problems, and that the whole thing was really more of a matter of the contending forces sitting down at the peace talk and working out the details. Well, could be, fellas, but I have just been told by the CD-4 camp that while there is merit in the idea, there are some very formidable technical problems in cutting and encoding such a disc, which would take at least a year to resolve. They also contend that with so much information crammed onto the walls of the record groove, some compromises in quality would be necessary, and they would be most unhappy to undertake such a degradation of their system. Now, don't go raising your eyebrow at me! I'm just telling you what the man said.

One last item this month. At the Brigham Young seminar there was a gentleman, who had traveled all the way from Canada at obviously considerable expense, who stated he was attending the seminar because thus far he thought quadraphonic was a big nothing . . . he was singularly unimpressed by its supposed virtues . . . and he wanted to be shown he was wrong. I don't know whether the seminar made him a true believer or not, but it points up the fact that here was a man who, prior to his attending the seminar, had obviously never had a proper demonstration of four-channel stereo. One can almost guarantee that the demonstrations he heard were not conducted in his home. This is central to the whole proposition of quadraphonic sound . . . demonstrations in the average audio salon and certainly in the oversized rooms used for meetings and demonstrations by various technical societies cannot be compared to the quadraphonic experience in the home. It is a serious obstacle to the propagation of quadraphonic sound and some sort of "loaner" equipment scheme worked out by the retailers would seem to have a high priority.

Bernstein in SQ

The new Bernstein Mass has certainly inspired some mixed feelings among the critics. I myself find this work to be a curious mixture of grandeur and utter banalities which is completely fascinating. It has a touch of Mahler and Poulenc with more than a hint of West Side Story padded out with moronic pseudo-Rock trivia. But the sound itself and the dramatic use of quadraphonics in the CBS SQ record is simply superb. The listener is really engulfed in sound with the variously placed choral groups, vocalists, and instrumentalists making a stunning impact, It shows what can be achieved with this new medium besides having instruments playing in all four corners.

George W. Tillett

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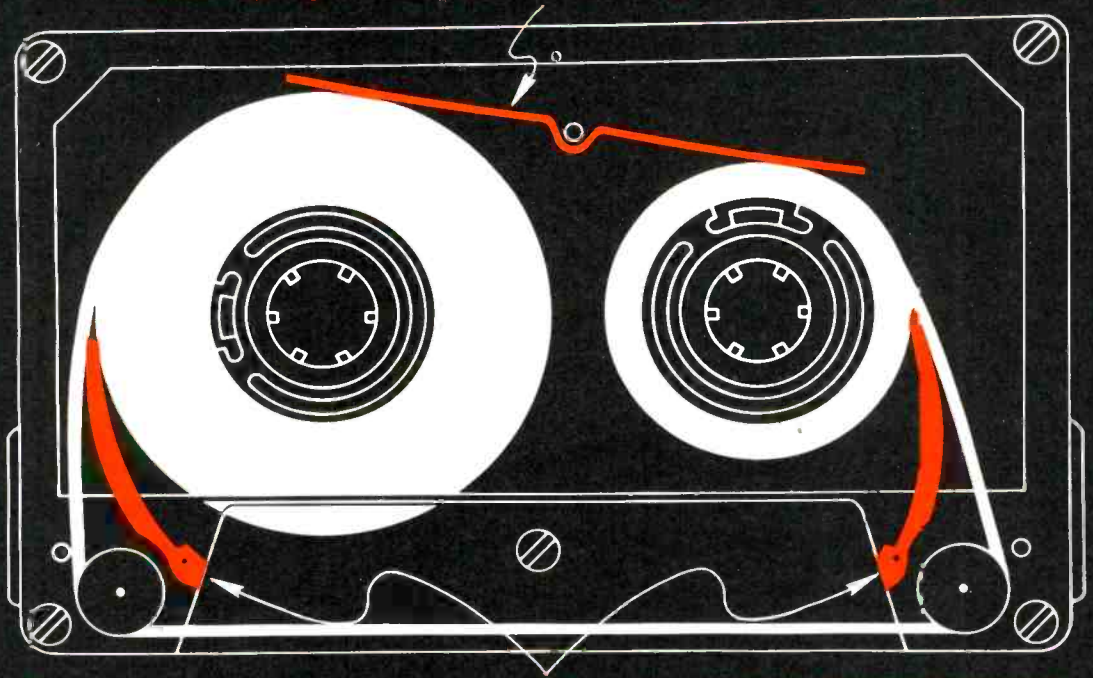

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TAPE COMPETITION

THIS MONTH the first prize of $50.00 goes to *Robert Austin* of New York for his recording of a concert given in the Riverside Church. Organist was Frederick Swan and the singer was Robert Cummings and among the works played in this *Abendmusikalien* were *Three Sonatas for Organ and Strings* by Mozart and Dupre's *Variations on a Noel.* The recorder was an Ampex 960 and two Shure mics were set up about 25 ft. apart facing the soloists who were on a platform in the center of the 85-ft. long chapel. Robert says there was no chance to make proper tests before the concert but nevertheless results were very good indeed with a nice balance and excellent organ tone.

Second prize of $25.00 goes to *S. Woythaler* of Newport, R.I., for a magnificent recording of the Univ. of Rhode Island Wind Ensemble. Works included *Rhapsodality Band* conducted by Arthur Custer, the composer, and Vincent Perichetti's *Celebrations*—also conducted by the composer and sung by the R.I. Univ. Chorus. Quality was excellent with good dynamic range and plenty of "bite" in the brass. Recorder was a Revox A-77 and mikes were two Syncron AU-7a condenser types which were placed on a boom 8-ft. high and 15-ft. in front of the orchestra. A TEAC A-1200 was used for dubbing.

Consolation prizes of Maxell or BASF low-noise tapes will be sent to the following (among others too numerous to list):

Robert Florian of Brookfield, Ill., for an interesting mèlange of Joan Baez, the Fifth Dimension, and various political speeches. Unfortunately no details of the equipment used are given.

If there were a prize for originality, it would certainly go to *Mortimer Goldberg* of Tappan, New York, for his two tapes—*Symphony of the Birds* and *Hear the Animals Sing.* The first was made by recording real birds and then reducing the recording speed to as slow as one-eighth normal, thus lowering the pitch. Portions of the calls were then excerpted and mixed to compose the symphony. *Hear the Animals Sing* was made in a similar manner and a commentary dubbed in. The *piece de resistance* of this "Animal Farm" is a young boy leading the animals in a version of *Old MacDonald Had a Farm.* Incredible! The least we can do is to send Mortimer two tapes. Maybe he will come up with a *Zoological Concerto* one day. . . .

Richard Price of Westland, Mich., sent in a recording of the Westland Symphony Orchestra and Rackham Choir made in Detroit's Orchestra Hall. This particular hall had not been used for 20 years (Mercury made some of their early recordings of the Detroit Symphony there). Some months ago, it was sold to Gino's but the local community managed to buy it back and eventually they hope to raise funds to refurnish it. Richard says that some of the background noises were due to water dripping on the stage and to pigeons flying above! (A pity Mr. Goldberg wasn't there.) Equipment used was a Revox A-77 (15 ips), another for dubbing at 7½ ips, a Gately Pro-Kit SM-6, an Advent 100 Dolby unit, two Sony ECM-22P mics. Sound is clean with good presence and the works performed included Negro spirituals, Stravinsky's *Pater Noster,* and choruses from Handel's *Messiah.* Also in the program were Rod's Little Acre trio with selections from Brubeck. Unfortunately, these items were not recorded as the temporary electric wiring would not carry the power for their amplifiers as well as Richard's equipment and so Richard had to defer to popular opinion in the hall and switch off!

Composition for Synthesizer #8 was the title of a tape sent by *Stephen Blair* of Newburyport, Mass. It was composed on a Moog and the recorder was a Revox 1102 HS and the tape was transferred to a Sony TC 355 via an Advent 101 Dolby unit. Some interesting effects, well recorded.

James K. Jobson of Atlanta, Ga., was a winner in June, so it probably would not be fair to award him another prize—although this second tape is certainly as good as the first. It is a recording of *L'Infant Prodige* by Debussy and this work involves three singers and a piano. The recorder was a Crown CX-822 and two Turner 500 mics were used for the piano while two AKG D-119 ES mics were used on booms for the three singers. A baffle was placed between the piano and the singers to produce the required balance. Piano tone was excellent and the stereo image most convincing.

Frank Ruhl of Fairfield, Ohio, used a TEAC TCA-42 recorder, a Sony MX-12 mixer plus a Shure RM-70 unit to record five songs—all originals. Stereo image was exceptionally good with lead guitar on the left, vocalist at the left of center, drums and bass next, and then a steel guitar at extreme right. The most successful number was *Diggin' More Coal* with a sewer drain and a knife used to give the effect of picking at the coal face!

The next tape came from Canada—Bon View, Ontario—and it was sent in by *John Woodward* who recorded a singing group called "Sing-Out West-End." These are all high school or college students who, John says, "travel around singing for their supper." Recorder was a Revox A-77, mics were Sony ECM-22's with E-V dynamics. Shure and Switchcraft mixers were employed together with an Advent 100 Dolby unit.

Tom Porett of Philadelphia sent in a most interesting tape recording of the famous local Mummer's Parade, complete with interviews and crowd effects—all skillfully put together. Tom used a Nagra IV and a Norelco Carrycorder, a Revox HS-77, and an Advent FBC unit.

The next tape was made in Mexico—at the Hotel El Ejecutivo in Mexico City to be precise. It was made by *Lee Price* of Coral City, Fla., and Lee recorded a stage performance by The Cabelleros—who were in pretty good form, no doubt fortified by generous helping of tequilla. The recorder was a Nagra III and Lee says that one Louis Castenada held the E-V 635 microphone—which was mounted on a pole!

The competition was closed at the end of June but there are still 60 tapes left (including some at 15 ips). These will be divided into two groups of 30 and winners announced in our October and November issues. Æ

Recently a number of influential publications have said some very nice things about our loudspeakers. And we're most grateful. But reviews—even good ones—don't tell the whole story. Stated simply, the only way to judge a loudspeaker is to hear it. Pictured here are four of our best selling models. To the far left, our extraordinary little Thirty-Two ($47.50†). Next, the very popular Seventeen ($74.95†). Up front, the classic Six ($134.00†). And finally, the spectacular Five ($189.95†). If you really want to know what KLH is all about, we suggest you listen to any one or all of these fine loudspeakers. And when you do, we're sure you'll agree that KLH delivers everything the reviews promised—and then some.

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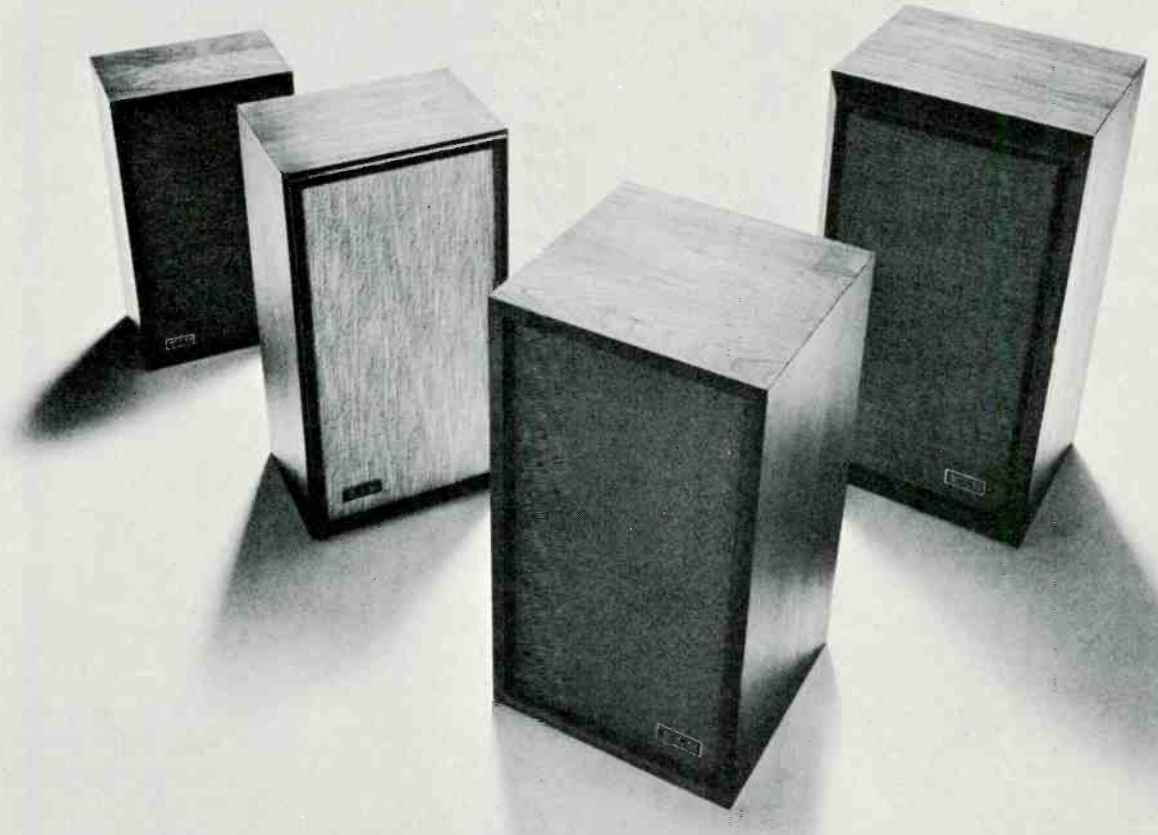

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Editor's Review

THIS ISSUE is our Annual Directory number and more than 40 pages list the specifications of amplifiers, receivers, loudspeakers, and other components. Even so, the list is far from complete—some manufacturers do not like to give us details of new products until they are on the market, others, such as McIntosh, do not want to be listed for reasons of their own, and then there is always the problem of space. I would like to emphasize once again that the figures given are supplied by the manufacturers themselves and are not the results of our tests.

Please note that we had originally intended to include a five-page section on microphones in this issue, but it was cancelled at the last moment because of the space considerations mentioned above. This directory will appear in the December issue, together with articles on microphone use.

Small speaker systems are reviewed in this issue, and comments on this comparison method of evaluation will be welcomed. Our equipment reviews are generally recognised throughout the world as being absoultely impartial and strictly factual. They are carried out with great care by highly qualified engineers with many years experience. We make many criticisms and occasionally our reports disclose discrepancies between manufacturer's claims and the hard facts, but even so, we are sometimes asked why we do not print really bad reviews—real stinkers. Well, we *do* get bad products and we tell the makers so. Usually the design is modified or the product withdrawn from the market. Loudspeakers cause most of the trouble, as it seems that anyone who knows a dynamic speaker has a magnet and a voice coil feels competent enough to put two or three in a cabinet and thereby hope to make a fortune. Time and time again, I have attended demonstrations where such speakers have been confidently compared with KLH, AR or other well-known systems with spectacular results. Sometimes the level controls have been turned down on the competitor's speakers but more often than not the New System using Special Phase Compensated Crossovers or New Acoustic Principles turns out to have a nasty bass resonance or a whopping great peak in the upper mid-range—or both . . . So really, there is no sense in wasting the time and space on them—even if we do lose some advertising.

Among the products now being tested are the following: Phase Linear 400 amplifier, Sherwood 7100 receiver, Harman-Kardon Citation 14 Dolby tuner, Revox A77 Dolby recorder, Sony 2000F preamp, TEAC TCA-42 and 3340 recorders, and Scott 433 tuner and 477 receiver. Loudspeakers include the Infinity 1001, Scott Design 51, Eastman/Martin Crescendo, ESS VII, Design Acoustics, Jensen 4, AR LST, Fairfax FTA-2, Empire 7500, Rogersound RSL 28, EPI 201A, small Advent, and SAE Mk 12.

New York Hi-Fi Show

The next IHF Hi-Fi Show will take place in the New York Statler-Hilton from September 28th to October 1st. Times of admission are 4:00 to 10:00 p.m. on Thursday and Friday, 2:00 to 10:00 p.m. on Saturday and 12:00 noon to 7:00 p.m. on Sunday.

A.E.S. Convention

This year, the A.E.S. Convention will be held at the New York Waldorf-Astoria Hotel and it looks as if Vanguard's John Woram will be a very busy man. On Tuesday, he will be chairing the quadraphonic sessions when papers dealing with several aspects will be presented, and later in the day, at 7:30 p.m. to be exact, he will be the chairman of a general meeting. Panelists have not yet been announced, but John tells me that a number of subjects will be discussed.

Suspension Acoustique

Eurythmics is the term generally used to describe "harmonic bodily exercise with music," but a French company, Audax, uses the term to describe their speaker systems. Come to think of it, the term is not *that* inappropriate as these musical exercises are usually suffered by pregnant ladies and the French word for pregnant and speaker enclosures is the same, *enceinte*. A disturbing thought. *G.W.T.*

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CONSTRUCTING A ROOM EQUALIZER

Dick Crawford

A ROOM EQUALIZER is to a loudspeaker what makeup is to a woman: it can change the character, the mood, the color. I'm going to discuss some of the characteristics of good room equalizers, and then show a circuit that can be used as a room equalizer, or, if you prefer, as an electronic crossover network, or both.

What exactly is a room equalizer? To my mind it is a sophisticated tone control. I say sophisticated because a room equalizer has many separate frequency bands rather than just bass and treble. This gives it the ability to correct for loudspeaker or room characteristics more exactly. For example, if a room is unusually resonant at a certain frequency, then the resonance can be corrected by the equalizer without seriously affecting other frequencies.

A room equalizer has filters that separate the audio signal into frequency bands, and then attenuators which set the gain in each of these bands. Next the output of each band is combined with all the other bands to reconstitute the audio signal, now equalized. One obvious way to make an electronic crossover would be to combine only the lower frequency bands to create the woofer channel; another group of bands would form the midrange, and the final set of bands would go to the tweeter. Such an arrangement would give the advantages of a room equalizer and an electronic crossover network. More of this later, let's now turn to the criteria of a good room equalizer.

1. *Flat frequency response.* If the equalizer is set "flat," that is, no equalization, then its frequency response should be just that. This is difficult to achieve in most room equalizer designs because it requires excellent matching of the reactive components in the filter for each band. The normal 10% tolerance on electronic parts is too much for such matching.

2. *Sharp cutoff at band edges.* The filter should cutoff at 12 decibels per octave or more so that adjusting one band won't significantly affect adjacent bands.

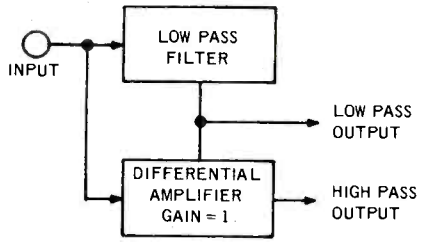


Fig. 1—Supplementary filter.

3. *Sufficient bands.* Obviously the more bands, the greater the flexibility, but too many bands and adjustment becomes difficult. Keep in mind that we are correcting for characteristics that we hope are relatively broadband. I chose octave bandwidths as being a reasonable compromise between complexity and versatility.

4. *Calibration.* It seems desirable to me that the gain adjustment for each band should be calibrated so that the user knows what equalization he is using.

5. *Distortion.* The room equalizer should not add appreciable distortion to the signal at any setting of the controls. This applies to hum and noise also.

How do we design a room equalizer to meet these goals? I used a clever technique suggested to me by Bernard M. Oliver and shown in Fig. 1. Start with a suitable low-pass filter. Then you subtract the output of the low-pass filter from the original input signal. The subtracted signal behaves as if it had gone through a high-pass filter. Simple. But you have to be careful in the design of the low-pass filter in order to get a symmetrical response, that is, one in which both the low-pass and the high-pass attenuations are of similar slope in decibels per octave. Dr. Oliver also figured this out, and Fig. 2 shows some of the theoretically possible characteristics for different transfer functions.

One characteristic of this class of filter (at least as so far developed) is the peaking in the vicinity of crossover. Indeed, these peaks are necessary when dealing with filters of greater than nine decibels per octave slope. This is because of the phase shift in each filter, leading to signals that partially oppose at crossover. Without the peaks there would be a dip in the response at crossover. This is one reason why careful crossover design is necessary with conventional crossover networks to avoid interference dips in the response.

As the reader can see from Fig. 2, the difficulty with the higher order filters is that the peak response near

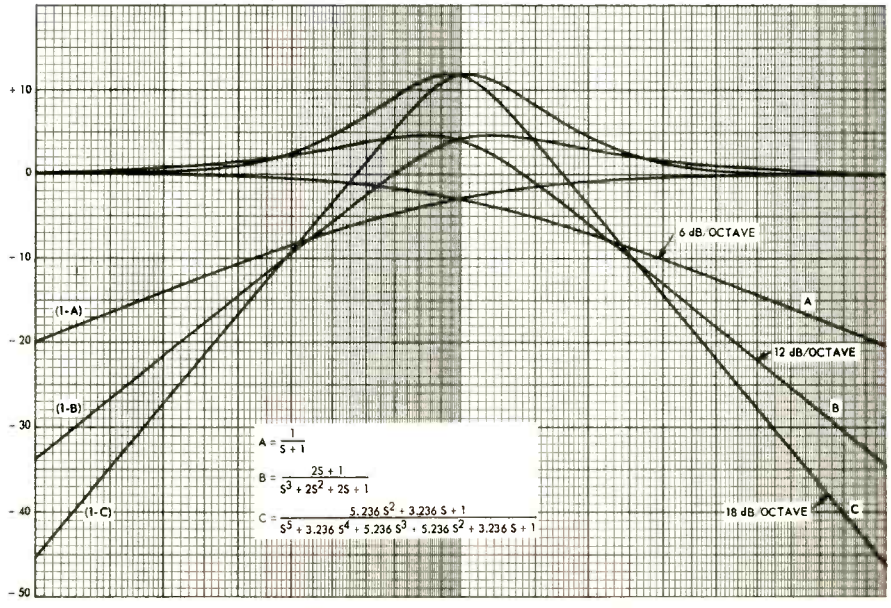


Fig. 2—Responses of supplementary filters.

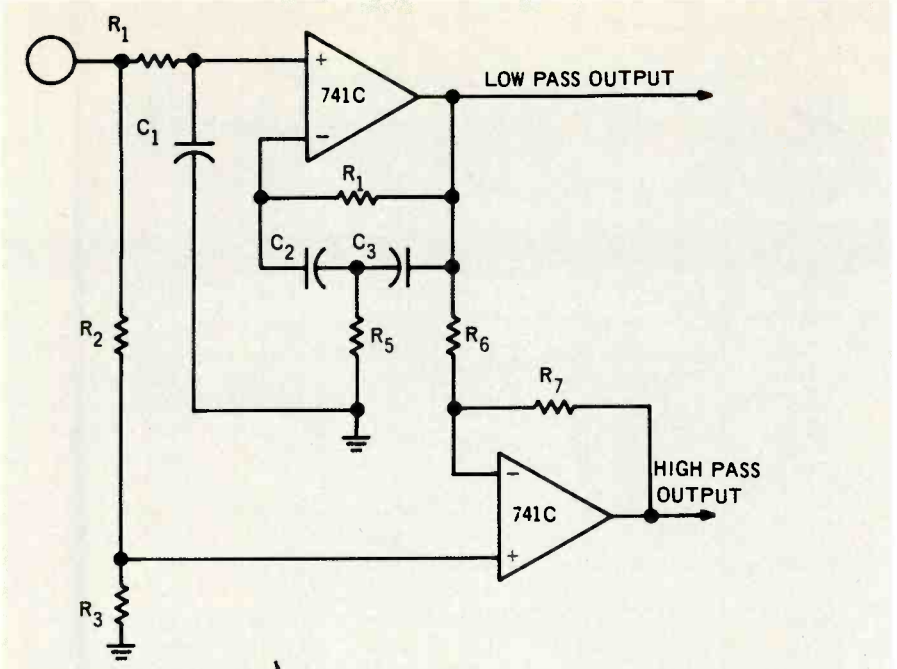


Fig. 3—Circuit diagram of supplementary filter.

crossover grows inordinately. I chose the 12 decibel per octave case. It is possible to synthesize the transfer functions shown in Fig. 2 exactly, and the results are very close to those predicted. A cheaper and simpler method is to approximate the desired low pass with the circuit of Fig. 3.

Incidentally, there may be some confusion as to where the crossover frequency is located. If we adopt the conventional –3 decibel point, then we have different crossover frequencies for the low and high pass sections of the same filter! I hope the reader won't object if I define the crossover frequency as that point where the response of the high pass section crosses over the response of the low pass section even though the response of both of these is greater there than it is in the midband of either section.

Figure 4 shows how the basic circuit of Fig. 3 is repeated and connected to form a nine-band equalizer. The circuit is shown only for a single channel, but for stereo can be simply repeated. Notice that the bandpass sections are created by taking the difference between two low-pass sections. Likewise the high frequency cutoff of band 8 (4-8 kHz) also creates the low frequency of band 9 (8 kHz). There is no high frequency cutoff for band 9, other than what is the natural limit of the amplifiers used, so band 9 is assymmetrical. If the reader wants a rapid cutoff at 20 kHz and 20 kHz, then he can substitute the circuit of Fig. 5 for the portion of Fig. 4 within the dotted lines. The 20 kHz cutoff allows boosting the bass without suffering from infrasonic interference such as turntable rumble. The 741C operational amplifiers can be Texas Instruments SN72741P, Fairchild U9T7741393, RCA CA3741CT or any other 741C you may happen to like. There are 30 of these operational amplifiers used in this design and at this quantity the price varies from $1.04 to $1.50 depending on the source. I did not show all the power supply wiring in order to simplify Fig. 4, but, as you might imagine, the plus 15 volts is connected to pin 7 and the minus 15 volts to pin 4 of all the 741C's.

The output of each band is brought to a front panel connector in the unit I built, as this might be useful for some forms of experimentation or analysis.

Notice that each band of the room equalizer has its own attenuator. The schematic of the attenuator is shown in Fig. 6 along with the power supply. The values shown for the attenuator resistors result in 3 decibel steps, for a possible boost of 15 decibels or a cut of 18 decibels in each band. If you use 1% resistors the attenuator will be within about 0.25 decibels accuracy. 5% resistors will give at worst about 1 decibel accuracy, and 10% resistors about 2 decibels.

The power supply, shown in Fig. 6, is a simple design which can easily supply the 60 milliamperes required for a single channel. Note that for stereo, heat sinks (fan top radiators or the like) should be placed on the two transistors in the power supply.

Returning to Fig. 4, we see that the values for the components used in the low-pass filter sections are shown in a table. One advantage of this design is the convenient and non-critical values of these components. There are many resistors in Fig. 4 that are unmarked, and these, as noted, are all 10 kilohms, 1%. 2% resistors may be used here, but then the selectivity of the filter sections may be degraded in the –30 to –40 decibel region. The outputs of the three lower bands are combined in the summing amplifiers to give an electronic crossover for a woofer. The three middle octaves likewise yield a mid-

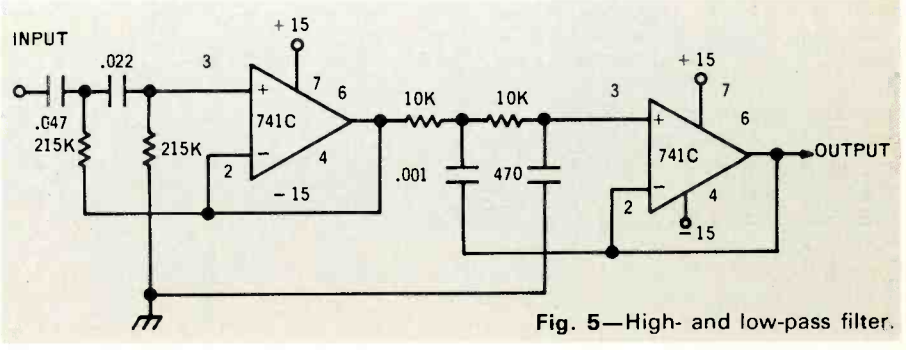
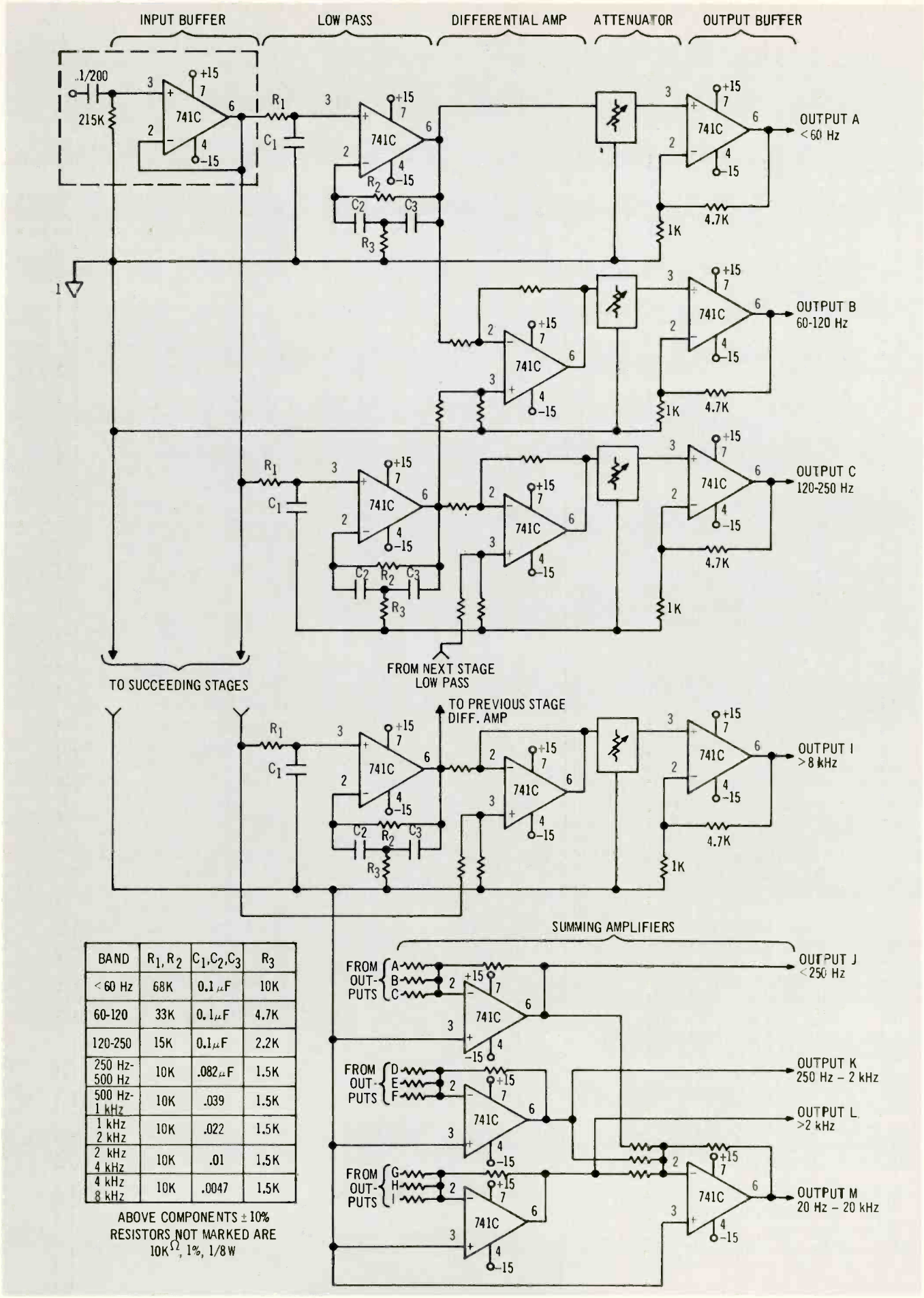


Fig. 5—High- and low-pass filter.



BAND	R_1, R_2	C_1, C_2, C_3	R_3
<60 Hz	68K	0.1 μF	10K
60-120	33K	0.1μF	4.7K
120-250	15K	0.1μF	2.2K
250 Hz-500 Hz	10K	.082μF	1.5K
500 Hz-1 kHz	10K	.039	1.5K
1 kHz 2 kHz	10K	.022	1.5K
2 kHz 4 kHz	10K	.01	1.5K
4 kHz 8 kHz	10K	.0047	1.5K

ABOVE COMPONENTS ±10%
RESISTORS NOT MARKED ARE
10KΩ, 1%, 1/8W

Fig. 4—Circuit diagram of room equalizer.

range channel, and the three upper bands when combined provide the signal for the tweeter amplifier. The crossover frequencies may be changed simply by summing different combinations of bands. Or you may prefer to just build an electronic crossover using Fig. 3. Let me point out that the resulting crossover has steep skirts near crossover, where they are needed, and milder skirts some distance from crossover.

The results of the room equalizer are shown in Fig. 7. Notice that the bands don't all have the same percentage bandwidth, nor are the skirt characteristics all identical. This is because of the inevitable variation in component values. The curves are all very good for -20 decibels or so, and that is what matters. When used as a crossover network, Fig. 8 gives the characteristics. Figure 8 also shows the output frequency response curve when all nine bands are set "flat." The result, flat within 0.25 decibel, is gratifying and proof that it all works.

The distortion curves for a 1 kHz sine wave input and flat output are shown in Fig. 9. This also shows the effect upon distortion of boosting the upper three bands by 12 decibels with a 1 volt 1 kHz input. This boosts the distortion as the bands in which the harmonics of the 1 kHz input fall are being emphasized. The distortion is still acceptably low.

With the input open curcuited the noise is 200 microvolts rms. Short circuited it is 150 microvolts rms. The noise is mostly in the form of spikes up to 1.5 millivolts peak. This is referred to as "popcorn noise" and is a characteristic of many operational amplifiers such as the 741C. At any rate, this amount of noise is 74 decibels below a 1 volt signal, so it's rather academic.

If used as a crossover network this design is correct for all loudspeakers mounted on the same plane and as close to each other as possible. This is because the filter has already corrected for the phase shift between loudspeakers. Especially get the midrange close to the woofer.

Figure 10 is a picture of the unit. The input and output are at the lower and upper right. The three outputs next to them are, from top to bottom, for the tweeter, mid-range, and woofer when used as an electronic crossover. The knobs or at least the skirts, are homemade. Such knobs are, of course, commercially available. Bond paper is glued to washers, marked with the proper numbers, and then glued to the rear of regular knobs. Below each knob is the output from each channel.

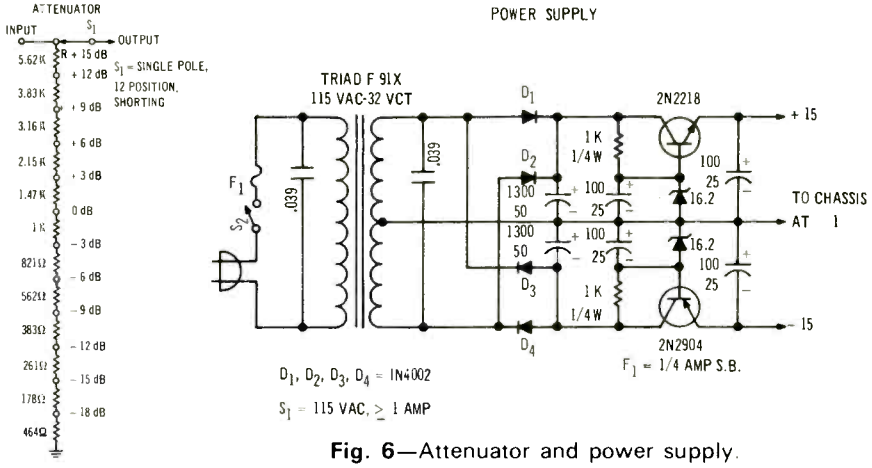


Fig. 6—Attenuator and power supply.

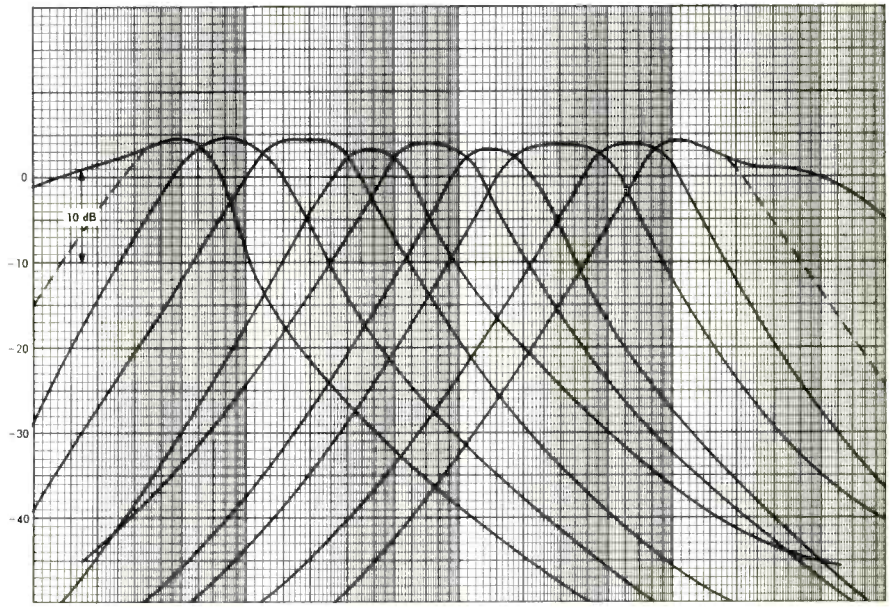


Fig. 7—Band frequency response characteristics.

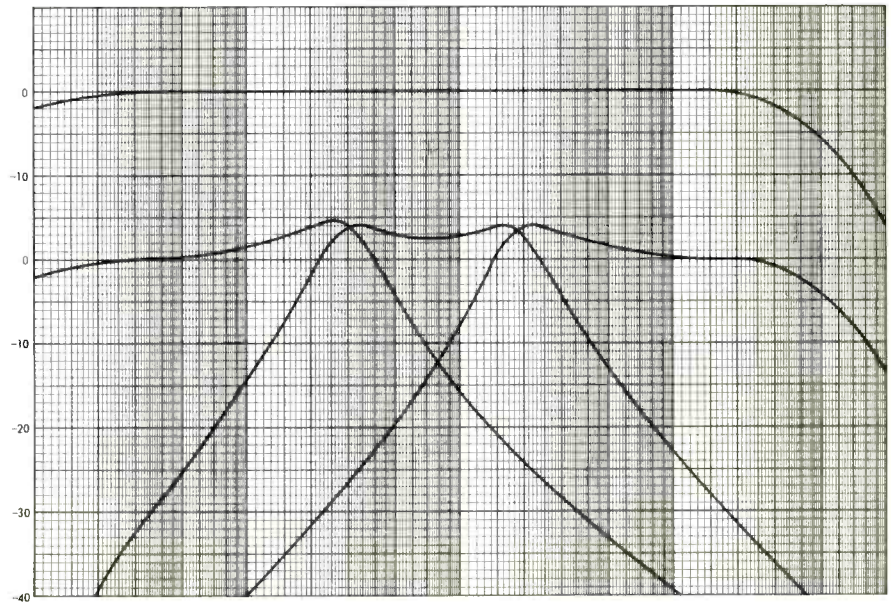


Fig. 8—Frequency response when set flat (top) and when used as an electronic crossover.

Are the results worth the effort? I think so. One thing about such a room equalizer is that it can make almost any speaker system sound like any other. This doesn't mean that it can make a poor loudspeaker into a good one, because it doesn't do anything to improve the transient response of a speaker system. (Or reduce distortion, coloration, etc.—Ed.) But if you like a bit of presence, dial in some more 2-4 and/or 4-8 kHz signal. If you're a bass buff, put in some bass below 60 kHz. Once you determine the equalization you want, you can design the proper circuit and build it into the system. Or, if you like knobs you can leave the equalizer in the system.

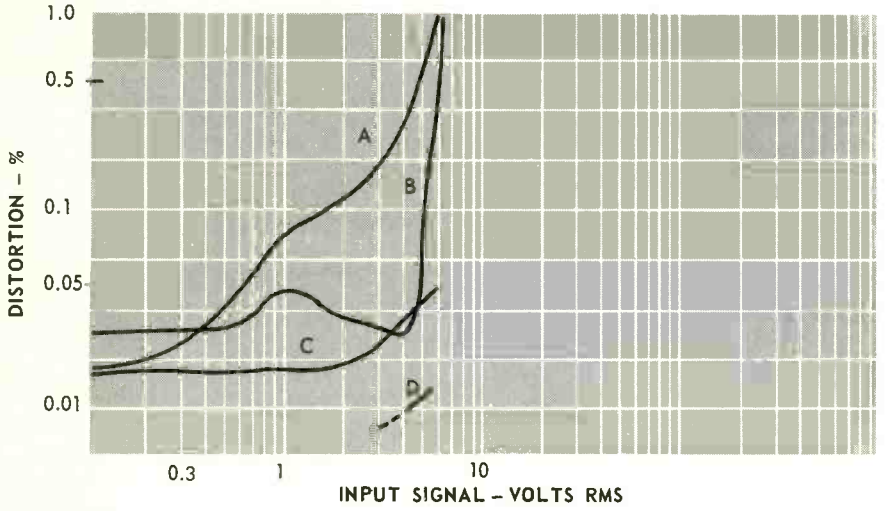


Fig. 9—Distortion components versus level: **A**, 2nd harmonic with boost; **B**, 3rd harmonic with boost; **C**, 2nd harmonic, flat response, and **D**, 3rd harmonic, flat response.

Fig. 10—View of the completed unit.

The AR FM tuner: ". . . simple and great, or rather, simply great." *High Fidelity Magazine*

Sensitivity: "The IHF sensitivity figure of 1.6 microvolts is among the best ever measured."[1]

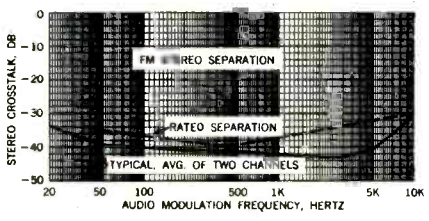
Limiting: ". . . the AR reaches a 50-dB s/n at the incredible sensitivity of 4μV and full limiting of its ultimate 60-dB s/n at 6 μV! No wonder I heard the stereo transmission from WQXR so clearly down in my basement!"[2]

Maximum signal to noise: "The signal to noise ratio was 68 dB—slightly better than rated."[3]

Overload: ". . . it shows no signs of overload for strong incoming signals."[1]

Selectivity: "Selectivity seems to be ideal, with no evidence of any weaknesses."[2]

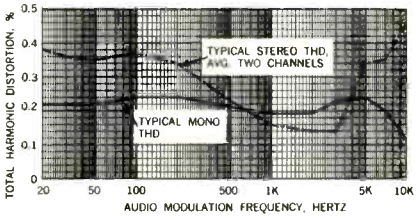
Separation: "Overall stereo separation is just about the best we have ever measured. While many



Stereo separation characteristics of the AR FM tuner. Curves remain below 30 dB between 20 Hz and 10 kHz.

tuners and receivers have boasted separation figures of 40 dB at mid-band frequencies, tuners which are able to maintain at least 30 dB of separation over the entire audio range are a rarity. The AR tuner does it, with some room to spare at the low end."[4]

Distortion: "Total harmonic distortion . . . came to 0.18 percent. By a sizable order of magnitude



Distortion characteristics.

that is the lowest figure I have ever found in a tuner—which no doubt explains the singular cleanness of the AR's sound."[2]

Performance in actual use: ". . . I found myself hearing (and hearing *well*) stations I have never picked up so distinctly."[2]

"In our cable-FM tests, we logged a total of fifty-four stations of which forty-three were judged suitable for critical listening or off-the-air taping; this of course puts the AR tuner in the 'champion class' in this regard . . . we could say of the AR tuner that its response capabilities generally exceed the broadcast quality of most FM stations."[1]

"The performance of the AR FM tuner cannot be described adequately by mere graphs and numbers. Its *effective* sensitivity is exceptional, and in side-by-side comparison with other fine FM units it generally provided listenable reception of very weak signals that could be heard barely, if at all, on other receivers or tuners operating from the same antenna."[3]

Value: ". . . the literal truth is that *any* price would not be unreasonable in light of the fact that no amount of money could buy better performance."[2]

The price of the AR FM tuner is $210; oiled walnut cover $15. Prices 5 percent higher in West and Deep South.

1 *High Fidelity*, June 1971
2 *The American Record Guide*, March 1971
3 *Stereo Review*, June 1971
4 *Audio*, July 1971

Please send detailed information on the AR tuner to

Name_____

Address_____

_____

AR Acoustic Research

Acoustic Research, Inc. Dept. AU-9
24 Thorndike St., Cambridge, Massachusetts 02141

Check No. 25 on Reader Service Card

THE LANGUAGE OF HIGH FIDELITY

Part IV--Basic Electronic Components--Cond.

Martin Clifford

SINCE ELECTRONICS is the warp and woof of our technological fabric, it is pleasant to think of electronics as new, something for which we, not our antecedents, can claim full credit. Not so! Electronics, or rather its progenitor, electricity, has an ancient and honorable history. The Greeks had a word for it—elektron—thousands of years ago, but it wasn't until 1897 that Sir J. J. Thomson first isolated the electron. An important step, but not a first one, for 20 years prior Heinrich Hertz had transmitted radio waves and some 40 years earlier Clark Maxwell had predicted their existence. Pushing time back a bit more, the word electricity was first used by Sir Thomas Browne in a book published in 1642. And around the time Caesar was invading Gaul, the Romans supplied the Latin base for electricity and electronics with their word "electrum." So much for newness.

One of the problems early investigators had is that electricity is one of relatively few forms of energy, existing as a rampaging force unless controlled. It was only divine providence and human ineptness that kept some of those early investigators of electricity from being electrocuted. Ultimately, prompted by relentless Nature, their research was channeled into two paths: how to generate voltages and how to control currents. With the advantage of 20:20 hindsight, we can see how electronic opportunity came knocking on many laboratory doors, only to be ignored. One such was Thomas A. Edison whose mantle of inventive genius would have been even more lustrous had he but paused and listened. Busily occupied in 1883 with inventing the incandescent lamp, he placed a metal plate inside one of his bulbs and noted that when the metal was made positive with respect to the hot filament, a current flowed from filament to plate. Something should have triggered a warning bell in Edison's mind, for he was witnessing the flow of electrons through the vacuum of space, not through a solid. Further, when he reversed the connections (Fig. 1) all current flow between the filament and the charged metal plate ceased. Current control with a vengeance, but only to be entered as an interesting experiment in a laboratory notebook, synonymous with being consigned to limbo. Edison had discovered the two-element tube, the diode, the keystone supporting today's science of electronics.

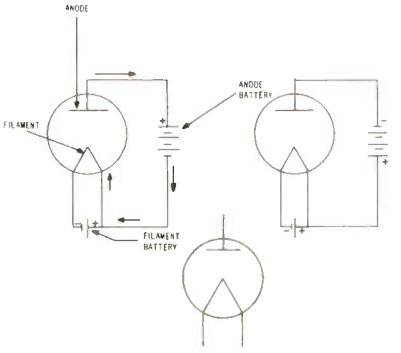


Fig. 1.—Basic diode symbol using a directly heated filament (A). When the diode plate is made positive with respect to the heated filament (B), current flows from filament to plate. If the battery connected to the plate is transposed, current stops flowing in the plate circuit (C).

The Diode

The diode is a classic example of inventive simplicity at its best. A few pieces of metal placed inside a vacuum bulb and you have the first step toward radio, television, radar, and computers. How many can look at an acorn and see a tree?

Operation of the diode is as simple as its construction. When a wire, or other conductor, is heated, electrons on or near the surface are supplied with the energy needed for escape. In an ordinary electric light bulb they form a cloud (or electron space charge) around the filament with nowhere to go, possibly returning to the filament at some time. But with the insertion of a charged plate, subsequently known as the anode, the electrons now had a chance to move through space.

The Plate Current Path

Electrons in the cloud surrounding the filament, now urged on toward the plate, reach that haven, but promptly move on through the connecting wire to the plus terminal of the voltage source, a battery in this instance. This is not a terminus, for their trip isn't completed. They move through the interior of the battery, from the positive to the negative electrode, using the electrolyte between these two as a conductor. Emerging from the negative electrode they continue on through the connecting wire to the filament where they promptly receive another energy boost. And so the whole process is repeated as long as the filament is heated and the battery connected between anode and filament is in working order.

This current, called the plate or anode current, is unidirectional and nonvarying. That's not so important. What is breathtaking is that this current can be controlled. (Fig. 2). If the voltage between filament and anode is increased, the anode current increases. Not indefinitely, of course, but within reassuring limits.

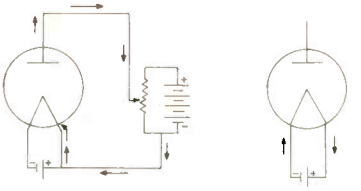


Fig. 2.—Current flow can be increased by raising the voltage on the anode (A). The anode voltage can be changed by shunting a variable resistor across the dc supply for the anode. The filament or heater current exists independently of the anode current (C). The arrows represent the direction of current.

The Filament Current Path

Meanwhile, back at the filament, a battery, or other voltage source is busily driving a current through the filament. This current has a path completely independent of the plate current and so the diode is a two-current device. The only purpose of the filament current is to heat the filament, encouraging electrons to leave it. A filament current isn't really needed, for if the filament could be heated in some other way, the same objective would be reached. By a blowtorch, perhaps. Interesting, but not practical.

The Anode Return

The electrons constituting the anode

The Pick-Up Pros.

Artie Altro makes the WOR-FM sound, while Eric Small, Sebastian Stone and Promotion Director, Kim Olian look over a new album.

WOR-FM, the country's leading FM/Stereo rock station, has been using Stanton cartridges since its inception.

Program Director Sebastian Stone likes the smooth, clean sound the Stanton delivers; the way it is able to pick up everything on the record so that the station can assure high quality transmission of every recording.

Eric Small, Chief Engineer for WOR-FM, likes the way that Stanton cartridges stand up under the wear and tear of continuous use. "We standardized on Stanton a couple of years back," Small said, "and we haven't had a cartridge failure since. Studio Supervisor Artie Altro concurs.

Whether you're a professional or simply a sincere music lover, the integrity of a Stanton cartridge delivers the quality of performance you want.

There are two Stanton professional cartridge series. The Stanton 681 Series is engineered for stereo channel calibration in record studios, as well as extremely critical listening. The 500 AL Series features design modifications which make it ideally suited for the rough handling encountered in heavy on-the-air use. In fact, among the nation's disc jockeys it has become known as the "industry workhorse."

All Stanton cartridges afford excellent frequency response, channel separation, compliance and low mass and tracking pressure. And every Stanton cartridge is fitted with the exclusive "longhair" brush to keep grooves clean and protect the stylus. They belong in every quality reproduction system—broadcast or high fidelity.

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STANTON

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current have a sole objective—a return to their starting point. And so the anode return, the wire connecting the anode battery to the filament can be attached to any convenient point on the filament battery's positive or negative terminal.

But doesn't this mean that some of the electrons forming the filament current and those of the anode current will become mixed? Hardly a problem. All electrons are alike, a pleasant fact that permits us to send more than one current through a wire and not worry about electron bookkeeping.

More Current Control

Another method of current control is to increase the temperature of the filament, by raising the voltage across the filament, sending more current through it. Moderation, as in all things, is required, for the filament can be made to glow to the point of complete burnout.

Indirect Heating

The filament can be heated by an alternating current supplied by a transformer. The problem here is that the voltage supplied by the transformer is a varying one, hence the current through the filament keeps changing. A fierce chain of cause and effect. The number of emitted electrons also varies, meaning the anode current follows in step. An unhappy situation for the current is doing something we don't want it to, and in that sense we have lost control.

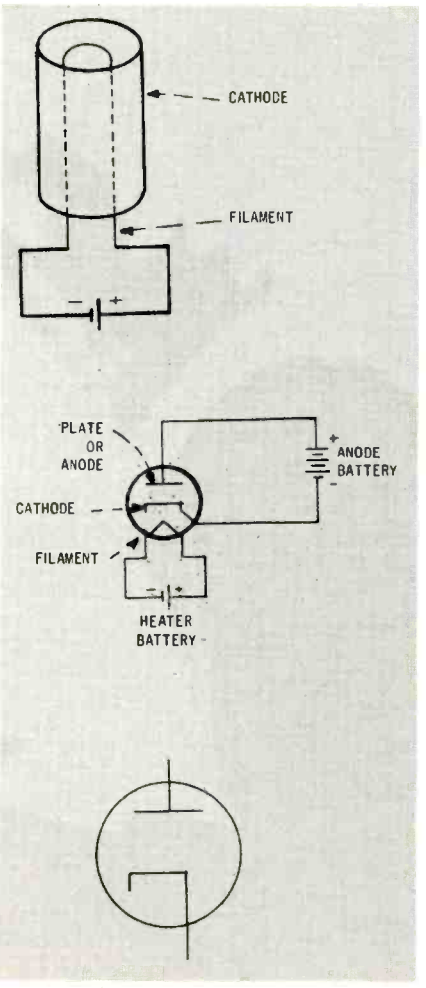

Fig. 3.—The thimble-like cathode is slipped over the heated filament, but has no connection to it. (A); the cathode lps isolate the anode and filament circuits (B). Diode symbol using a cathode (C). In this symbol the filament is omitted since its only function is that of a heater.

The solution is the difference between broiling over an open flame and using a frying pan. The modified diode now contains (Fig. 3) an element called a cathode. Heated by the filament, the cathode becomes the electron emitting source. The only function of the filament is that of a heater, and that is what such a filament is often called. We now have two separate, distinct circuits, not connected . . . the annode circuit consisting of the cathode, anode and the anode voltage source, and the filament and its voltage source. The

cathode is simply a sleeve of electron-rich oxides placed over, but not touching, the filament.

From A.C. to D.C.

The advantage of a.c. is that it lends itself so well to transmission over long distances. The voltage delivered to your home by your local power company is a.c., and so is the signal picked up by your receiver antenna. Not the same a.c., of course, but related. When delivered, it is often essential to be able to change that a.c. into some form of d.c., and it is in this circumstance that the diode shows its particular merit.

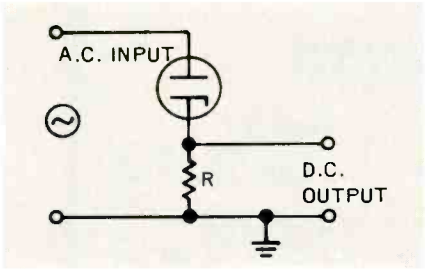

Fig. 4.—The diode can be used to change a.c. to varying d.c.

Fig. 4 shows a modified diode circuit. Two changes have been made. The anode voltage source is now a.c. and a part known as a load resistor is wired in series with it.

The a.c. voltage reverses its polarity regularly and so the anode is alternately made positive and negative. During the time it is positive, current flows from the cathode to the anode, through the load resistor and a.c. voltage source, back to the cathode. No current flows when the a.c. source makes the anode negative.

All of the anode current flows through the load resistor, but only in one direction. In doing so we have fulfilled the conditions for the production of a voltage. Every time a current flows through a resistor, a voltage develops across it. But the voltage, in this instance, is d.c. which varies in strength, but d.c. nonetheless. The diode curcuit, then, can be used as a rectifier, a circuit that can change an a.c. input voltage into a d.c. output voltage.

The Basic Receiver

The process of changing a.c. to d.c. is called rectification. The same technique can be used in a rather crude type of radio receiver, but still a radio receiver, as shown in Fig. 5. Instead of using power line a.c., the a.c. is supplied by a radio signal. Other than that, the circuit functioning is the same. The diode used in this connection is referred to as a demodulator. Demodulation and rectification are synonymous; it is the diode applications that are different.

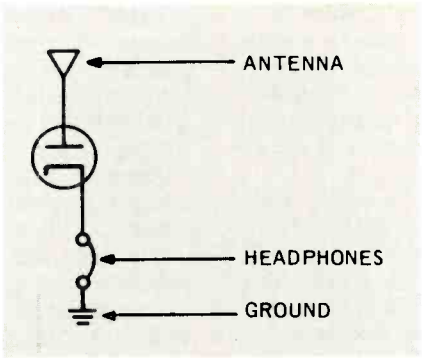

Fig. 5.—Complete radio receiver using diode, headphones, antenna and ground. No sensitivity, no selectivity, no amplification, but it works. The filament circuit is not shown, but is required for heating the cathode.

The radio receiver of Fig. 5 has no sensitivity or selectivity for there is no way of separating the various signals fighting for supremacy at the antenna input. And so what is heard in the headset, now used in lieu of the load resistor of the rectifier circuit, is a mèlange, a cacaphony of sound that would discourage anyone but a hi-fi enthusiast. A journey of a thousand miles starts with a single step, and the road to sophisticated music reproduction begins with a most elementary circuit.

Enter The Triode

Current control in the diode is effective, not sensitive. Ideally, it would be best if we could somehow poke a finger into the tube, directly in the path of electron movement between cathode and anode. An impractical thought having practical consequences, for where our fingers may not go, substitutes can be used. Such a replacement is a tiny bit of wire mesh or wire spiral, first inserted between cathode and anode by Dr. Lee de Forest in 1906. Originally called the Audion, but now known as a triode because the modified diode contains three electrodes: the cathode and anode, plus the new electrode, the control grid. (Fig. 6).

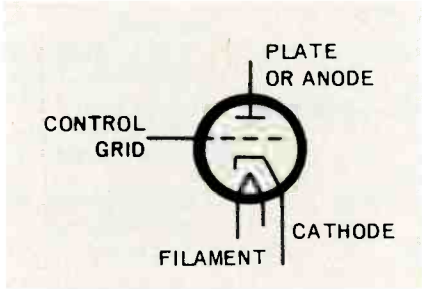

Fig. 6.—The triode is a three element tube containing a cathode (or possibly a directly heated filament), a control grid, and a plate or anode.

The control grid, an ideal name for this element, is mounted close to the cathode and has the same general behavior as the anode. When the control grid is made positive, it exerts an attracting force on the electron cloud around the cathode. Although the distance between the cathode and the control grid is small, the electrons have considerable velocity by the time they reach the grid region. Unlike the anode, the control grid is mostly open space, and the majority of electrons hurl through to the anode, their inertia not permitting them to stop. Some electrons do impinge on the control grid structure, and, just as in the case of anode current, are returned directly to the cathode.

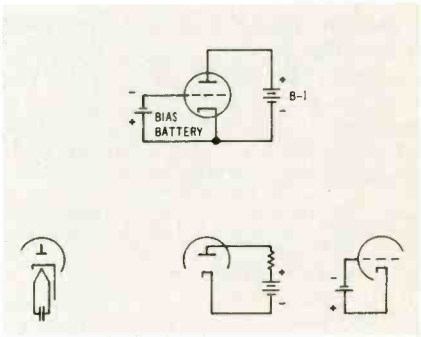

Fig. 7.—The triode tube includes three circuits: the heater-cathode circuit (A); the anode or plate circuit (B) and the control-grid circuit (C). Drawing D shows these three circuits combined.

The Grid Circuit

The tube has now become the hub of activity for three different circuits. (Fig. 7). Two of these are the heater cathode circuit and the anode circuit. The new member is the grid circuit consisting of the cathode, the control grid, and the voltage source between the cathode and grid. Current moving in this circuit is appropriately called grid current. Not only does the triode encompass three different cirduits, but each of these has its own voltage supply. The cathode has its filament voltage; the anode its anode voltage, while the voltage in the grid circuit is called bias.

If permitted to do so, water from a kitchen faucet, because of the tremendous pressure behind it, could easily flood any kitchen. Restraint is imposed by a valve and so water flow can be governed from no water at all, to a trickle, to full force. In a comparable manner, the number of electrons moving from cathode to anode is measurable in the multi-millions, and so some electron

(Continued on page 122)

1973 PRODUCT PREVIEW DIRECTORY

AUDIO's annual Product Preview Directory follows, as is the usual custom in the September issue. The specifications presented are in the tabular form first used in 1965 to facilitate comparisons. Readers should bear in mind that *the specifications are those supplied by the manufacturers—they are not the result of our tests of measurements.* Methods of testing and measurement may differ from manufacturer to manufacturer, but in general the performance may be considered to be as specified.

Note that letter codes are employed in some instances for the purpose of clarity. For instance, the symbol (B) together with the model number of an amplifier indicates that it is a basic power amp; (K) indicates kit, and D with a recorder indicates Dolby B circuitry. Similarly, tape recorder speeds are indicated by letter codes which are shown on their respective charts.

Amplifier power ratings are given in rms or continuous power figures at 8 ohms both channels driven as this rating is more realistic than fictitious music power or peak power ratings. With certain quadraphonic amplifiers and receivers, power per channel is higher in the two-channel mode than in four; with these we have tried to list power per channel in quadraphonic mode at the regular spot and power in two-channel in the *Special Features* column.

For more information on any product, or on any products which are not listed, the reader may write the manufacturer directly at the company addresses which are listed below.

Obviously, not all the products of every manufacturer are listed, due to space limitations. Also, no listings of microphones are included since the December issue will contain a comprehensive Directory and several articles on microphones.

Directory of Manufacturers

Acoustic Research, Inc.
24 Thorndike St.
Cambridge, Mass. 02141

Advent Corp.
195 Albany St.
Cambridge, Mass. 02139

Akai America
2139 E. Del Amo Blvd.
Compton, Calif. 90220

Altec-Lansing
1515 S. Manchester Ave.
Anaheim, Calif. 92803

Astrocom
Oneonta, N.Y. 13820

Audio Dynamics Corp.
230 Pickett District Rd.
New Milford, Conn. 06776

Audionics
8600 N.E. Sandy Blvd.
Portland, Oregon 97220

Audio Research Corp.
2843 26th Ave. South
Minneapolis, Minn. 55406

Audiotex, Div. Hydrometals
400 So. Wyman St.
Rockford, Ill. 61101

Aztec Sound Corp.
1322 Broadway
Denver, Colo. 80223

BGW Systems
P. O. Box 3742
Beverly Hills, Calif. 90212

B&O of America
2271 Devon Ave.
Elk Grove Village, Ill. 60007

BSR-McDonald
Route 303
Blauvelt, N.Y. 10913

B&W (see Linear Devices)

Benjamin Electronic Sound
40 Smith St.
Farmingdale, N.Y. 11735

Bose Corp.
East Natick Indus. Park
Natick, Mass. 01760

Bozak Co.
P. O. Box 1166
Darien, Conn. 06821

Braun/ADS
1209 Governor's Drive, S.E.
Huntsville, Ala. 35801

British Industries Corp. (BIC)
South Service Road
Westbury, N.Y. 11590

CCA Electronics
716 Hersey Ave.
Gloucester City, N.J. 08030

Concord (See Benjamin)

Crisman Speaker Co.
835 Walnut
Boulder, Colo. 80302

Crown International
1718 W. Mishawaka Road
Elkhart, Ind. 46514

DWD
3209 N. Marks
Fresno, Calif. 93705

Dayton-Wright Assoc.
P. O. Box 419
Thornhill, Ontario, Canada

Delta-RET
P. O. Box 10734
Houston, Texas 77018

Design Acoustics
P. O. Box 2722
Palos Verdes, Calif. 90274

Dokorder, Inc.
11264 Playa Court
Culver City, Calif. 90230

Dunlap-Clarke
44 River St.
Framingham, Mass. 01701

Dynaco, Inc.
3060 Jefferson St.
Philadelphia, Penna. 19121

EPI, Inc.
1 Charles St.
Newburyport, Mass. 01950

ESS, Inc.
4503 Railroad
Sacremento, Calif. 95826

Electromusic
Bin 30, Arroyo Annex
Pasadena, Calif. 91109

Electro-Voice
600 Cecil St.
Buchanan, Mich. 49107

Elite Electronics
195 Central Ave.
Farmingdale, N.Y. 11735

Elpa Marketing
Thorens & Atlantic Aves.
New Hyde Park, N.Y. 11040

Empire Scientific Corp.
1055 Stewart Ave.
Garden City, N.Y. 11530

Equasound
3330 So. Sepulveda Blvd.
Los Angeles, Calif. 90034

Ercona Corp.
2121 Bellmore Ave.
Bellmore, N.Y. 11710

Fairfax Industried, Inc.
900 Passaic Ave.
East Newark, N.J. 07029

Ferrograph (See Elpa)

Fisher Radio Corp.
11-40 45th Road
Long Island City, N.Y. 11101

Frazier, Inc.
1930 Valley View Lane
Dallas, Texas 75234

GC Electronics
400 So. Wyman
Rockford, Ill. 61101

Gotham Audio Corp.
2 West 46th St.
New York, N.Y. 10036

Grado Laboratories, Inc.
4616 Seventh Ave.
Brooklyn, N.Y. 11220

Harman-Kardon, Inc.
55 Ames Court
Plainview, N.Y. 11803

Harmony House
197 E. 76th St.
New York, N.Y. 10021

Hartley Products Corp.
Box 68A
Hohokus, N.J. 07423

Heath Co.
Hill Top Road
Benton Harbor, Mich. 49022

Hegeman Labs
176 Linden Ave.
Glen Ridge, N.J. 07028

Hill Speaker Co.
P. O. Box 457
Lawrence, Kansas 66044

Hitachi
48-50 34th St.
Long Island City, N.Y. 11101

IMF Products
7616 City Line Ave.
Philadelphia, Penna. 19151

Impro Industries, Inc.
120 Hartford Ave.
Mt. Vernon, N.Y. 10553

Infinity Systems, Inc.
9001 Fulbright Ave.
Chatsworth, Calif. 91311

Ingenuics, Inc.
16000 Industrial Dr.
Gaithersburg, Md. 20760

JBL, Inc.
3249 Casitas Ave.
Los Angeles, Calif. 90039

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

JansZen
7516 42nd Ave. North
Minneapolis, Minn. 55427

Jensen Sound
4310 Trans-World Road
Schiller Park, Ill. 60176

KLH Reaseach & Development
30 Cross St.
Cambridge, Mass. 02139

Karlson Research & Mfg.
Box 117
West Hempstead, N.Y. 11552

Kenwood Electronics
72-02 51st Ave.
Woodside, N.Y. 11377

Kirksaeter of America
2020 F St. N.W.
Washington, D.C. 20006

Klipsch & Assoc.
P. O. Box 280
Hope, Ark. 71801

Koss Corp.
4129 No. Port Washington Ave.
Milwaukee, Wis. 53212

Lafayette Radio Electronics
111 Jericho Tpke.
Syosset, N.Y. 11791

Linear Design Labs
114 Wilkins Ave.
Port Chester, N.Y. 10573

Linear Devices
148 French St.
New Brunswick, N.J. 08901

MGA Div., Mitsubishi
7045 No. Ridgeway
Lincolnwood, Ill. 60645

3M Company
2501 Hudson Road
St. Paul, Minn. 55119

Magnavox
345 Park Ave.
New York, N.Y. 10022

Magnum Opus
220 West 19th St.
New York, N.Y. 10011

Marantz Co.
8150 Vineland
Sun Valley, Calif. 91352

Martin
Harmony Road
Mickleton, N.J. 08056

Maximus Sound Corp.
5 South St.
Garden City, N.Y. 11530

McIntosh Laboratory, Inc.
2 Chambers St.
Binghamton, N.Y. 13903

Metrotec Industries
33 Cain Drive
Plainview, N.Y. 11803

Micro/Acoustics Corp.
Box 302
White Plains, N.Y. 10602

Mura Corp.
50 So. Service Road
Jericho, N.Y. 11753

Nagra
1147 No. Vine
North Hollywood, Calif. 91605

Nikko Electronics
5001 Lankershim, Blvd.
No. Hollywood, Calif. 91601

Ohm Acoustics
133 Emerson Place
Brooklyn, N.Y. 11205

Olson Electronics
260 So. Forge St.
Akron, Ohio 44308

Onkyo
25-19 43rd Ave.
Long Island City, N.Y. 11101

PE (See Impro)

Pacific Electronics
6601 Bay St.
Emeryville, Calif. 94608

Panasonic
200 Park Ave.
New York, N.Y. 10017

Paoli Hi-Fi
P. O. Box 876
Paoli, Penna. 19301

Phase Linear, Inc.
405 Howell Way
Edmond, Wash. 98020

Pickering & Co., Inc.
Sunnyside Blvd.
Plainview, N.Y. 11803

Pilot
66 Fieldpoint Road
Greenwich, Conn. 06830

Pioneer Electronics
178 Commerce St.
Carlstadt, N.J. 07072

Premier Electronic Labs
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New York, N.Y. 10003

Quad (See Harmony House)

Quadraflex Industries
6601 Bay St.
Emeryville, Calif. 94608

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11937 Rech Road
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Radio Shack
2617 West Seventh St.
Fort Worth, Texas 76107

Rectilinear Research Corp.
107 Bruckner Blvd.
Bronx, N.Y. 10454

Revox Corp.
155 Michael Drive
Syosset, N.Y. 11791

Rogersound Laboratories
5706 Lankershim Blvd.
No. Hollywood, Calif. 91601

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Yonkers, N.Y. 10710

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P. O. Box 60271, Terminal Annex
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1200 W. Walnut St.
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477 Madison Ave.
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Gardena, Calif. 90247

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1100 E. Franklin St.
Huntington, Ind. 46750

Turner Div., Conrac
909 17th St., N.E.
Cedar Rapids, Iowa 52402

United Audio Products
120 S. Columbus Ave.
MT. Vernon, N.Y. 10553

Utah Electronics
1124 E. Franklin St.
Huntington, Ind. 46750

Video-Tone Ltd.
131 Bloor St. West
Toronto, Ontario, Canada

V-M Corp.
375 Main St.
Benton Harbor, Mich. 49022

Wharfedale (See BIC)

Weltron Co.
514 E. Peabody St.
Durham, N.C. 27702

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BGW 1000

Crown D-40

Fisher TX-2000

MANUFACTURER	MODEL	RMS power/chan., W, 8 ohms	THD at rated power, %	THD at 1 watt, %	IM at rated power, %	IM at 1 watt, %	Power bandwidth, Hz - kHz	Freq. resp. at 1 watt, Hz ± ? dB	Rated output S/N, phono, dB	Phono sensitivity, mV	Phono overload, mV	Tape head input, mV	High level input, V	Output Z, ohms	Damping factor	Dimensions, W x D x H, in.	Weights, lbs.	Price	SPECIAL FEATURES
ACOUSTIC RESEARCH	AR	50	0.5	0.15	0.25	0.1	14-44k	20-20k ± 1	57	2.5 adj.	100	–	0.2	4,8, 16	40	15¼ x 10	19	250.00	Wood case, opt., $15.00.
AKAI	AA-6100 4-chan.	12½	1.2					20-22k ± 3	70	3.0		150	0.15	8		16¾ x 9½ x 4	19	189.95	Discrete.
AUDIO RESEARCH	M60C (T/B)	50	0.5	0.1	1.0	0.25	15-30k	5-20k ± 1						4,8, 16	10	9 x 9 x 6		295.00	Mono.
	D51 (T/B)	50	0.1		0.5	0.05	15-30k	5-20k ± 1						4,8, 16	15	19 x 12 x 7	54	695.00	
	D75 (T/B)	75	0.1		0.5	0.05	15-30k	5-20k ± 1						4,8, 16	15	19 x 12 x 7	59	975.00	
BGW SYSTEMS	(B) 1000	225	0.1	0.1	0.1	0.1	5-20k	5-30k +0-0.5	110				1.25	4,8, 16	500	19 x 17 x 7	70	1200.00	SCR crow bar; no fuses; adj. power limiting; FET op-amp; forced air cooling
	(B) 4 x 250 4-chan.	250	0.1	0.1	0.1	0.1	5-20k	5-30k +0-0.5	110				1.25	4,8, 16	500	19 x 17 x 7	70	1450.00	As above, but 4-chan.
	(B) 4 x 125 4-chan.	125	0.1	0.1	0.1	0.1	5-20k	5-30k +0-0.5	110				1.25	4,8, 16	400	19 x 15 x 7	50	950.00	4-chan.; SCR crow bar; no fuses; IC op amp.
	(B) 500	125	0.1	0.1	0.1	0.1	5-20k	5-30k +0-0.5	110				1.25	4,8, 16	500	19 x 15 x 7	35	500.00	SCR crow bar; no fuses; adj. power limiting; IC op amp.
CROWN	D-300 (B)	150	0.05	0.05	0.05	0.05	D.C. -20k*	D.C. -100k	110				1.75	4,8, 16	200	19 x 9¾ x 7	40	685.00	* ± 1 dB; opt. oil. wal. cab., $39.00; PA adapter, 70 V bal. line out, $70.00.
	D-150 (B)	75	0.05	0.05	0.05	0.05	10-20k*	4-100k ± 1	110				1.19	4,8, 16	200	16½ x 8 x 5	22	399.95	Opt. front panel, $30.00; oil. wal. cab., $33.00. * ± 1 dB.
	D-60 (B)	30	0.05	0.05	0.05	0.05	5-30k*	20-20k ± 0.1	106				0.775	4,8, 16	200	17 x 8¾ 1¾	10	229.95	Front panel phone jack. * ± 1 dB.
DYNACO	Stereo 400(B)	200	0.25	0.1	0.25	0.1	5-100k	5-70k +0-1	106				1.6	8	100	16 x 12 x 7	45	399.95K 499.95W	Prot. circuit.
	SCA-80Q 4-chan.	40	0.5	0.1	0.5	0.1	8-50k	15-50k ± ½	60	3	100		0.13	8	40	13½ x 10 x 4	16	169.95K 249.95W	Built-in matrix cirt. for 4-D sound w. 4 spkrs.
	Stereo 120(B)	60	0.5	0.1	0.5	0.1	5-50k	5-100k ± ½	100				1.5	8	40	13 x 10½ x 4	20	159.95K 199.95W	Regulated power supply
	Stereo 80(B)	40	0.5	0.1	0.5	0.1	8-50k	10-50k ± ½	90				1.3	8	40	14 x 8 x 4	13	119.95K 159.95W	
ESS	500 (B)	250	0.1	0.01	0.1	0.01	5-50k	5-50k ± 0.5							500	16⅜ x 12 x 5¾	45	500.00	
ELECTRO-VOICE	1244X 4-chan.	18	1.0				20-20k	20-30k ± 1½	60	3.0			150 mV	4,8, 16	35	8⅜ x 10¼ x 3⅜	9	149.95	Add-on amp with E-V Stereo-4 decoder; for rear channels.
FISHER	TX-2000	50	0.5	0.2	0.8	0.2	22-24k	20-40k ± 1½	90	2.0; 7.0	40	1.8	0.2	4	10	15⅛ x 12¾ x 4¾	24	349.95	Mic. input; hi filter 1 & 2; low filter.
	TX420 4-chan.	15	0.5	0.2	0.8	0.3	30-20k	20-25k ± 2	65				0.2	–	10	16¼ x 11¾ x 4¾	17½	299.95	W. 4-chan. 8-tk. player, matrix decoder.

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Amplifiers—Basic & Integrated

Harman-Kardon Citation 12

Heathkit AA-2004

JVC VB-100

MANUFACTURER	MODEL	RMS power/chan., W, 8 ohms	THD at rated power, %	THD at 1 watt, %	IM at rated power, %	IM at 1 watt, %	Power bandwidth, Hz - kHz	Freq. resp. at 1 watt, Hz ± ? dB	Rated output S/N, phono, dB	Phono sensitivity, mV	Phono overload, mV	Tape head input, mV	High level input, V	Output Z, ohms	Damping factor	Dimensions, W x D x H, in.	Weights, lbs.	Price	SPECIAL FEATURES
HARMAN-KARDON	Citation 12	60	0.05	0.01	0.08	0.01	8-40k	1-100k ± 1½	105				1.25		50	12¼ x 12⅝ x 5½	30	295.00	Term. & mech. breakers.
HEATH	AA-15	50	0.5	0.2	0.5	0.2	6-30K	8-40K ± 1	60	2.2	155		0.2	4,8, 16	45	16⅞ x 14½ x 4¾	21.5	189.95K	
	AA-29	35	0.25	0.1	0.2	0.1	5-30K	7-60K ± 1	65	2.2	155		0.18	4,8, 16	50	16¾ x 14½ x 5⅛	22	159.95K	
	AA-2004 4-chan.	35	0.25	0.1	0.2	0.1	5-45k	7-50k ± 1db	65	2.2	155	2.2	0.18	4,8, 16	100	18½ x 13¾ x 6½	28	379.95K	4-Chan. with built-in matrix decode.
	AA-1214	15	0.5	0.25	0.5	0.2	5-30k	7-100k ± 1db	60	2	75	190	0.19	4,8, 16	50	12¾ x 12 x 3⅞	10	89.95K	With Cabinet
HITACHI	IA-1200	60	0.1					20-50k	100	1.5, 5.0		1.5	0.3	8	40	16¾ x 12⅝ x 5½	26½	695.00	Four main amps.
	IA-1000	55	0.1					20-50k		2.0, 5.0			0.14	8	50	17⅝ x 13 x 5⅜	27¾	359.95	Two VU mtrs., radiation finn.
	IA-600	32	0.1					20-20k	68	2.5, 6.0			0.25	8	50	16¼ x 12⅜ x 4¾	19½	249.95	Radiation finn.
INTEGRAL SYSTEMS	B-1000 4-chan.	500	0.1	0.05	0.1	0.05	8-60k	5-100k ± 1	100				1.5	4,8, 16	150	19 x 18 x 8	55	1000.00	2 or 4 indep. chan.; elect. level display.
JVC	4VN-770 4-chan.	16	0.5	0.2	0.8	0.3	10-30k	18-40k ± 1	65	2.5	100		0.1	4-16	50	16½ x 12 x 5½	21½	269.95	4-chan. integ. amp.; 4 VU mtrs.
	4VN-990 4-chan.	58	0.5	0.1	0.8	0.2	10-30k	10-50k ± 1	65	2.5	100		0.15	4-16	50	16⅝ x 15⅜ x 5⅜	35¼	469.95	4-chan. integ. amp.; 4 VU mtrs.; Dual SEA tone controls.
	VN-700	40	0.25	0.05	0.4	0.1	25-20k	20-50k ± 0.5	65	2.5	170		0.2	4-16	50	16⅝ x 12½ x 5⅜	22	269.95	SEA tone control.
	VN-900	60	0.25	0.05	0.4	0.1	20-20k	20-50k ± 0.5	65	2.5	250		0.2	4-16	50	16⅝ x 12½ x 5⅜	28	349.95	SEA tone control, pink noise tester.
	(B) VB-10	60	0.07	0.05	0.1	0.05	10-70k	10-100k ± 0.2	–	–	–	–	1	4-16	80	19 x 13½ x 6	36	599.95	Two VU mtrs.
	(B) VB-100	50	0.07	0.05	0.15	0.1	20-30k	18-45k ± 0.5	–	–	–	–	0.8	4-16	0.5-50	8½ x 12½ x 5½	16½	259.95	Two VU mtrs.; var. damping.
KENWOOD	KA-7002	50	0.5		0.3			20-50k ± 1	65	0.06, 2.5		200	1.0		45	16¼ x 11 x 5⅛	22	319.95	Direct coupling; 2 each tape, phono, tuner, aux; 3 spkr. sys.
	KA-6004	40	0.5	0.05	0.3	0.05	10-50k	20-40k ± 0-1	68	2.5		200			32	17⅛ x 11¾ x 6	25⅜	279.95	Direct coupled; prot. cir.; 2 each tape, phono, aux; A-B spkr. sys.
	KA-4004	18	0.5	0.05	0.5	0.08	10-50k	20-40k +0-1½	65	2.5		160			32	17⅛ x 11¾ x 6	20½	189.95	As above.
	KA-2002	17					20-30k	20-30k ± 2	60	2		150				13 x 9½ x 5	11½	119.95	2 each phono, aux, tuner.

LAFAYETTE 1973 CATALOG 730

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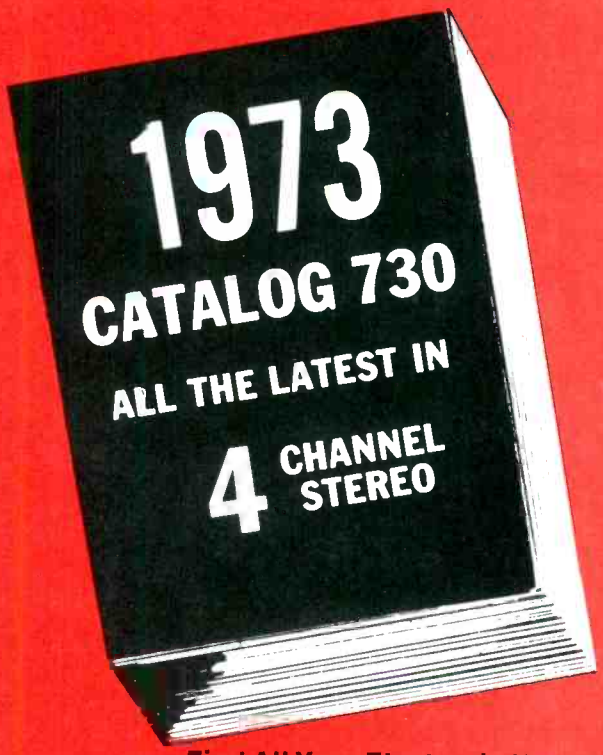

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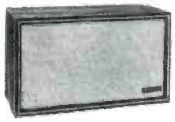

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Amplifiers—Basic & Integrated

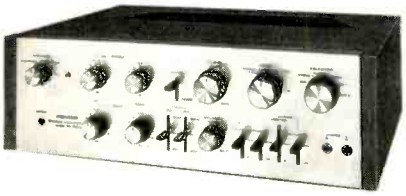
Marantz 4060

Phase Linear 700

Panasonic SU-3404

MANUFACTURER	MODEL	RMS power/chan., W, 8 ohms	THD at rated power, %	THD at 1 watt, %	IM at rated power, %	IM at 1 watt, %	Power bandwidth, Hz - kHz	Freq. resp. at 1 watt, Hz ± ? dB	Rated output S/N, phono, dB	Phono sensitivity, mV	Phono overload, mV	Tape head input, mV	High level input, V	Output Z, ohms	Damping factor	Dimensions, W x D x H, in.	Weights, lbs.	Price	SPECIAL FEATURES
LAFAYETTE	LA-64 4-chan.	23½	0.8	0.07			15-25k	20-20k ± 1½	60	3.5	42		0.25	4,8, 16		13½ x 9½ x 4	21	199.95	SQ, matrix; AGC; 2 spkr. sets; can be operated as 2 2-chan. amps.
	LA-975 4-chan.	25	1.0	0.07			20-35k	20-20k ± 1	60	4.5	60		0.25	4,8, 16		13 x 10½ x 4¼	20	169.95	SQ decoder.
	LA-222 4-chan.	7.	1.0	0.15				20-20k ± 1½	55	2.5	55		0.27	4,8, 16		13½ x 8¾ x 4⅜	14	129.95	SQ, matrix decode; main/remote spkr. swit.
	LA-150	33	1.0	0.05			13-35k	22-20k ± 1	56	2.2; 7	40, 120		0.25	4,8, 16		13 x 9¼ x 3⅞	19	149.95	Main/remote spkr. swit. & level contls.
MARANTZ	4100 4-chan.	25	0.3	0.1	0.3	0.1	15-50k	15k-80k ± 2	96	1.8	100		0.18		50	15⅜ x 14½ x 5¾	49	499.95	2/4 chan., 60Wx2; SQ adaptable with plug-in module.
	500	250	0.1	0.1	0.1	0.1	3-60k	2-100k ± 1½					1.75		500	17⅝ x 16 x 7	78	1200.00	Relay operated prot. devices.
	250	125	0.1	0.1	0.1	0.1	5-45k	20-20k ± 1					1.5		100	15⅜ x 6⅛ x 9½	34	395.00	Opt. 70.7 V line Xfmr. Model LT70; blk. anod. front panel.
	4060 4-chan.	15	0.9	0.9	0.9	0.9		20-20k ± 1	93	1.8	100		0.18			14¼ x 12 x 4¾	38	299.95	Synthesizes 4-chan. sound from any stereo source.
METROTEC	SD4A-Q	15																149.95	SQ; tone contls.; tape mon.
NIKKO	TRM-1200	45	0.3	0.1	0.3	0.1	15-30k	13-50k	85	2.0		220	0.2		30	15¼ x 12¼ x 4½	20	249.95	2 ICs; 2 mic jacks; 2 spkr. sys.; tone-flat swit.; time-delay mute.
OLSON	AM375	40	0.5	0.3	1.0	0.3	20-40k	20-30k ± 1½	65	2.0	35	2.5	0.25	4,8, 16	28	15½ x 7½ x 4¾	15	139.95	Distortion indicators.
	AM-395	12	0.75	0.4	1.5	0.52	20-28k	20-20k ± 1.8	58	2.0	40	2.8	0.2	4,8, 16	20	11½ x 7¼ x 4¼	12	80.00	
	AM-372	8	1.75	1.75	1.5	1.0		20-20k ± 3					0.25	4,8, 16		12¼ x 7½ x 3¼	7	34.99	
PANASONIC	SU3604 4-chan.	50	0.2		0.2		5-50k	5-100k ± 1	73	1.5	130		0.1	4,8, 16	100	16½ x 14¾ x 5⅞	27	369.95	Matrix decoder; direct coupling.
	SU3404 4-chan.	35	0.2		0.2			5-100K ± 3	73	2.0	100		0.1	4,8, 16	50	17½ x 11⅜ x 7	24	289.95	Discrete; 2 matrix; preset.
PHASE LINEAR	(B) 700	350	0.1	0.1	0.1	0.1	0-40k	0-250k ± 0.1	100						1000	19 x 10 x 7½	45	779.00	2 mtrs.; turn-on time delay.
	(B) 400	200	0.1	0.1	0.1	0.1	0-40k	0-250k ± 0.1	100						1000			499.00	2 mtrs.; turn-on time delay.
PILOT	310 4-chan.	30	0.5		0.5		15-30k		65	2.5; 4.5			0.2	8	40	18 x 12 x 6½		349.90	Discrete, SQ. matrix; 60 W stereo; 4 mtrs.; mic mix.; bal. signal.
	210	25	0.5		0.5		25-25k		65	2.5			0.2	8	25	15 x 12 x 5		159.90	

Amplifiers—Basic & Integrated

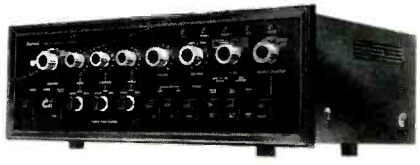


Pioneer SA-1000

Revox A78

Scott 499

Sherwood S9400



Sansui AU999

MANUFACTURER	MODEL	RMS power/chan., W, 8 ohms	THD at rated power, %	THD at 1 watt, %	IM at rated power, %	IM at 1 watt, %	Power bandwidth, Hz - kHz	Freq. resp. at 1 watt, Hz ± 1 dB	Rated output S/N, phono, dB	Phono sensitivity, mV	Phono overload, mV	Tape head input, mV	High level input, V	Output Z, ohms	Damping factor	Dimensions, W x D x H, in.	Weights, lbs.	Price	SPECIAL FEATURES
PIONEER	SA-1000	57	0.3	0.05	0.2	0.2	5-80k	5-80k ± 1	80	2.9	80	–	0.2	8	65	17 x 13¾ x 5¾	29	329.95	Direct coupled; prot. cir.; step tone contls.; 2 monitors; cabinet.
	SA-800	34	0.5	0.1	0.2	0.2	5-80k	5-80k ± 1	80	3	80	–	0.23	8	65	17 x 13¼ x 5¾	23	259.95	Direct coupled; prot. cir.; step tone contls.; 2 monitors; cabinet.
	SA-600	19	0.5	0.1	0.2	0.2	10-50k	15-70k	80	2.3	70	–	0.2	8	30	17 x 13¼ x 5¾	19	199.95	Two monitors, cabinet.
	SA-500A	10	0.5	0.1	0.5	0.2	20-40k	20-50k	75	2.5	70	–	0.2	8	40	13 x 12½ x 4⅜	12	119.95	Two monitors; 2 speaker sys.; cabinet.
RADFORD (AUDIONICS)	SPA50II	65	0.01	0.01	0.01	0.01	18-150k							4,8, 16	50	16⅜ x 8¾ x 4½	26	375.00	
RADIO SHACK	QA-680 4-chan.	12					30-20k	20-25k ± 3		2.5				4,8, 16	30	14⅛ x 11¾ x 4	14	199.95	4-chan.: built-in decoder.
	QA-620 4-chan.	2					20-20k	30-25k ± 3		1.5				8		12 x 8 x 4	10½	69.95	4-chan.; built-in decoder.
	SA-900	22	1	0.2	0.4	0.25	20-20k	30-20k ± 3	55	2.5			0.2	4,8, 16		14¼ x 11 x 3½	17	139.95	Mag. phono & 2 tape inputs.
	SA175B	8	1	0.3	0.5	0.3	25-15k	20-20k ± 3	55	2.5, 100			0.5	4,8, 16		7 x 10 x 4		64.95	Mag. & cer. phono inputs.
REVOX	A78	40	0.1	0.1	0.3		10-40k	20-20k ± 1	80	2.0			0.25	4,8, 16	20	16⅜ x 7⅞ x 6¼	18	379.00	Step. tone contls.; sep. adj. inputs.
ROTEL	RA-610	32	0.1	0.08	0.1	0.1	3-55k	5-90k +0-3	65	2.5	100		0.12	4,8, 16	35	16¼ x 8¾ x 4⅞	13¼	179.95	Slide contls.; mute; 2 spkr. sys.; loudness swit.
	RA-310	17	0.3	0.2	0.4	0.2	20-80k	15-90k +0-3	65	2.7	50		0.28	4,8, 16	30	14 x 7½ x 4½	12	119.95	2 spkr. sys.; mag. & cer. phono inputs; loudness swit.
	RA-210	8	0.5	0.3	1.0	1	30-25k	20-85k ± 1	60	2.7	40		0.12	4,8, 16	15	12¾ x 6½ x 3¾	7½	69.95	Mag. & cer. phono inputs; phone jack.
SAE	(B)Mk III	120	0.1		0.1		8-50k	3-100k +0-2	100						150	17 x 15 x 5¾	49	700.00	2 VU meters.
	(B)Mk IIB	90	0.1		0.1		8-50k	3-100k +0-2	100						150	17 x 13¾ x 5¾	49	450.00	
	(B)MK IIIA	120	0.1		0.1		8-50k	3-100k +0-2	100						150	17 x 13¾ x 5¾	49	550.00	
	(B)MK IVB	60	0.1		0.1		8-50k	3-100k +0-2	100						150	17 x 13¾ x 5¾	45	350.00	2 VU meters.
	(B)MK XXIII	300	0.1		0.1		8-50k	3-100k +0-2	100						150	19 x 18½ x 7	100	950.00	Mk XXIIIA, less meters, $850.00.

Amplifiers—Basic & Integrated

Sony 1130

Superscope A-240

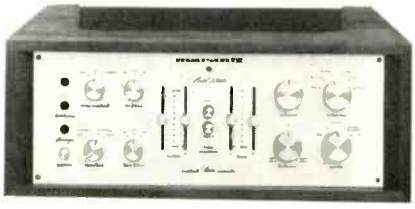
TEAC AS-100

MANUFACTURER	MODEL	RMS power/chan., W, 8 ohms	THD at rated power, %	THD at 1 watt, %	IM at rated power, %	IM at 1 watt, %	Power bandwidth, Hz - kHz	Freq. resp. at 1 watt, Hz ± dB	Rated output S/N, phono, dB	Phono sensitivity, mV	Phono overload, mV	Tape head input, mV	High level input, V	Output Z, ohms	Damping factor	Dimensions, W x D x H, in.	Weights, lbs.	Price	SPECIAL FEATURES
SANSUI	AU-999	50	0.4		0.4		10-30k	5-100k ±1	80	2.0			0.2	4,8, 16	45	18⅛ x 11¾ x 6⅛	38½	329.95	Sep. adj. inputs; mute; 3 tone contls. with turn-over select.; bal. check.
	QS-500 4-chan.	33	0.5		0.5		20-40k	20-50k ±1					0.15	8	24	15 x 13¼ x 6½	22	289.95	Add-on amp w. decoder.
	QS-100 4-chan.	15	0.8		1		25-40k	20-50k ±1					0.1	8	70	9⅞ x 11 x 5	11	214.95	As above.
	AU-505	25	0.5		0.5		25-40k	20-60k ±2	70	3.0			0.2	4,8, 16	50	16 x 11 x 4½	17¾	159.95	Front panel mic jack; wal. cab.
	AU-101	15	0.8				25-40k	20-60k ±2	65	3.0			0.2	4,8, 16		16 x 11 4½	13	114.95	Wal. cab.
SANYO	DCA 1700X 4-chan.	20	0.8		0.8		15-100k	10-100k ±2		2.5						11½ x 10 x 4¼	11	169.95	For add-on 4-chan.; discrete and SQ matrix; 2 or 4 chan. tape inputs, phone jack.
	DCA 1400	20	0.8		0.8		15-100k	10-100k ±2	75	2.5						11½ x 10 x 4¼	11	139.95	2 spkr. sys.; slide bal. cont.; phone jack.
	DCA 1600 4-chan.	10	0.8		0.8		15-100k	10-100k ±2								11½ x 10 x 4¼	9½	119.95	For add-on 4-chan.; 2 matrix & SQ; slide bal. cont.
SCOTT	490	70	0.5	0.5	0.5	0.5	15-40k	15-30k	65	4.0			0.55	8	30	17½ x 15½ x 6	36	299.90	Preamp output/power amp input allow use of Dolby/equalizer units, etc.
	499 4-chan.	35	0.5	0.5	0.5	0.5	15-25k	15-30k ±1	65	3.0		1.0	0.5	8	30	18½ x 14 x 6¼	36	459.90	4-chan.; can be used as 2 sep. 2-chan. amps with indiv. front-ends, contls.
SHERWOOD	S9400	50	0.8	0.15	0.6	0.3	5-45k	20-20k ±0.5	60	1.8	80	2.1	0.2	8	40	17½ x 14 x 5½	29	259.95	2 phono imputs; 2 AUX inputs; mics; built-in Dynaquad; spkr. overload protection.
SINCLAIR (AUDIONICS)	605	30	0.1	0.1	0.15	0.15	15-35k		65	3	30			4,8, 16	50			109.95K	Supplied in semi-kit of modules; case opt.
SONY	TA-1130	65	0.1	0.05	0.1	0.05	7-30k	10-200k +0-2	70	1.2	90		0.13		100	15¾ x 12⅞ x 5⅞	28¾	371.50	
	TA-1150	40	0.2	0.1	0.2	0.1	8-35k	12-150k +0-2	70	2.0	70		0.14		100	15¾ x 12½ x 5¾	18⅜	249.50	2 tape mon.
	TA-3211F (B)	100	0.1	0.03	0.1	0.03	5-35k	5-200k +0-2	110						170	15¾ x 12¾ x 5⅞	30⅝	359.50	
	TA-3130 (B)	70	0.1	0.05	0.1	0.05	7-30k	10-200k +0-2	110						200	7⅞ x 12¾ x 5⅞	17⅜	249.50	
SPECTROSONIC	SQ4 4-chan.	20	0.25	0.35	0.18	0.3	10-36k	5-50k ±2					0.8, 0.25	4,8, 16	30	7½ x 14 x 5		99.95	SQ, matrix, discrete; lo level input for JVC/RCA sys.; tape mon.
SUPERSCOPE	A-225	5	1.0	0.5			28-53k	27-43k	60	2.5	100		0.18	8	30	14¼ x 7⅜ x 4½	6½	79.95	Mag./cet. phono. inputs.
	A-240	10	1.0	0.5			13-23k	8½-36k	60	2.7	85		0.2	8	30	14⅜ x 7½ x 4½	8¾	99.95	Tape mon.; main/remote spkr. swit.
TEAC	AS-100	60	0.2	0.1	0.2		10-40k	5-200k +0-2	70	2.0		–	150 mV	8		16⅛ x 12¼ x 5½	22	299.50	
TOMLINSON	(B) 1002	100	0.15	0.05	0.15	0.05	15-23k	10-100k ±1							500	17 x 10 x 7	33	450.00	Level contls.; port. cir., modular cons.; power swit. Mono version, Model 1001, as above; $275.00.
	(B) 3501	350	0.15	0.05	0.15	0.05	15-23k	10-100k ±1							500	17 x 10 x 7	38	500.00	Mono, features as above.
TOSHIBA	SB404 4-chan.	17	0.8	0.1	0.8	0.2	10-30k	10-55k ±3	65	3			0.15	8	20	15¼ x 12 x 4⅞	16		2/4-chan. pre-main amp.
	SC410	15	0.8	0.2	0.8	0.2	20-40k	20-40k ±3	65	150			0.5	8	20	11⅞ x 15⅛ x 4⅞	13	169.95	QM decoder.

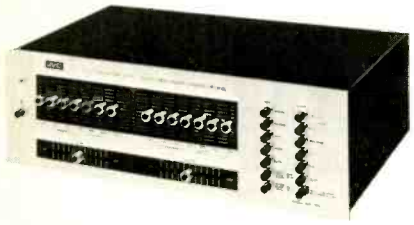
Pre-amplifiers

Audio Research SP-3

Crown IC 150



Marantz 3300



JVC VP-10

SAE Mk I

MANUFACTURER	MODEL	Frequency response, Hz ± dB	Rated output, V	THD at rated output, %	IM at rated output, %	Rated output S/N, phono, dB	Phono sensitivity, mV	Phono overload, mV	Tape-head sens., mV	High-level sens., V	Tape-monitor Z, ohms	Dimensions, W x D x H	Weight, lbs.	Price	SPECIAL FEATURES
AUDIO RESEARCH	SP-3 (T)	5-30k ± 1	5.0	0.005	0.005	70	2	400		0.1	10k	15⅝ x 14¾ x 5	23	595.00	2 tape mon., inputs, & outputs.
BGW SYSTEMS	4XPA 4-chan.	5-75k ± 1	5.0	0.1	0.1	70	2.5	125		0.2	600	15 x 10 x 7	20	N.A.	4-chan.
CROWN	IC-150	3-100k ± 0.6	2.5		0.01	90	0.8-8*	33-330*		0.22	600	17 x 8⅛ x 5¼	10	269.00	*Adjustable.
DYNACO	PAT-4	10-100k ± ½	2	0.05	0.05	70	3	80	3	0.15	600	13½ x 9 x 4	10	89.95K 159.95W	Front panel input & output; 3-pos. hi filter.
	PAS-3 (T)	10-40k ± ½	2	0.05	0.05	70	2	250	2	0.2	47k	13½ x 9 x 4	11	79.95K	3-pos. blend swit.
ESS	ESS-1	5-100k ± 0.5	2.5	0.025	0.025	80	2.5	100		0.25	100	16⅜ x 12 x 5¾	20	289.00	
HARMAN-KARDON	Citation 11	1-150k ± 1½	6.0	0.05	0.05	65	2.5	200		150		16 x 12 x 4¾	20	350.00	2 tape con.; equalizer; spkr./phones swit.
JVC	VP-10	10-100k ± 0.5	3.0	0.03	0.05	84	1.0	120	1.2	0.17	10k	19 x 13½ x 6	22	599.95	7-pos. SEA tone control.
	VP-100	18-50k ± 0.5	1.0	0.03	0.1	80	1.2	120		0.12	12k	17 x 11½ x 5½	19	259.95	7-pos. SEA tone control, pink noise tester.
	4DD-5	20-16k	0.3				1.5					7 x 13 x 3½	5	99.95	CD-4 demodulator for discrete 4-chan. disc.
MARANTZ	3300	20-20k ± 0.25	3.0	0.02	0.02	100	1.35	120	1.3	0.135	47k	15⅜ x 8¾ x 5¾	14	395.00	Straight-line tone contls.; front panel dubbing; 2 tape mon.; remote spkr. swit.
PIONEER	SC-100	5-50k ± 1	5.0	0.2	0.2	70	1.5	80		0.08		17 x 12 x 7	14	375.00	Step tone contls.; muting sw.; phone jack.
	SC-700	10-60k ± 1	4.0	0.5	0.2	80	4	90		0.25		12 x 10 x 4½	13	129.00	Step cone contls.; muting sw.; phone jack.
RADFORD (AUDIONICS)	SC24	20-50k ± 1	5	0.01	0.01	75	2	200		0.08	Lo	16⅜ x 8¾ x 4½	21	359.95	Mid-range contl.; graphic contls.
SAE	Mk I	10-100k ± 0.25	2.5	0.02	0.02	75	2.5	100		0.25	5k	17 x 10½ x 5¾	18	550.00	Stepped contls.; tape copy; equalizers.
	Mk IX	10-100k ± 0.25	2.5	0.02	0.02	75	2.5	100		0.25	5k	17 x 7 x 5¾	16	350.00	Torroid filters; tape copy; equalizers.
SONY	TA-2000F	10-100k +0-2	4.5	0.03	0.05	90	1.2	300		0.11		15¾ x 12⅜ x 5¾	19	549.50	2 Mtrs.; simil. rec. on 2 tape rec.

Crown

PROFESSIONAL STUDIO EQUIPMENT

Specs	15ips	7½ips
w. & fl.	0.06%	0.09%
f. resp. +2dB	40Hz to 30kHz	20Hz to 20kHz
S/N	-60dB	-60dB

3 speeds - 15, 7½ & 3¾ips; hysteresis synchronous drive motor

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

torque reel motors

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

optional Trac-Sync

individual channel equalizers

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

2 mixing inputs per channel

individual channel bias adjust

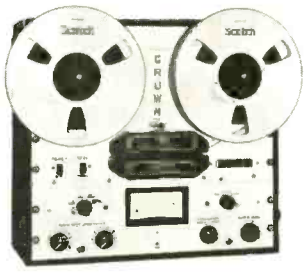
"construction . . . rugged enough to withstand parachute drops" -Audio magazine, 4/68

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

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

CX822

RECORDERS & REPRODUCERS



SX711

Claimed by its pro audio owners to be the finest professional tape recorder value on the market today - price versus performance ■ Frequency response at 7½ips ±2dB 20Hz-20kHz, at 3¾ips ±2dB 20Hz-10kHz ■ Wow & flutter at 7½ips 0.09%, at 3¾ips 0.18% ■ S/N at 7½ips -60dB, at 3¾ips -55dB ■ Facilities: bias metering and adjustment, third head monitor with A/B switch, sound-with-sound, two mic or line inputs, meter monitoring same as CX822, 600Ω output ■ Remote start/stop optional, automatic stop in play mode ■ $895 for full-track mono deck as shown, $995 for half-track stereo deck

SP722

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

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

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

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

STUDIO MONITOR AMPLIFIERS

D60

Delivers 30 watts RMS per channel at 8Ω ■ Takes only 1¾" rack space, weighs 8½ lbs. ■ IM distortion less than 0.05% from 1/10w to 30w at 8Ω ■ S/N 106dB below 30w output ■ $229 rack mount

D150

Delivers 75 watts RMS per channel at 8Ω ■ IM distortion less than 0.05% from 0.01w to 75w at 8Ω ■ S/N 110dB below 75w output ■ Takes 5¼" rack space, weighs 20 lbs. ■ $429 rack mount

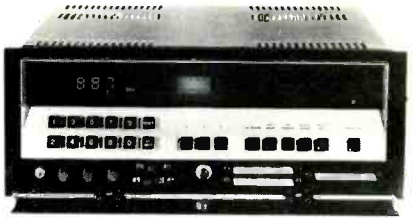
DC300

Delivers 150 watts RMS per channel at 8Ω ■ IM distortion less than 0.05% from 0.01 w-150w at 8Ω ■ S/N 110dB below 150w output at 8Ω ■ Lab Standard performance and reliability ■ "As close to absolute perfection as any amplifier we have ever seen" - Audio magazine, 10/69 ■ $685 rack mount

Check No. 39 on Reader Service Card

Tuners

Dynaco AF-6



Heath AJ-1510

MANUFACTURER	MODEL	IHF sensitivity, μV	Capture ratio, dB	Alt. chan. selectivity, dB	Am suppression, dB	Frequency response, Hz ± 1 dB	Stereo separation, 1000 Hz, dB	Stereo separation, 10 kHz, dB	THD, mono, 100% mod., %	THD, stereo, 100% mod., %	Tuning indicator	S/N, dB	AM band?	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
ACOUSTIC RESEARCH	AR	2.0	2.0	55	55	20-15k ± 1	40	43	0.5	0.5	Mtr.	65	No	15¾ x 9⅞ x 4½	7½	210.00	Univ. model similar but for 120 or 220 V, 50/60 Hz; swit. de-emphasis 50/75 μS.
DYNACO	AF-6	1.75	1.5	65	58	50-15k ± 1	40	30	0.5	0.5		65	Yes	13½ x 11 x 4	13	199.95K 249.95W	
	FM-5	1.75	1.5	65	58	50-15k ± 1	40	30	0.5	0.5		65	No	13½ x 9 x 4	11	159.95K 249.95W	
HARMAN-KARDON	Citation 14	2	2	60	65	1-100k ± 1½	50	35	1.1	0.3	2 Mtrs.	70	No		22	525.00	Dolby; phase-lock loop; quieting mtr.; Citation 15, less Dolby, $395.00.
HEATH	AJ-1510	1.8	1.5	95	60	20-15k ± 1	40	25	0.3	0.3	*	65	No	16⅜ x 14¾ x 6	23	569.95(K)	*Digital readout; keyboard & synthetic tuning.
	AJ-29	1.8	1.5	70	50	20-15k ± 1	40	30	0.5	0.5	Mtr	60	Yes	16¾ x 13 x 5⅛	14½	179.95(k)	
	AJ-15	1.8	1.5	70	50	20-15k ± 1	40	25	0.5	1.0	Mtr	65	No	16⅞ x 12½ x 4¾	11½	119.95(k)	
	AJ-1214	2	2	60	50	20-15k ± 1	35	25	0.5	1.0		65		12¾ x 13 x 3⅞	7¾	89.95(K)	With cab.
HITACHI	FT-600	1.8	1.5	50	50		40		0.3	0.5	Mtr.	70	Yes	16¼ x 12⅜ x 4¾	16½	269.95	Multipath terminal.
JVC	VT-900	1.7	0.8	70	55		38	25	0.3	0.5	Mtr.*	65	No	16⅜ x 12½ x 5½	19½	399.95	*Digital readout; IC & FET; dual element FM filters.
	VT-700	1.7	0.8	70	55		35	25	0.3	0.5	2 Mtrs.	65	Yes	17 x 12 x 5½	16½	249.95	4 FM mechanical filters; MPX filter.
KENWOOD	KT-7001	1.5	1.0	90		20-15k ± 1½	30	40	0.25	0.5	2 Mtrs.	75	Yes	16¼ x 11 x 5⅛	18	309.95	3 FETs; X-tal filter & 4 IC i.f.; mute.
	KT-6005	1.5	1.3	80	60	20-15k ± 1	38		0.3	0.5	2 Mtrs.	70	Yes	17⅛ x 11¾ x 6	17¾	269.95	Mute; 'scope output.
	KT-4005	1.9	2.0	60	55	20-15k ± 1½	35		0.4	0.7	2 Mtrs.	70	Yes	17⅛ x 11¾ x 6	17¾	189.95	As above.
	KT-2001	2.0	4.0	45		20-15k ± 2	30		0.5	0.7	Mtr.	60	Yes	13 x 9½ x 5	9½	119.95	
KIRKSAETER	RT7010	1.1	1.5	60	50		40							18¾ x 12¼ x 4¾	12		
LAFAYETTE	LT-725A	1.7	1.5	50			40			0.25	Mtr.	75	Yes	12 x 3¾ x 9⅛	12½	139.95	Interstation mute; tape output; internal FM antenna.
	LT-670A	3.5	5	35			30				Lt.	50	Yes	10⅝ x 8⅜ x 3½	12	89.95	AFC; MPX filter swit.; built-in AM & FM antennas.
MGA	SM-26	2.0	2	80	50	50-15k ± 3	40		0.5	0.5	Mtr.	70		18⅛ x 15⅜ x 5½	35¼	399.95	
	SM-19	2.5	5	55	40	50-15k ± 3	35		1.0	1.0	Mtr.	60		18¼ x 16⅝ x 9½	27¾	299.95	
	SM-16	2.5	5	55	40	50-15k ± 3	35		1.0	1.0	Mtr.	60		17 x 17 x 9¼	25⅜	229.95	
	SM-14	2.5	5	55	40	50-15k ± 3	35		1.0	1.0	Mtr.	60		17 x 16 x 9¼	25⅜	199.95	
MARANTZ	120	1.4	1.5	80	80	20-15k ± 1	42	26	0.15	0.25	*	80	Yes	15⅜ x 13 x 5¾	27	429.95	*Built-in oscilloscope; Gyrotouch tuning.
	105	2.8	2.5	48	30	20-15k ± 1½	32	22	0.6	1.0	Mtr.	60	Yes	14¼ x 12 x 4¾	26	149.95	Gyro-touch tuning; FET; IC.
	115	1.7	1.6		60	20-15k ± 1	42		0.15	0.3	Mtr.			15⅜ x 13 x 5¾	30	249.95	Front-panel muting level contl.; jack for 4-chan. decode.
NIKKO	FAM-14	1.8	1.5	60	60	50-15K ± 1	38	20		1	Mtr.	60		13 x 9½ x 3¾	8½	139.95	Dual-gate FET; cer. filters; plug-in modules; circuit bkrs.
	FAM-12	1.8	3.0	55	60	50-15k ± 1	40	30		1	Mtr.	60	Yes	12 x 10 x 3¼	7½	119.95	FETs; noise filter; mute.
OLSON	RA-235	2.0	2.0	40	40	50-15k ± 2	30	18	0.6	1.0	Mtr.	65	Yes	15½ x 17½ x 4¾	12	139.00	
	RA-310	3.5	3.8	35	37	50-15k ± 3	28	16	0.9	1.8	Mtr.	58	Yes	11½ x 7¼ x 4¼	10	80.00	
PANASONIC	ST-3600	1.7	1.5	65	50	30-13k ± 0.5	40	25	0.3	0.5	2 Mtrs.	70	Yes	16½ x 14¾ x 5⅞	21	299.95	4-pole MOS FET; x-tal filters; ICs; 6 FM i.f. amp.
	SR3400	1.7	1.5	65	50	40-13k ± 0.5	40	25	0.3	0.5	Dual Mtr.	70	Yes	16⅜ x 11¾ x 5½	17½	239.95	2 4-pole MOS FETs; handles 4-chan MPX adapter.

Some expert opinions on the Heathkit "Computer Tuner" and AR-1500 Stereo Receiver:

"...The tuner which may well prove to be the 'classic' of the 1970's is Heath's new AJ-1510 Digital FM Stereo Tuner." – *Leonard Feldman,* AUDIO MAGAZINE

"...It is probably as near to the ideal FM tuner as we have ever encountered." – *Julian Hirsch,* STEREO REVIEW

"...We know of nothing else on the market with comparable features... It more closely resembles a small digital computer. There are no moving parts (the tuning is entirely electronic) ..." – *Julian Hirsch,* STEREO REVIEW

"...All frequency indications are read from digital read-out tubes... at the left are ten keyboard buttons... as well as a re-set button (punched when you wish to 'punch up' a new station frequency) and a button labeled BY-PASS (used to initiate the 'auto-sweep' action ...three more buttons... select three pre-determined favorite stations... you easily program onto... cards yourself." – *Leonard Feldman,* AUDIO MAGAZINE

"...Because of the crystal controlled reference frequency and the phase-lock-loop circuitry... the accuracy of the frequency tuned ...will be as accurate as the crystal frequency and, in the case of the AJ-1510, that means at least 0.005% accuracy!... in short, every spec was easily met or exceeded... [it] has got to be the way all tuners of the future will be made." – *Leonard Feldman,* AUDIO MAGAZINE

"...for anyone who wants a tuner that is most certainly representative of the present state of the art, and which is not likely to be surpassed in any important respect for the foreseeable future, his search can stop at the AJ-1510." – *Julian Hirsch,* STEREO REVIEW

Kit AJ-1510 "Computer Tuner," less cabinet, 23 lbs. **539.95***
AJ-1510-1, Pecan cabinet, 6 lbs. **24.95***

"...The AR-1500 is the most powerful and sensitive receiver we have ever measured." – *Julian Hirsch,* STEREO REVIEW

"...a stereo receiver easily worth twice the cost (or perhaps even more)..." – AUDIO MAGAZINE

"...Great new solid-state stereo receiver kit matches the demands of the most golden of golden ears." – RADIO ELECTRONICS

"...The FM tuner section... was outstandingly sensitive. We measured the IHF sensitivity at 1.4 microvolts and the limiting curve was the steepest we have ever measured ...The FM frequency response was literally perfectly flat from 30 to 15,000 Hz... Image rejection was over 10 dB (our measuring limit)... The AM tuner... was easily the best-sounding AM tuner we have had the pleasure of using..." – *Julian Hirsch,* STEREO REVIEW

"...As always, construction instructions are lucid enough for the inexperienced kit-builder and there is enough technical and theoretical information to satisfy even the most knowledgeable audio/RF engineer." – AUDIO MAGAZINE

"...As you know, the original, the AR-15 has been widely acclaimed as one of the very best stereo receivers that has ever been made. Therefore, it's hard to imagine that anyone has gone ahead and built a better one. But spec for spec, the AR-1500 is ahead of the AR-15." – RADIO ELECTRONICS

Kit AR-1500 Stereo Receiver, less cabinet, 53 lbs. ... **379.95***
ARA-1500-1, Walnut cabinet, 8 lbs. **24.95***

Now available assembled, ready to use. Supplied with its individual performance curves plotted and pertinent specifications measured, documented and guaranteed for one year.

Model ARW-1500, receiver & walnut cabinet, 48 lbs., Exp./Frt. **649.95***

Heathkit 4-Channel Amplifier.....349.95* less cabinet

The new Heathkit AA-2004 gives you 50 watts per channel (IHF) into 8 ohms for discrete or matrixed 4-channel sound, stereo or mono. The built-in decoding circuitry decodes matrixed 4-channel material, gives your existing stereo library a brilliant 4-channel effect. Amplifier sections are controlled in pairs for front and back speakers. That gives you two complete stereo systems if you want. In 4-channel mode, there's capability for both main and remote systems. That's eight speaker systems! Move up to 4-channel... order your AA-2004, now.

Kit AA-2004 amplifier, less cabinet, 39 lbs. **349.95***
AAA-2004-1, pecan cabinet, 7 lbs. **24.95***

See them all at your Heathkit Electronic Center... or fill out the coupon below

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HEATHKIT Schlumberger

See and hear the Heathkit "Computer Tuner" and AR-1500 Stereo Receiver at your nearest Heathkit Electronic Center. For complete specs on both, send for your free Catalog.

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Benton Harbor, Michigan 49022

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☐ Enclosed is $_____, plus shipping.
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Address_____
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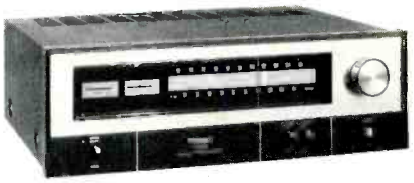
Tuners

Scott 433



TEAC AT-100

All numbers solid-state except when model number is preceded by (T). "K" indicates kit price; "W" wired.

MANUFACTURER	MODEL	IHF sensitivity, μV	Capture ratio, dB	Alt. chan. selectivity, dB	AM suppression, dB	Frequency response, Hz ± 1 dB	Stereo separation, 1000 Hz, dB	Stereo separation, 10 kHz, dB	THD, mono, 100% mod., %	THD, stereo, 100% mod., %	Tuning indicator	S/N, dB	AM band?	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
PILOT	211	1.8	1 8	60		20-15k ± 1	38	25	0.5	0.8	2 Mtrs	60		15 x 12 x 5		199.90	Front panel tape input.
PIONEER	TX-1000	1.7	1.5	70	55		40	25	0.3	0.5	Mtr.	70	Yes	17 x 13¾ x 5⅝	19	299.95	2 Xtal filters; linear scale, muting level contl.; phone jacks; cabinet.
	TX-800	1.8	2	70	50		40	25	0.4	0.4	Mtr.	70	Yes	17 x 13¾ x 5⅝	16	229.95	3 solid state filters; linear scale; muting; cabinet.
	TX-600	2.2	3	45	50		40	25	0.6	0.6	Mtr.	70	Yes	17 x 13¾ x 5⅝	17	179.95	Solid state filter; linear scale; muting; cabinet.
	TX-500A	2.3	3.5	45			40	25	0.5	0.6	Mtr.	70	Yes	13 x 13¾ x 4⅝	10	119.95	Muting; linear scale; cabinet.
RADFORD (AUDIONICS)	FMT-4	1.2	1	100	50	40-15k ± 1	40	40	0.2	0.5	Mtrs.	70	No	16⅜ x 8¾ x 4½	18	475.00	Phase-lock loop, pushbutton & remote select.; varicap tuning.
RADIO SHACK	TM-90	4	3.5			20-20k ± 2		20	0.25	0.3	Mtr.	55	Yes	14½ x 11 x 3½	11	109.95	FET front-end; wood case.
	TM-175B	5				20-20k ± 2		25	0.25	0.3	Mtr.	48	No	7 x 10 x 4	6	69.95	As above.
	TM-100	5	6	15		20-20k ± 2		15	0.3	0.3	Mtr.	40	No	9 x 3 x 6½	6	44.85	Wood case.
REVOX	A76	1.0	1.0	80	54	30-15k ± 1	40	30		0.2	Mtr.	70	No	16⅜ x 9⅜ x 6¼	18	549.00	Var. trigger level.
ROTEL	RT-620	1.7	1.5	60		40-18k ± 1	38	25	1.0	0.8	Mtr.	65	Yes	16¼ x 9½ x 4⅞	11	179.95	Adj. mute; cer. filter; FET.
	RT-320	2.0	3	45		50-15k ± 1	35	20	1.0	1.0	Mtr.	65	Yes	14 x 7½ x 4½	8¾	119.95	FET; 4-stage i.f.
SAE	MK VI	1.6	1.9	75	60	20-15k ± ½	50	30	0.1	0.15	*	75	No	17 x 10½ x 5¾	25	950.00	*Digital readout, 3-in. scope; 14 pole filter; 4 ganged FET front-end.
SANSUI	TU999	1.8	1.5	70			38		0.3	0.5	2 Mtrs	65	Yes	17⅛ x 13⅛ x 6⅛	22	279.95	Muting level contl.
	TU666	2.5	3	45			35		0.8		Mtr.	65	Yes	13¼ x 11 x 5	11	159.95	Muting swit.
	TU555	2.5	3	45			35		0.8		Mtr.	60	Yes	11½ x 11½ x 4⅜	8½	129.95	Muting swit.
SANYO	FMT 1400K	1.8	1.8	50		10-15k +0-2	35		0.6		Mtr.	60	Yes	11½ x 11 x 4⅛	7¾	129.95	FET front-end; ICs; MPX noise filter.
SCOTT	431	1.7	2.5	70	70	50-15k	35	25	0.8		2 Mtrs.	65	Yes	17½ x 15½ x 6	20	219.90	
	433	1.9	1.8	75	70	50-15k	35	25	0.25		*	67	No	17½ x 15½ x 6	24	459.90	Digital readout; quartz crystal freq. synth.; manual or auto station selection.
SHERWOOD	S2400	1.8	1.5	65	60	20-15k ± 1	40	25	0.25	0.5	2 Mtrs.	70	Yes	17½ x 14 x 5½	29	229.95	Wal. case; scope outs; 4-chan. FM outs.
	SEL300	1.5	1.7	80	65	20-15k ± 1	40	30	0.15	0.25	2 Mtrs.	70	No	16¼ x 14 x 5¼	25	579.00	Digital readout; scope outs; tape mon. & dubbing; headphone amp. & out.
SONY	STC-7000	1.7	1.0	100	60	30-15k ± 1	40		0.3	0.5	2 Mtrs	70	Yes	18¾ x 13½ x 5½	23	599.50	Multipath and audio outputs.
	ST-5130	1.5	1.0	100	60	20-15k ± 1	42		0.2	0.3	2 Mtrs.	72	Yes	15¾ x 16½ x 5⅞	17	329.50	Multipath output.
	ST-5150	2.0	1.0	70	56	20-15k ± 1	40		0.3	0.5	2 Mtrs.	70	Yes	15¾ x 13½ x 5¾	16	249.50	Multipath output.
	ST-5600	3.0	2.0	50	60	30-15k ± 1	38	30	0.3	0.7	Mtr.	65	Yes	16⅜ x 10½ x 4⅞	9	122.50	
SUPERSCOPE	T-208	5.0	6	40	26½	20-10.5k ± 1½	30	16	1.5	1.5	Mtr.	50	Yes	14¼ x 8 x 4½	5¼	89.95	
TEAC	AT-100	2.0	1.5	65	50	50-15k ± 1	40	30	0.5	0.5	Mtr.	70	No	16⅛ x 13 x 5½	16½	229.50	
TOSHIBA	ST500	1 8	1.5	80	50	20-15k ± 1	35		0.2	0.5	Mtr	66		15¾ x 12 x 4⅞	15		

The first tuner that can tell the difference between music and noise.

Since the function of FM tuners is to bring in FM stations, tuners have traditionally been designed to bring in the strongest signals possible.

This seems like the height of common sense. It isn't.

Signals, weak or strong, are often noisy. So even after you pull in a strong signal, you may have to deal with the problem of noise polluting the music. Since your tuner can't tell you which is which, you have to rely on instruments that have failed you in the past. Your ears.

Not with the new Citation 14.

Ours is the first tuner with a quieting meter (patent pending). It tells you exactly how much noise is accompanying the music. This lets you adjust the tuning dial, or your antenna, to the precise point where quieting is at a maximum. (It's sensitive enough to detect a 1° rotation of your antenna.)

But Citation 14 does more than just tell you how noisy a signal is. It's the first tuner with a multiplex circuit that senses any phase error in the pilot signal, and then readjusts the circuit for maximum separation and minimum distortion.

Once Citation 14 has brought in the cleanest possible signal, it won't add any noise of its own. Signal-to-noise ratio is −70dB. And to make things even quieter, it's also the first tuner with a built-in Dolby noise suppressor.

But to really appreciate all these firsts, you first have to record off the air.

Since it is so noiseless, you can produce recordings of close to master-tape quality. It even has a 400-Hz tone oscillator to let you match levels with the station you're recording. So you don't have to make adjustments every time the music changes.

Still, at $525, Citation 14 obviously isn't for everyone. Like Citation amplifiers, preamplifiers and speakers, it's designed for people who can't tolerate even the suspicion that there's anything in their music but music.

But if you are such a person, there's finally a tuner as intolerant as you.

For complete details and specifications, write Harman/Kardon Incorporated, 55 Ames Court, Plainview, N.Y. 11803.*

harman / kardon
The Music Company

*Distributed in Canada by Harman/Kardon of Canada, Ltd., 9429 Cote de Liesse Rd., Montreal 760, Quebec.

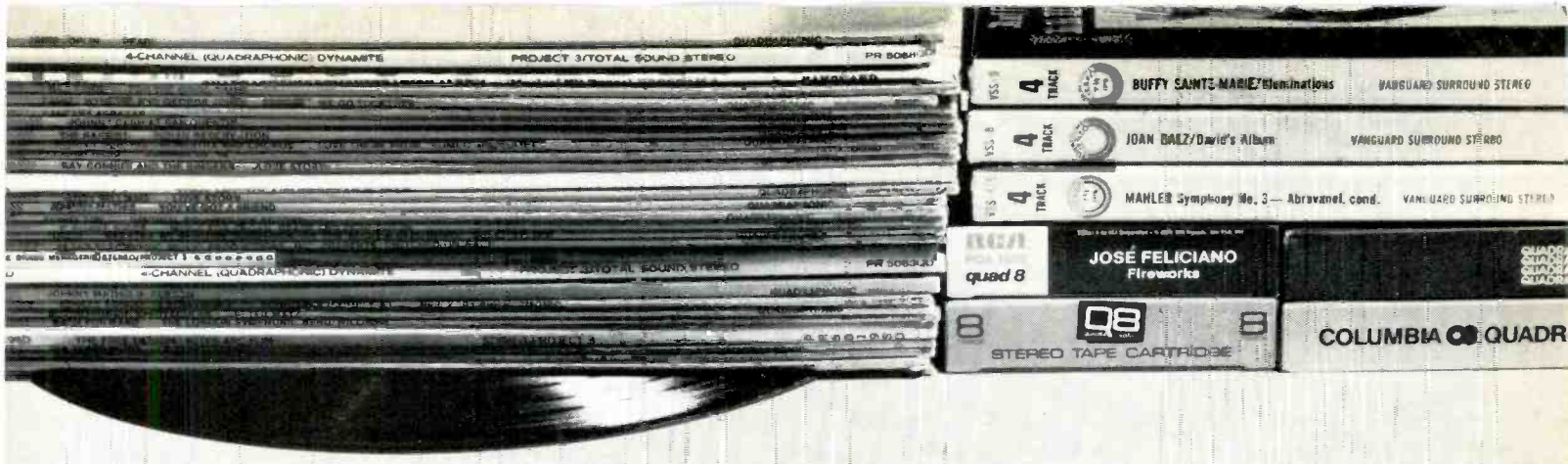
Check No. 42 on Reader Service Card

Receivers

E-V 4X4

Fisher 504

		AMPLIFIER										TUNER											
MANUFACTURER	MODEL	RMS power/chan., W, 8 ohms	THD at rated power, %	IM at rated power, %	IM at 1 watt, %	Power bandwidth, Hz–kHz	1-watt freq. resp., Hz ± dB	Rated output S/N, phono, dB	Phono sensitivity, mV	Phono overload, mV	IHF sensitivity, µV	Capture ratio, dB	THD mono, 100% mod., %	THD stereo, 100% mod., %	Stereo separation, 1000 Hz dB	Tuning indicator	Alt. chan. selectivity, dB	AM band?	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
ACOUSTIC RESEARCH	AR	50	0.5	0.25	0.1	14-44k	20-20k ± 1	57	2.5 adj.	100	2.0	2.0	0.5	0.5	40	Mtr.	55	No	17¼ x 11½ x 6	33	420.00	Wood case opt., $20.00. Univ. model similar but handles 100, 120, 220, 240 V, 50-60 Hz; swit. de-emphasis 50-75µV.
AKAI	AS8100S 4-chan.	18	0.1			20-20k	20-100k ± 3	60	3		2	1.5	0.5	0.8	40	Mtr.	60	Yes	19¼ x 14½ x 7	35¼	399.95	Matrix, discrete; joy-stick bal. contl.; muting; MOS FET front-end.
	AA8080	35	0.1			20-20k	20-50k ± 3	65			2	1.5	0.5	0.8	40	Mtr.	60	Yes	18½ x 14 x 5¼	25½		FET front-end; muting; prot. cir.; front panel dubbing jacks.
ALTEC	724 tuner/ preamp	5 V rms						60	2.0; 5.0		1.8	1.3	0.3		40		70	Yes	17¾ x 16½ x 5		550.00	Preamp only; Model 780, digital readout, $800.00.
	725A	60	0.3	0.3	0.5	30-20k	20-20k ± ½	60	2.0; 5.0	30; 60	1.8	1.3	0.3		40	2 Mtrs.	70	Yes	17¾ x 16½ x 5		699.00	
	714A	44	0.5	0.5	0.5	30-20k	20-20k ± 1	60	2.0; 5.0	30; 60	1.9	2.0	0.5		40	2 Mtrs.	48	Yes	16½ x 14 x 5⅛		435.00	
	710A	30	0.5	0.5	0.5	30-20k	20-20k ± 1	60	2.5	30	2.5	2.5	0.5		40	Mtr.	40	Yes	16½ x 14 x 5⅛		349.95	
	704A	12½	0.5	0.5	0.5	40-20k	20-20k ± 1	60	2.5	40	2.5	3.0	0.5		35	Mtr.	40	Yes	15⅜ x 13 x 4¾		239.95	
B&O	3000-2	30	0.6	0.6	0.6	10-30K	20-40k ± 2	62	3	12	2	3	0.4	0.4	40	2 Mtrs.	55	No	22¾ x 10¼ x 3¾	19	380.00	6 presets; ceramic filters; ICs; FETs.
BSR MCDONALD	R-40A	12	1.0	1.0	1.0	20-20k	20-20k ± 2	55	25		2.8	2.5	0.8	1.0	35	Mtr.	40	Yes	15½ x 11¾ x 4⅞	20	179.95	Tape mon.; spkr. select.
	R-30	4.5	1.0	1.0	1.0	20-20k	20-20k ± 2	55	25		2.9	2.5	0.8	1.0	35	Mtr.	40	Yes	16 x 10½ x 4¼	13	129.95	
BRAUN	Regie 510	55	0.1	0.1				80			1.2	1.2	0.2	0.3	40	2 Mtrs.		Yes	19⅜ x 4⅜ x 12⅝	31	749.50	Black or silver face plates.
CONCORD (BENJAMIN)	CR-250	25	1.0			20-35k	22-40k	60	2.5		2.3	1.5	0.5		37	Mtr.	46	Yes		20	229.95	
	CR-200	12	1.0			26-33k	23-38k	58	2.8		2.9	1.8	0.6		35	Mtr.	43	Yes	15⅜ x 12¾ x 5	16	179.95	
DOKORDER	MS-800Q 4-chan.	30	0.5			30-45k	30-70k ± 3	65			1.8		0.5		30	2 Mtrs.		Yes	16⅜ x 11½ x 4¾	17	249.95	Discrete, matrix decode; master vol., l/r, f/b contls.
ELECTRO-VOICE	EVR-4x4 4-chan.	10	1.0			20-20k	20-20k ± 1	54	1.5		2.5	3	0.5	0.5	35	2 Mtrs.		Yes	17⅞ x 11 x 5⅜		349.95	Integral cabinet.
	EVR-3	45	0.2	0.2		10-20k	10-50k ± 1	60	2.5		1.9	2.5	0.3	0.3	30	Mtr.		Yes	17⅞ x 11 x 5⅜		299.95	Integral cabinet.
	EVR-2	27	0.2	0.2		15-20k	10-50k ± 1	60	2.5		2.0	2.5	0.3	0.3	30	Mtr.		Yes	17⅞ x 11 x 5⅜		229.95	Integral cabinet.
	EVR-1	17	0.2	0.2		15-20k	10-50k ± 1	60	2.5		2.3	2.5	0.3	0.3	35	Mtr.	50	Yes	19⅞ x 13⅜ x 6⅞	33⅛	139.95	Discrete, matrix; slide vol. contls.; phone jack.
FISHER	801 4-chan.	44	0.5	0.8		20-25k	30-15k ± 2	60	2.7	50	1.7	1.5	0.35		36	Mtr.	60	Yes	17¾ x 16½ x 6	35	749.95	Matrix; 2 spkr. sys.; pushbut. tune.
	504 4-chan.	50	0.5	0.8		8-40k	20-20k ± 0	65	2.7	60	1.8	1.2	0.2	0.3	38	2 Mtrs.	56	Yes	21½ x 16⅞ x 6⅞	43	499.95	Discrete, SQ; strapped amps; mid contl; master bal. contl. 404, similar but 36 W, $399.95; 304, 28 W, 28 W, $299.95.
	500TX	65	0.5	0.8	0.2	8-35k	20-25k ± 1½	90	2.5; 10	45; 100	1.7	1.5	0.4	0.4	38	Mtr.	70	Yes	16⅞ x 15½ x 4¾	30	499.95	Push but. & elect. tune.; 450T, less pushbutton tune, $399.95.
	401	45	0.5	0.8	0.2	25-20k	20-20k ± 1½	80	2.8	50	2.0	2.8	0.5	0.5	30	Mtr.	45	Yes	18½ x 16 x 5½	20½	449.95	Wireless remote tuning.
	205	35	0.5	0.5		20-50k	20-20k ± 1	70	2.5	50	2.5	3	0.5	0.8	35	Mtr.	40	Yes	17½ x 14 x 5½	23½	299.95	Dual mtr.; mid contl.; hi filter.
HARMAN-KARDON	150+ 4-chan.	30	0.2	0.1	0.05	7-45k	1-85k ± 1	70	2.5	110	1.8	1.5	0.2	0.3	42	Mtr.	60	Yes	18¾ x 15¼ x 5	32	599.95	70 W stereo; SQ; joystick bal.; Dolby; 2 tape mon.
	100+ 4-chan.	24	0.2	0.1	0.05	7-45k	1-85k ± 1½	70	2.5	110	1.9	2.0	0.3	0.5	38	2 Mtr.	50	Yes	18¾ x 15¼ x 5	30	499.95	57½ W stereo; SQ; joystick bal.; Dolby; 2 tape mon.
	75+ 4-chan.	18	0.2	0.1	0.05	7-45k	1-85k ± 1½	65	2.5	100	2.0	2.5	0.3	0.5	35	Mtr.	47	Yes	16⅝ x 15 x 5	28	399.95	45 W stereo; SQ; 4-chan. tape mon.
	930	45	0.08	0.06	0.01	10-45k	1-75k ± 1½	75	2.5	110	1.8	2.0	0.2	0.4	40	2 Mtrs.	60	Yes	17 x 13¾ x 4¾	29	399.95	Dolby; 2 tape mon.
	630	30	0.08	0.06	0.01	10-45k	1-75k ± 1½	75	2.5	100	1.9	2.5	0.3	0.5	35	Mtr.	50	Yes	12 x 13¾ x 4⅞	28	299.95	Dolby.
	50+ 4-chan.	12½	0.6	0.5	0.2	18-40k	15-70k ± 1½	60	2.5	65	2.5	3.0	0.5	0.8	30	Mtr.	45	Yes	15⅝ x 12⅜ x 4¾	18	249.95	SQ; joystick bal. contl.; 4-chan. tape mon.
	330A	20	0.6	0.4	0.1	18-40k	7-70k ± 1	70	2.5	90	2.5	3.5	0.5	0.5	30	Mtr.	45	Yes	15½ x 13 x 4¼	20	199.95	
	230A	10½	0.8	0.6	0.2	20-40k	15-70k ± 1½	60	2.5	85	2.7	4	0.8	0.7	30	Mtr.	40	Yes	14¾ x 7½ x 3⅞	14	159.95	



There goes your last excuse for not getting into 4-channel

Whatever reason might be holding you back from getting into 4-channel now, just won't hold water anymore. Not with the introduction of the Sony SQR-6650 receiver.

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Still a bit skeptical? Consider this: the SQR-6650 has a built-in "Doubting Thomas" insurance. Flick a switch and the four-channel, 32 watt (RMS into 8 ohms) amplifier becomes a 50 watt stereo amplifier (25+25W RMS), thanks to Double-Stacked Differential circuitry.

FM reception is superb: 2.2uV IHF sensitivity, 70dB selectivity, for example. And the preamp section has all the controls for stereo, four-channel, or mono: high filter, loudness compensation, independent bass and treble controls for front and back.

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Enjoy 4-channel now. It's ready at your Sony dealer. Sony Corporation of America, 47-47 Van Dam St., Long Island City, N.Y.11101. *Suggested retail price.

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Receivers

JVC 5444

Kenwood KR-7200

KLH 54

		AMPLIFIER											TUNER										
MANUFACTURER	MODEL	RMS power/chan., W. 8 ohms	THD at rated power, %	IM at rated power, %	IM at 1 watt, %	Power bandwidth, Hz–kHz	1-watt freq. resp., Hz +, -1 dB	Rated output S/N, phono, dB	Phono sensitivity, mV	Phono overload, mV	IHF sensitivity, µV	Capture ratio, dB	THD mono, 100% mod., %	THD stereo, 100% mod., %	Stereo separation, 1000 Hz dB	Tuning indicator	Alt. chan. selectivity, dB	AM band?	Dimensions, W x D x H	Weight, lbs.	Price	SPECIAL FEATURES
HEATH	AR-1500	60	0.25	0.1	0.1	8-30k	7-80k ±1	63	1.8	145	1.8	1.5	0.5	0.5	40	Mtr.	90	Yes	18½ x 13⅞ x 5⅛	32	(K) 379.95	
	AR-29	35	0.25	0.2	0.1	5-30k	7-60k ±1	65	2.2	155	1.8	1.5	0.5	0.5	40	Mtr.	70	Yes	16¾ x 14½ x 5⅛	26.5	(K) 299.95	
	AR-1302	20	0.25	0.25	0.1	5-30k	6-35k ±1	65	2.4	155	1.9	1.8	0.5	0.5	40	Mtr.	60	Yes	16¾ x 14½ x 5⅛	26.5	(K) 239.95	
	AR-1214	15	0.5	0.5	0.2	5-30k	7-100k ±1	60	2	75	2	2	0.5	1	35	No	60	Yes	17 x 13 x 3⅞	13	(K) 169.95	With Cabinet
HITACHI	SR-1100	55	0.5			30-30k	20-50k	70	1.8, 4.0		1.6	0.8	0.3	0.8	42	2 Mtrs.	65	Yes	17⅝ x 13 x 5⅜	27¾	499.95	Wood sides.
	SR-800	40	0.5			30-30k	20-50k	70	2.5, 5.0		1.8	1.1	0.3	0.8	40	2 Mtrs.	43	Yes	17⅝ x 13 x 5⅜	25¾	399.95	Wood sides.
	SR-700	38	0.5			30-30k	20-20k	70	2.5, 8.0		1.8	1.1	0.3	0.8	40	Mtr.		Yes	17⅝ x 13 x 5⅜	25¾	329.95	Wood sides.
	SR-301	12½	1.5			30-20k	20-50k	66	3.0, 7.0		3.0		0.5	1.2	35	Mtr.		Yes	15 x 4¾ x 12½	12	229.95	Wood sides.
JVC	4VR-5445	26	0.5	0.8	0.5	20-30k	15-50k ±1	65	2.5	80	2.0	2.0	0.5	1.0	35	Mtr.*	65	Yes	23 x 14 x 6	33	499.95	4-chan.; 2 SEA tone controls; *Bull's eye tuning indic.; walnut case.
	4VR-5414	20	0.5	0.8	0.5	20-30k	15-50k ±1	65	3.0	70	2.0	2.0	0.5	1.0	35	Mtr*	65	Yes	19½ x 14½ x 6	28	369.95	4-chan.; SEA tone controls; *Bull's eye tuning indic.
	VR-5551	60	0.5	0.8	0.5	15-30k	10-60k ±1	65	2.5	85	1.6	0.7	0.3	0.5	40	2 Mtrs.	70	Yes	19½ x 14½ x 6	29	449.95	SEA tone controls; 2 mic inputs. VR-5541, similar but 40 W., $389.
	VR-5521	26	0.5	0.8	0.5	20-30k	15-50k ±1	65	2.5	80	2.0	2.0	0.5	1.0	35	Mtr*	65	Yes	18 x 14½ x 6	22	299.95	SEA tone controls; *Bull's eye tuning indic.; walnut case.
	VR-5511	19	0.8	0.8	0.6	30-30k	20-50k ±1	65	2.5	70	2.5	4.0	0.5	1.0	33	Mtr*	45	Yes	17 x 13 x 5½	18	229.95	SEA tone controls; *Bull's eye tuning indic.; walnut case.
	VR-5660	90	0.4	0.4	0.3	10-40k	10-60k ±1	65	2.5	100	1.7	0.8	0.4	0.6	40	Mtr*	70	No	20⅜ x 15¼ x 6¾	38	699.95	Digital readout tuner & clock; SEA tone controls; *Bull's eye tuning indic.
KLH	54 4-chan.	25	0.5	0.5	0.3	16-30k	20-20k ±2	63	2.5	50	1.8	2	0.3	0.8	35	2 Mtrs.	46	Yes	17⅞ x 14 x 5½		550.00	Discrete, SQ, CD4; joystick bal. contl.
	52	30	1.0	0.8	0.4	20-20k	20-20k ±2	65	3.5	60	2.0	2.5	0.5	0.8	35	2 Mtrs.	46	Yes	17¾ x 13 x 5¼		289.00	
	51	20	0.5	0.5	0.3	15-30k	10-35k ±2	63	2.5	140	2.5	2.5	0.3	1.0	35	Mtr.	50	Yes	17 x 12⅝ x 6¼	21½	259.95	
	55	13	1.0	0.5	0.5	20-20k	20-20k ±2	55	2.5	50	2.5	4	0.6	1.0	30	Mtr.	45	Yes	16⅜ x 13 x 5¼		199.95	
KENWOOD	KR-7200	55	0.5	0.5	0.1	10-30k	20-40k ±2	65	2.5		1.6	1.5	0.4	0.6	40	2 Mtrs.	75	Yes	17⅛ x 14 x 5¾	29	499.95	Direct-coupling; 2 tape inputs; 3 tone contls.; mic mix w. level contl.; 3 spkr. sys.; 2 each phono, aux.
	KR-6200	45	0.5	0.5	0.2	13-30k	20-40k	65	2.5		1.7	1.5	0.5	0.6	40	2 Mtrs.	65	Yes	17⅛ x 14 x 5¾	29	399.95	As above, less mic mix & 1 phono.
	KR-5200	30	0.5	0.5	0.2	17-30k	20-40k ±2	65	2.5		1.8	2.0	0.5	0.7	40	Mtr.	60	Yes	17 x 14 x 5	28	349.95	As above but 2 tone contls.
	KR-2200	8	0.8	0.8	0.2	30-20k	25-35k ±2	60	2.0		2.5	4.0	0.8	1.0	30	Mtr.	40	Yes	17⅝ x 15⅛ x 4¾	13⅜	159.95	Mic mix. w. level contl., 2 spkr. sys.
KIRKSEATER	RTS-8000	140	0.15	0.15		10-80k ±3		65	1.8		1.1	1.5				2 Mtrs.	60	No	18¾ x 14 x 4¾	22¼		
LAFAYETTE	LR-4000 4-chan.	47½	1.0			13-35k	20-20k ±1	70	4		1.65	1.5			40	Mtr.		Yes	21 x 13 x 5¼	49	499.95	Wave-matching SQ, matrix, discrete.
	LR-440 4-chan.	35	0.8			15-25k	20-20k ±1½	70	3.5	35	1.65	1.5		0.3		Mtr.		Yes	18½ x 13¾ x 4¾	41	369.95	SQ, matrix; main/remote spkr. switch.
	LR-220 4-chan.	11	1.0				20-20k ±1½	55	4		2.5	3.0		0.7	35	Mtr.		Yes	15⅞ x 11½ x 4½	21	249.95	
	LR-200	23	1.0					60	3.3	33	2.5	3		0.6	35	Mtr.		Yes	14½ x 10½ x 4½	20	174.95	
	LR-1500TA	70	0.8	4		18-55k	20-20k ±2	60	1.8; 4.5; 12	33	1.5	1.25		0.3	40	Mtr.	50	Yes	16¾ x 14¼ x 4⅜	34¼	319.95	

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FM/AM Stereo Receiver

KR-6200...240-Watt (IHF)
FM/AM Stereo Receiver

KR-7200...260-Watt (IHF)
FM/AM Stereo Receiver

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TUNER SECTION			
	KR-7200	KR-6200	KR-5200
FM Sensitivity	1.6 μV	1.7 μV	1.8 μV
S/N Ratio	68 dB	66 dB	65 dB
Capture Ratio	1.5 dB	1.5 dB	2.0 dB
Selectivity	75 dB	65 dB	60 dB
Stereo Sep. @ 1k Hz	40 dB	40 dB	40 dB
Front End	3 FET, 4 Gang	2 FET, 4 Gang	2 FET, 4 Gang
IF Stage	IC/3 Mech. Fltr.	IC/3 Mech. Fltr.	IC/3 Mech. Fltr.
AM Sensitivity	15 μV	15 μV	15 μV

AMPLIFIER SECTION			
	KR-7200	KR-6200	KR-5200
Continuous Power Both Channels Driven @ 8 ohms from 20-20k Hz	55 W/Ch	45 W/Ch	30 W/Ch
THD & IM (@ rated output)	0.5%	0.5%	0.5%
Freq. Resp. (± 2 dB)	20-40k Hz	20-40k Hz	20-40k Hz
Power Bandwidth	10-30k Hz	13-30k Hz	17-30k Hz
Controls	Triple Tone 'Mike Mix' 2 Phono, 2 Aux	Triple Tone Phono, 2 Aux	Phono, 2 Aux

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Receivers

Marantz 4415

Onkyo TX-555

Panasonic SA-6800X

		AMPLIFIER										TUNER												
MANUFACTURER	MODEL	RMS power/chan., W. 8 ohms	THD at rated power, %	IM at rated power, %	IM at 1 watt, %	Power bandwidth, Hz–kHz	1-watt freq. resp., Hz ± 1 dB	Rated output S/N, phono, dB	Phono sensitivity, mV	Phono overload, mV	IHF sensitivity, µV	Capture ratio, dB	THD mono, 100% mod., %	THD stereo, 100% mod., %	Stereo separation, 1000 Hz dB	Tuning indicator	Alt. chan. selectivity, dB	AM band?	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
MAGNAVOX	1K8896	50	0.5	1		15-20k	20-25k ±1	60	2		3	4	1	1.5	30	Mtr.	60	Yes	18 x 15½ x 5¼			Also with digital readout; FET; 41Cs.
	1K8894	25	0.5	1		15-20k	20-25k ±1	60	2		3	4	1	1.5	30	Mtr.	60	Yes	18 x 15½ x 5¼			FET; 41Cs.
	1K8802	10	0.5	1		25-25k	25-25k ±1	60	2		4	4	1	1.5	30	Mtr.	60	Yes	16½ x 13 x 4½			21Cs.
	1K8803	18	0.5	1		25-25k	25-25k ±1	60	2		4	4	1	1.5	30	Mtr.	60	Yes	16½ x 13 x 4½			21Cs.
MARANTZ	4430 4-chan.	30	0.3	0.3	0.1	10-50k	15-80k ±2		1.8	96	1.7	1.6	0.15	0.3	42	Mtr.	60	Yes	16⅞ x 14¼ x 5		399.95	Vari-matrix; remote contl. receptacle.
	2010	10	1.0	1.0	0.5	20-22k	20-20k ±1½		2.2	100	2.8	2.5	0.6	1.0	32	Mtr.		Yes	14¼ x 12 x 4¾		199.95	Gyro-touch tuning; main/ remote spkr. swit.
	2270	70	0.3	0.3	0.3	7-70k	10-80k ±1		1.8	220	1.4	1.5	0.2	0.3	45	*		Yes	16⅞ x 14 x 5	50	549.95	Var. overlap drive; FET front-end; direct coupled.
	4415 4-chan.	15	0.9	0.9	0.5	15-50k	20-20k ±1		2.2	100	2.8	2.5	0.6	1	32	Mtr.		Yes	16⅞ x 14¼ x 5		399.95	SQ decoder jack; SQA 1&2 decoder assy.; remote contl.
MASTERWORK	SQ-445 4-chan.	6	2.0	1.0	0.5	40-25k	20-20k ±3	55	1.5	3.0	4	3	0.5	0.8	35	Mtr.	28	Yes	17¾ x 10 x 4¾	18	229.95	SQ decoder.
	SQ-446 4-chan.	6	2.0	1.0	0.5	40-25k	20-20k ±3	55	1.5	3.0	4	3	0.5	0.8	35	Mtr.	28	Yes	24⅛ x 10 x 4¾	23	279.95	SQ decoder; 8-track player.
MAXIMUS	6000	45	0.3			15-30k	10-40k ±3	65	4	10	2	3	1	1.5	40	Mtr.	50	Yes	17¾ x 10½ x 5¾	15		
	4000	16	0.5			20-30k	20-35k ±3	60	4	8	2	3	1.2	1.6	35	Mtr.	50	Yes	17¼ x 12 x 5⅜	10¼		
	3000	14	0.5			30-20k	20-25k ±3	55	5	10	3	3	1.2	1.6	30	Mtr.	50	Yes	17 x 12 x 5⅜	9½		
	300	8½	0.7			20-20k	15-30k ±3	55	4	15	5	4	1.5	2.0	35	Mtr.	50	Yes				
NIKKO	STA-1101	40	0.3	0.6		20-30k		75	2		1.5	1.5	0.6	1.0	40	Mtr.	60		18½ x 14⅜ x 6½	33	399.95	6 FETs; 12 ICs; X-tal filters; 2 mic inputs; 2 phone jacks; sep. vol. contls. for rem. spkrs.
	STA-6500	50	0.5	0.7	0.16	5-65k	10-100k +0-1	70	2	100	1.8	1.5	0.4	0.5	40	2 Mtrs.	60	Yes	16⅞ x 15¼ x 5⅞	34	369.95	MOS FET; x-tal filter; w. wal. cab.
	STA-6200	38	0.5	0.8	0.2	5-40k	10-70k +0-1	70	3	100	1.8	1.5	0.4	0.5	40	Mtr.	60	Yes	16⅞ x 14⅞ x 5½	30.6	319.95	As above.
	SA-5800	27	0.5	0.7	0.25	5-40k	10-50k +0-1	70	2	100	1.8	1.5	0.4	0.7	35	Mtr.	80	Yes	16 x 14 x 5½	24	259.95	MOS FET; 2 tape mon.; wal. cab.
	SA-701B	25	0.8	1.0		20-20k		65	2.8		1.8	3.0			40	Mtr.			14¾ x 12⅜ x 4½	17	239.95	2 FETs; 3 ICs; AFC; mute; dual tone contls; scrth. & rmbl. fils.; crt. break.
OLSON	RA-777 4-chan.	25	0.2	0.75	0.6	10-40k	8-50k	65	2.2	12	3.5	2	0.5	0.9	35	Mtrs.	65	Yes	15¼ x 12¾ x 4½	18	230.00	Matrix; circuit breakers; with cab.
	RA-632 4-chan.	15	0.5	0.85	0.7	15-26k	19-23k	62	2.5	25	2.0	3	0.6	1.0	35	Mtr.	62	Yes	18 x 10 x 3½	16	200.00	Discrete, matrix; joystick bal. contl. Model RA-618, less joystick & discrete, $170.00.
	RA-660 4-chan.	5	0.5	0.9	0.72	20-24k	25-20k	60	2.8	25	3.0	3.5	0.75	1.2	30	Mtr.	62	Yes	16 x 10 x 3½	14	120.00	Discrete, matrix; joystick bal. contl.
ONKYO	TX-666	50	0.2	0.3	0.2	10-40k	10-40k ±1	70	2.5	200	1.8	1.5	0.2	0.5	40	2 Mtrs.	65	Yes	18⅜ x 15⅛ x 5½	30	429.95	
	TX-555	40	0.3	0.4	0.3	15-35k	10-35k ±1	70	2.5	200	2	1.5	0.2	0.5	40	2 Mtrs.	65	Yes	18⅜ x 15⅛ x 5½	27½	349.95	
PANASONIC	6800X 4-chan.	42	0.5	0.7		7-40k	10-70k +0-1	73	3		1.8	1.5	0.4		35	Mtr.	70	Yes	16 x 17⅞ x 6¼	34	599.93	Discrete & matrix; Acous. Field dimen. contl.; mic mixing; elec. output prot.
	6400 4-chan.	4x19	0.5	0.7		9-40k	10-70k +0-1	70	3		1.8	1.5	0.4		35	Mtr.	70	Yes	16 x 17⅞ x 6¼	32	429.95	Discrete & Matrix; Acous. Field dimen. contl.; mic mixing.
	5800	27	0.5	0.7		5-40k	10-70k +0-1	70	2		1.8	1.5	0.4		35	Mtr.	80	Yes	16 x 14 x 5	24	299.95	Direct coupling; 4 MOS FETs; ceramic filters.
	5200	14	0.8	1.0		7-30k		70	3		1.9	2	0.4		35	Mtr.	60	Yes	16⅛ x 14 x 5¼	17	199.95	4 pole MOS FETs; 4 prs. tape jacks; 4-chan. enhancement.

...among other things it has the world's first universal four-channel decoder.

The new EVR-4x4 Four-Channel AM/FM Stereo Receiver

Look at all you get: 4 complete amplifier channels, multiplex stereo FM with ceramic IF filter, integrated circuit AM, main and remote speaker outputs, 4-channel headphone jacks, front/back and left/right balance controls, tuning meter, stereo indicator light, FM muting defeat switch, full provision for 4-channel tape or future "discrete" disc inputs... it's all there. And for only $249.95 suggested retail.

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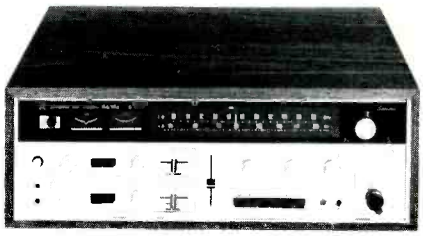
Receivers

Pioneer SX-828



Sansui QR-6500

MANUFACTURER	MODEL	AMPLIFIER: RMS power/chan., W, 8 ohms	AMPLIFIER: THD at rated power, %	AMPLIFIER: IM at rated power, %	AMPLIFIER: IM at 1 watt, %	AMPLIFIER: Power bandwidth, Hz-kHz	AMPLIFIER: 1-watt freq. resp., Hz ± 1 dB	AMPLIFIER: Rated output S/N, phono, dB	AMPLIFIER: Phono sensitivity, mV	AMPLIFIER: Phono overload, mV	TUNER: IHF sensitivity, μV	TUNER: Capture ratio, dB	TUNER: THD mono, 100% mod., %	TUNER: THD stereo, 100% mod., %	TUNER: Stereo separation, 1000 Hz dB	TUNER: Tuning indicator	TUNER: Alt.-chan. selectivity, dB	TUNER: AM band?	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
PILOT	366 4-chan.	30	0.5	0.5		10-40k		65	2.5; 4.5		1.8	1.8	0.5	0.8	38	2 Mtrs.	60	Yes	18½ x 17½ x 6½		499.90	Discrete, SQ, matrix; 60 W stereo; mic mix.; 2 phono, aux, tape inputs.
	365 4-chan.	15	0.5	0.5		25-25k		65	2.5; 4.5		2.5	2.5	0.5	0.8	38	Mtr.	45	Yes	18½ x 17½ x 6½		379.90	Discrete, SQ, matrix; 30 W stereo; 4-chan. phones.
	254	65	0.5	0.5		10-40k		70	2.5; 4.5		1.8	1.8	0.5	0.8	38	2 Mtrs.	60	Yes	18½ x 17½ x 6½		429.90	2 each phono, aux inputs; mic mixing; 3-pos. spkr. swit.; ceramic filters.
	253	35	0.5	0.5		15-30k		65	2.5; 4.5		1.8	1.8	0.5	0.8	38	Mtr.	60	Yes			299.90	2 phono inputs; front tape jack; 2 spkr. sys.
	252	25	0.5	0.5		25-25k		65	2.5; 4.5		2.5	2.5	0.5	0.8	38	Mtr.	45	Yes			249.90	Mute; 2 spkr. sys.
PIONEER	SX-828	60	0.5	0.5		10-60k		85	2.7		1.7	1.5	0.2	0.4	40	Mtr.	75	Yes	19⅛ x 14¾ x 6	32	429.95	Direct coupled; prot. cir; 2 tape mon.; step tone contls; cabinet, tape-to-tape duping.
	SX-727	40	0.5	0.5		10-60k		85	3		1.8	2.0	0.3	0.5	40	Mtr.	70	Yes	19¼ x 15⅜ x 5⅞	30	349.95	As above.
	SX-626	27	1.0	1.0		10-70k		70	2.5		2.0	2.5	0.4	0.5	40	Mtr.	70	Yes	17¾ x 14¼ x 5¾	21	279.95	2 monitors; tape-to-tape duping; linear scale; cabinet.
	SX-525	17	1.0	1.0		10-45k		75	2.7		2.2	3	0.6	0.8	40	Mtr.	45	Yes	17¾ x 14¼ x 5¾	17	239.95	As above.
RADIO SHACK	STA-180	60	1.0	0.5		15-25k	20-25k ± 1	62	1.5; 3.5						35	Mtr.		Yes	19¼ x 14¾ x 6¼	35	399.95	Mag. & cer. phono inputs; midrange tone contl.; wal. case.
	STA-120B	40	1.0	0.4		18-25k	20-25k ± 1	65	2		1.8	2.0			35	Mtr.		Yes	19⅜ x 15⅜ x 5⅜	32	299.95	Midrange tone contl.
	QTA-750 4-chan.	15	0.8				20-20k ± 1		3.0		3.3	2.5			30	Mtr.		Yes	13 x 19 x 5¾		259.95	4-chan. with SQ decode.
	STA-65C	21	0.5	1.0		20-25k	20-25k ± 1	60	3.0		2.0	2.5			35	Mtr.		Yes	16¾ x 13½ x 5¾	24	219.95	Wal. case.
ROTEL	RX-154A 4-chan.	10	0.5	0.7	0.8	30-30k	20-50k ± 3	60	3	45	4	6	1.5	2.0	35	Mtr.		Yes	17¼ x 12½ x 5	17	239.95	SQ, discrete; 20 W stereo; FET.
	RX-600A	30	0.2	0.2	0.1	15-85k	9-100k +0-1	67	2	50	2.2	2	0.5	1.0	35	Mtr.		Yes	21½ x 18 x 5½	19½	299.95	3 phono inputs; 2 tape inputs/outputs.
	RX-400A 4-chan.	20	0.2	0.4	0.3	25-30k	15-50k +0-1	65	3	50	2.5	3	1.0	1.5	35	Mtr.		Yes	17⅛ x 12½ x 5	15⅜	199.95	Matrix; loudness contl.
	RX-200A 4-chan.	10	0.5	0.5	0.5	30-20k	30-30k +0-1½	60	2	45	4	5	1.0	1.5	35	Mtr.		Yes	14¼ x 8¼ x 4	11	169.95	Matrix; FET; loudness contl.
	RX-150A	7½	0.6	1	0.8	35-20k	30-20k ± 3	60	2.8	45	5	6	1.5	2.5	35	Mtr.		Yes	16 x 6¼ x 5¼	9⅞	129.95	2 spkr. sys.
SANSUI	QR-6500 4-chan.	50	0.5	0.5		20-30k	20-30k ± 1	60	2		1.8	1.5	0.8		35	2 Mtrs.		Yes	21⅛ x 14⅜ x 7⅞	48½	699.95	QR4500, similar 38 W, 2 μ V sens., 2 dB capt., $599.95.
	QR-1500 4-chan.	20	0.8	0.8		30-30k	30-30k ± 1	60	2		2	2	1.0		30	Mtr.		Yes	19 x 12¼ x 5¼	20	299.95	QR-500 similar but 11W, 5μ V sens., $239.95.
	Eight	60	0.3	0.4		10-40k	5-50k ± 1	70	2		1.7	1.5	0.1		35	2 Mtrs.	60	Yes	17½ x 12⅞ x 5½	37⅜	529.95	Muting & level contls.; wal. cab.
	Seven	45	0.3	0.3		10-35k	15-40k ± 1	70	2.5	100	1.8	1.5	0.3	0.5	40	2 Mtrs.	60	Yes	17⅜ x 13 x 5½	31½	459.95	As above. Model Six, similar but 35 W, 2 μV sens., 2 dB cap., $389.95.
	2000X	39	0.8	0.8		20-40k	10-50k ± 1	70	2.5		1.8	1	0.8		35	Mtr.		Yes	18¼ x 13¼ x 5¾	28¾	339.95	2 phono inputs; mute; wal. cab.
SANYO	DCX 3300K 4-chan.	20	0.5	1.0		20-34k	20-40k	60			2.0		0.8		30	Mtr.	45	Yes	19⅜ x 12¾ x 6	30	329.95	2 matrix, SQ, discrete; indiv. & master vol. cont.; 4 level mtrs.
	DCX 3000K 4-chan.	10	0.5	1.0		20-34k	20-40k	60			2.2		0.8		30	Mtr.	40	Yes	19⅜ x 12¾ x 4¾	30	329.95	2 matrix, SQ, discrete; indiv. & master vol. conts.
	DCX 2500K	10	1.0	1.0		30-15k	20-40k	60			2.8		0.8		30	Mtr.	40	Yes	17¼ x 12½ x 5	12	169.95	

Quick. Name the most powerful receiver under $300 . . . .

. . . with a walnut case included.

Two auxiliary inputs.

Front panel provision for a 4-channel decoder (which can double as a second tape monitor).

Direct-coupled output circuit.

1.8 uv FM sensitivity.

Illuminated selector indicators.

Maybe you still can't tell from this description.

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Sherwood Model S7200.

Ask your dealer. Or write:

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The Sherwood Experience

AMPLIFIER:
Power output:
Music power 150 watts total (IHF)
RMS power Output
(both channels driven):
50 watts x 2 @ 4 ohms, 1 KHz
40 watts x 2 @ 8 ohms, 1 KHz.

36 watts x 2 @ 4 ohms.
20-20,000 Hz.
32 watts x 2 @ 8 ohms.
20-20,000 Hz.

Harmonic distortion:
0.7% @ 8 ohm rated output.
0.20% @ 10 watts

Intermodulation distortion:
0.7% @ 8 ohm rated output.
0.25% @ 10 watts

Power bandwidth:
12-35 KHz—1% dist.

TUNER (FM)

FM sensitivity (IHF):
1.8uv (–30dB noise & dist.)

Capture ratio: 1.9dB

Distortion:
0.25% @ 100% Mod.

Alternate channel selectivity: 60dB

Check No. 51 on Reader Service Card

Receivers

Scott 443

Tandberg TR-1020

Sony STR-6200F

MANUFACTURER	MODEL	AMPLIFIER: RMS power/chan., W, 8 ohms	AMPLIFIER: THD at rated power, %	AMPLIFIER: IM at rated power, %	AMPLIFIER: IM at 1 watt, %	AMPLIFIER: Power bandwidth, Hz/kHz	AMPLIFIER: 1-watt freq. resp., Hz ± dB	AMPLIFIER: Rated output S/N, phono, dB	AMPLIFIER: Phono sensitivity, mV	AMPLIFIER: Phono overload, mV	TUNER: IHF sensitivity, μV	TUNER: Capture ratio, dB	TUNER: THD mono, 100% mod., %	TUNER: THD stereo, 100% mod., %	TUNER: Stereo separation, 1000 Hz dB	TUNER: Tuning indicator	TUNER: Alt. chan. selectivity, dB	TUNER: AM band?	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
SCOTT	525	100	0.5			8-40k		75	3.3 6.6		1.7	2.5	0.5		40	2 Mtr.	75	Yes	20 x 15½ x 8	40	599.90	6-way spkr. select.
	477	70	0.5			15-40k		75	4.0; 8.0		1.9	2.5	0.5		35	2 Mtr.	40	Yes	17½ x 15½ x 6	34	419.90	6-way spkr. select.
	387B	55	0.5			10-38k		75	4.2; 8.5		1.9	2.5	0.6		35	2 Mtr.	35	Yes	17½ x 13½ x 5½	30	359.90	
	357B	25	0.8			20-20k		70	2.5; 4.5		2.5	2.5	0.6		30	Mtr.	40	Yes	17½ x 12½ x 5½	24	214.90	
	377B	40	0.5			15-20k		75	3.6; 6		1.9	2.5	0.6		30	2 Mtrs.	35	Yes	17½ x 13½ x 5½	28	319.90	
	433 4-chan.	15	0.8			15-15k		69	1.6; 4.8		3.0	3.0	0.8		35	Mtr.	40	Yes	17½ x 17 x 6	30	319.90	Dutputs strapable for doubled power on 2 chan.
	544 4-chan.	25	0.8			15-25k		68	1.5; 4.0		1.7	2.5	0.8		40	Mtr.	75	Yes	20 x 15½ x 8	43	549.90	As above.
SHERWOOD	SEL200	60	0.2	0.6	0.1	8-35k	20-20k ± 0.5	65	1.6	100	1.5	1.7	0.15	0.25	40	2 Mtrs.	70	No	18¾ x 13 x 5¾	37	599.00	Torroidal FM i.f. filters; FET hust cirt.
	S8900A	60	0.3	0.3	0.1	7-60k	20-20k ± 1	65	1.5, 3.8, 8.0	100	1.7	1.9	0.15	0.3	40	Mtr.	65	No	16¼ x 14 x 5¼	30	429.95	Dynaquad matrix; 4-chan. swit.; full-mode swit.: tape dubbing
	S7900A	60	0.3	0.3	0.1	7-60k	20-20k ± 1	65	1.5, 3.8, 8.0	100	1.7	1.9	0.15	0.3	40	Mtr.	65	Yes	16¼ x 14 x 5¼	30	459.95	As above
	S7200	40	0.7	0.7	0.25	12-35k	20-20k ± 0.5	60	2.2	80	1.8	1.9	0.25	0.5	40	Mtr.	60	Yes	17½ x 14 x 5¾	32	299.95	Wal. case; tape dubbing; 4-chan. swit.
	S7100A	22	0.9	1.0	0.35	15-50k	20-20k ± 1	65	1.5	60	1.9	2.8	0.5	0.8	40	Mtr.	50	Yes	17½ x 13½ x 5⅝	30	199.95	Wal. case; tape dubbing.
	S7050	10	1.0	1.0	0.35	15-50k	30-20k ± 1	65	2.0	50	3.5	4.0	0.6	1.0	35	Mtr.	40	Yes	16 x 12 x 5½	24	159.95	Wood case; A/B spkr. swit.
SONY	STR-6200F	70	0.2	0.2	0.2	10-40k	12-100k +0-3	70	1.4	100	1.8	1	0.2	0.35	40	Mtr.	100	No	19 x 15⅞ x 5¾	39	699.50	
	STR-6065	70	0.2	0.2	0.2	15-30k	12-100k +0-3	70	1.4	100	2.2	1.5	0.2	0.5	38	Mtr.	80	Yes	17¼ x 14 x 5¾	29	429.50	
	STR-6055	40	0.2	0.2	0.2	15-30k	10-60k +0-3	70	1.8	80	2.6	1.5	0.2	0.5	38	Mtr.	80	Yes	17¼ x 13½ x 5¾	26	319.50	
	STR-6045	40	0.5	0.5	0.5	10-30k	10-50k +0-3	60	2.5	80	2.6	1.5	0.4	0.8	35	Mtr.	80	Yes	15¾ x 12¼ x 5¾	18	249.50	
SPECTROSONIC	310-4	50	0.25	0.18	0.3	5-50k	3-70k ± 2	70	2.5	40	2.0	3	0.25	0.4	35	2 Mtrs.	63	Yes	17⅜ x 14 x 5		349.95	Front panel swit. for 4-chan. adapter.
	210-4	30	0.25	0.18	0.3	5-40k	3-50k ± 2	70	2.5	40	2.0	3	0.25	0.4	35	Mtr.	63	Yes	17⅜ x 14 x 5		269.95	As above.
	110-4	20	0.25	0.25	0.3	10-30k	5-50k ± 2	70	2.5	40	2.0	3	0.5	0.8	33	Mtr.	55	Yes	17⅜ x 14 x 5		199.95	As above.
	55-4	7½	0.8	0.5	1.0	12-30k	5-48k ± 2	65	2.5	40	5	4	1.0	1.5	30	Mtr.	48	Yes	17⅜ x 14 x 5		149.95	As above.
SUPERSCOPE	R-230	5	1			31-68k	25-20k ± 3	60	2.0	6.6	5	6	1.0	2.0	30	Mtr.	40	Yes	16¾ x 10¾ x 4½	9½	139.95	Mag./cer. phono inputs.
	R-250	10	0.9			15-61k	10-60k ± 3	70	2.5	7.0	2	2.75	1.0	1.7	35	Mtr.	35	Yes	16⅜ x 11⅜ x 5¾	15½	199.95	ICs; FET; cer. filters.
SYLVANIA	CR-2743W 4-chan.	50	0.5	0.5	0.2	17-30k	17-35k +0-3	60	0.3	80	1.9	1.5	1.0	0.6	40	Mtr.	55	Yes	17 x 15 x 5	26	269.95	Matrix; FET; ICs; ceramic filters; w. cab.
	CR-2742W 4-chan.	25	0.5	0.5	0.2	17-30k	17-35k +0-3	60	0.5	80	1.9	1.5	1.0	0.6	40	Mtr.	55	Yes	17 x 13 x 5	20	199.95	As above.
	CR-2741W 4-chan.	12½	1.0	1.0	1.0	25-20k	25-20k +0-3	70	1.2	35	2.5	5.5	2.0	2.0	35	Mtr.	52	Yes	17 x 12 x 5	14½	159.95	As above.
TANDBERG	TR-1020	38	0.2	0.2	0.5	7-30k	12-70k ± 1½	72	2	80	2	1.8	0.3	0.4	35	Mtr.	48	Yes	17 x 12 x 4¾	20	429.80	
TOSHIBA	SA504 4-chan.	30	0.4			10-80k	20-40k ± 1	65	2.5		1.8	1.5			35	Mtr.	80	Yes	20 x 14 x 4⅞	33		2/4-chan. receiver.
	SA500	35	0.4			8-80k	20-40k ± 1	65	2.5		1.8	1.5			35	Mtr.	80	Yes	17⅝ x 14 x 4⅞	21		
	SA400	15	0.8			20-40k	20-40k ± 3	65	3		2.5	2			35	Mtr.	60	Yes	16½ x 11¼ x 4½	14½	199.95	
V-M	1521	40	0.5	0.5	0.2	9-30k		60	3	2	1.9	1.8	0.5	0.5	40	Mtr.	75	Yes	18⅞ x 13 x 6½	25	330.00	
	1520	25	0.5	0.5	0.2	9-30k		60	3	2	1.9	1.8	0.5	0.5	40	Mtr.	75	Yes	18⅞ x 13 x 6½	25	280.00	
	1531	20	0.5	0.8	0.8	9-20k		60	5	2	2.5	2.2	0.5	0.5	30	Mtr.	60	Yes	17¼ x 15⅜ x 4½	20	250.00	
	1532	25	0.5	0.5	0.3	9-30k		60	3	2	1.7	2.0	0.5	0.5	35	Mtr.	55	Yes	17 x 15 x 4½	21	229.95	

From the guys who brought you the world's best tape recorders... The world's newest and finest receiver.

Take a second look and you'll begin to see some of the things that make this receiver extraordinary. Like two tuning meters . . . three tape facilities . . . eight function-indicator lights. All of which do more than meets the eye.

That left-hand meter is a field-strength indicator when you're tuning FM. Pull out the speaker-selector knob and it becomes a power effect indicator—a built-in early warning system that will avert amplifier clipping and speaker overload.

Tapes 1 and 2 control standard rear-panel jacks for two decks—reel-to-reel, cassette, cartridge—so you can copy and convert as well as play and record. Tape 3 is a typical Tandberg touch. It's jacked into a preamp circuit that lets you use the amplifier controls to modify the output signal. With Tape 3, you can tone down, brighten up, boost and rebalance worn discs and imperfect tapes when you re-record.

As for the pilot lamps, they're the visible indicator of eight function controls hidden under a flip-down cover. Two scratch/hiss filters for moderate or extreme high-frequency attenuation, rumble filter, loudness contour, Tape-3 preamp, mono left, mono right, and stereo.

What meets the ear in the TR1020 comes from the same no-compromise electronics that have made Tandberg tape recorders the industry standard.

To cite just a few points, there's the true complementary output stages, a MOSFET front end for both AM and FM, separate power supplies, fully encapsulated electronic tuning, FM sensitivity typically 1.7 uV, and a capture ratio of 1.8 dB.

In sum, the TR1020 is pure Tandberg. An AM/FM stereo receiver that delivers about $600 worth of performance for $429.90.

Including the hardwood cabinet.

Don't just look at it. Look into it. With your nearest Tandberg dealer.

TANDBERG TR1020

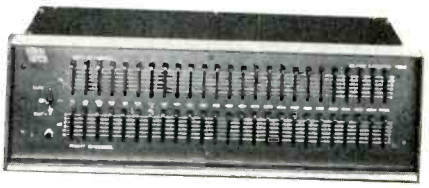
When you make the finest tape decks in the world, you don't settle for second best in anything.

TANDBERG OF AMERICA, INC., 8 THIRD AVENUE, PELHAM, NEW YORK 10803

Check No. 53 on Reader Service Card

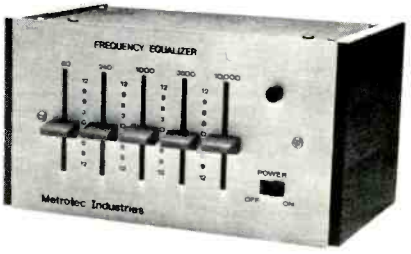
Equalizers

Advent FBC



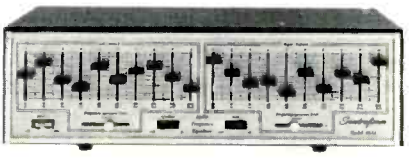
Altec Acousta-Voicette

Frazier SEE-24



Metrotec FEW-1

SAE Mk-7



Soundcraftsmen 20-12

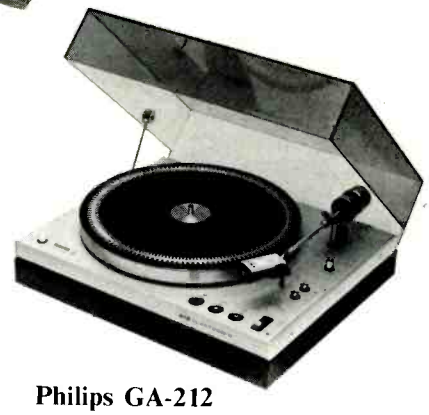
MANUFACTURER	MODEL	Channels	Bands	Bandwidth (oct.)	Range, dB ±	Max. output rms	Distortion, % THD	S/N, rated output	Dimensions	Weight	Price	SPECIAL FEATURES
ADVENT	FBC	2	10	1	12	4.5	0.5	60	12 x 7¾ x 3⅝		*	3-pos. swit. for input sens., 375 μV, 750 μV, & 1.5 V. *Discontinued.
ALTEC	Acousta-Voicette	2	24	⅓	12	4.5	0.5	80	18½ x 8 x 5¾	13	850.00	Separate reinsertion gain controls for each channel. 150 ⅓ octave filters.
FRAZIER	SEE-24	2	12	⅔	15	*	*	*	15 x 12 x 7	15	795.00	*Passive filters, no insertion loss at level positions.
METROTEC	FEW 1	2*	5	1.5 app.	12	9.0	0.05	80	8⅜ x 5½ x 4⅝	4	99.95	*Ganged controls. Kit price, $79.95.
SAE	Mk 7	2*	11	0.9 app.	16	7.0	0.05	90	17 x 7 x 5½	16	450.00	*Ganged controls. Switched 8 or 16 dB range.
SOUNDCRAFTSMEN	20-12	2	10	1	24	7.0	0.05	90	18 x 11 x 5¼	22	299.50	
	RP10-12	1	10	1	24	7.0	0.01	95	18 x 11 x 5¼	22	349.50	Professional model; input/output level metering.

Manual Turntables & Tonearms

Panasonic SP-10

Empire 598

JVC VL-8



Philips GA-212

SPEEDS

A—33, 45, 78
B—33, 45
C—33 only
D—16, 33, 45, 78
E—16, 33, 45
F—Cont. variable

TURNTABLES												TONE ARMS												
MANUFACTURER	MODEL	Speeds (see letter code)	Wow and flutter at 33⅓, %	Rumble (NAB) dB	Motor type	Platter diameter, in.	Platter weight, lbs.	Drive	Arm mounting provision	Dimensions, W x D x H, in.	Weight, lbs.	MODEL	Overall length, in.	Pivot-stylus dist., in.	Vertical bearing	Lateral bearing	Stylus force method	Max. tracking error, deg.	Cart. weight range, gms.	Arm resonance, Hz	Stylus force range, gms.	Weight, if sep., oz.	Price	SPECIAL FEATURES
ACOUSTIC RESEARCH	XA	B	0.1	35	24-p sync.	11¾	4	Belt	Integ.	16¾ x 12¾ x 5¼	13½	–	12	9	Cone	Ball	Bal.	0.35/in.		10 15	0-8	–	87.00	With cover, base, stylus force gauge, oil, overhang gauge. XA Univ. similar but 120 or 220 V, 50 or 60 Hz.
	TA	C	0.1	35	24-p sync.	11¾	4	Belt	Integ.	16¾ x 12¾ x 5¼	13½	–	12	9	Cone	Ball	Bal.	0.35/in.		10 15	0-8	–	84.00	
AUDIO RESEARCH												TA-1	12	8.5	Ball	Ball	Bal. & Spg.	2	3-15	8	0.6		175.00	
BRAUN	PS 500	D	0.09	45	Hys.	12	7	Belt	Integ.	17 x 12½ x 6¾	28			8¾	Ball	Ball	Bal. & Spg.	2		8	0-5		269.50	Oil-hydrl. susp.; intermed. chassis; ill. strobe; auto off; with base and cover.
DECCA (PAOLI)												Int'l.	11½	9	Cone		Bal.		7-20	10	0-5		117.50	Viscous damp.; adj. mag. anti-skating.
EMT (GOTHAM)	928	A	0.02	65	Sync.	12	7½	Belt	Integ.	10 x 18 x 3½	31		12			Ball	Bal. & spg.	0.83	7-19	8	0-5		899.00	Includes pre-amps.
	930	A	0.02	64	Hys. sync.	12	31	Idler	Integ.	15½ x 19¼	51		12			Ball	Bal. & Spg.	0.83	7-19	8	0-5		1570.00	Includes pre-amps.
EMPIRE	598	A	0.01	55	Hys.	12	7	Belt	Integ.	17½ x 15⅛ x 8	30	990	12	9	Ball	Ball	Bal. & Spg.	0.7	5-15	6	0-6	20	349.95	With Empire 1000 Zex cart.; 990 arm alone, $79.95.
JVC	VL-8	B	0.05	60	Servo	12	4	Belt	Integ.	19⅜ x 16¼ x 7½	22	–	13	10	Ball	Ball	Bal.	0.94	5-20	7	0-4	–	249.95	
LENCO (BENJAMIN)	L-85	B	0.08	63	Sync.	12½		Belt	Integ.	18¼ x 14⅜ x 3	30												179.95	
	L75	D&F	0.06	38	Sync.	12		Belt	Integ.	17½ x 13¼ x 6	32												99.95	
	B-55	D	0.12	37	Sync.	11¾		Belt	Integ.	17½ x 13¾ x 5⅝													79.95	
	B-52	D	0.12	37	Sync.	11¾		Belt	Integ.	14¾ x 11¼ x 5¼													59.95	
PANASONIC	SP-10	B	0.03	65	D.C.	12	6	Direct	Indep.	14 x 14 x 4	20												349.95	
	SL-1100	B	0.03	65	D.C.	13	4 4	Direct	Integ.	25 x 15 x 7	28												299.95	
PHILIPS	GA212	B	0.06	38	D.C. servo	12	2¼	Belt	Integ.	15½ x 13½ x 5½	10½		10¾	9		Ball	Bal.	1/6	5-17	7	½-5		149.50	
	GA308	B	0.2	38	Sync.	10	2¼	Belt	Integ.	14½ x 12 x 5½	11½		10	8½		Ball	Bal.	1/5	5-12	2-3	2-4		99.50	
PIONEER	PL-61	B	0.05	55	D.C. Servo	12¼	4	Belt	Integ.		24													
	PL-41DC	B	0.08	52	Hys.	12		Belt	Integ.	19⅜ x 16⅞ x 7⅞	28													
	PLA-35	B	0.1	47	Sync.	12		Belt	Integ.	18⅞ x 16⅜ x 7¼	20													
	PL-12AC	B	0.12	45	Sync.	12		Belt	Integ.	17 x 13½ x 6	13													

Manual Turntables & Tonearms

Rabco ST-4

Sony 5520

Thorens TD-160

V-M 1579

MANUFACTURER	MODEL	Speeds (see letter code)	Wow and flutter at 33⅓, %	Rumble (RAB) dB	Motor type	Platter diameter, in.	Platter weight, lbs.	Drive	Arm mounting provision	Dimensions, W x D x H, in.	Weight, lbs.	MODEL	Overall length, in.	Pivot-stylus dist., in.	Vertical bearing	Lateral bearing	Stylus force method	Max. tracking error, deg.	Cart. weight range, gms.	Arm resonance, Hz	Stylus force range, gms.	Weight, if sep., oz.	Price	SPECIAL FEATURES
RABCO	ST-4	B	0.08	32	Sync.	11¾	5	Belt	Integ.	15 x 18 x 5	15												159.00	
												SL-8E	14	7	Cone	Cone	Bal.	0.16	4-18	10	0-4	48	169.50	
REK-O-KUT	B 12-71	A	0.02	40	Hys.	12	5¼	Idler	Hole for 12-in. arm	15¼ x 15⅜ x 6	16												194.50	
	CVS-12	F	0.098	35	Hys.	11¾	4¼	Idler	Hole for 12 in. arm	15 x 16 x 5	15												169.50	
												S-320	12	9	Ball	Ball	Spg.	1		9-12	0-6.5		54.95	
												S-260	15¾	11¾	Ball	Ball	Spg.	1		9-12	0-6.5		64.95	
												S-410	12	10-⅛	Ball	Ball	Bal.	1¼		10	½-2½		69.95	
SME (SHURE)												3009		9	Knife edge	Ball	Bal.		3-20		¼-5	30	117.50	3009 HE, similar but horizontal cable entry.
												3012		12	Knife edge	Ball	Bal.		3-20		¼-5	34	128.00	
SANSUI	2050E	B	0.07	40	Sync.	12	2.9	Belt	Integ.	17½ x 13⅞ x 7½	26		8¾		Knife	Knife	Bal.	1½					149.95	Damped cueing; with base & cover, auto off.
	1050E	B	0.07	40	Sync.	12	2.9	Belt	Integ.	17¼ x 13¼ x 7½	21½		8¾		Knife	Knife	Bal.	1½					119.95	Damped cueing; with base & cover.
SOUND SYSTEMS INT'L.	PS5520	B	0.1	43	Hys.	12	2¼	Belt	Integ.	17¾ x 15½ x 6⅞	18½		11½	8½		Ball	Bal.	3	4-14		0-3		139.50	
SONY	PS-5520	B	0.1	43	Hys.	12	2¼	Belt	Integ.	17¾ x 15½ x 6⅞	19		11½	8½	Pivot	Ball	Bal.						139.50	
												PUA-237	13⅜	9⅜	Ball	Ball	Bal.			9			85.00	
												PUA-286	15⅜	11¼	Ball	Ball	Bal.			8			99.50	
THORENS (ELPA)	TD-125 AB MkII	B	0.08	48	Sync.	12	8½	Belt	Integ.	18 x 14 x 5	32												310.00	
	TD-125B	E	0.08	48	Sync.	12	8½	Belt	Mount. board	18 x 14 x 5	32												230.00	
	TD-160	B	0.09	37	Sync.	12	8½	Belt	Integ.															
	TD-150 MkII	B	0.09	37	Sync.	12	8½	Belt	Integ.	15⅝ x 12⅞ x 5	14¾												140.00	
TOSHIBA	SR40E	B	0.1		Ind.	12		Belt	Integ.	18⅞ x 15¼ x 7⅛	2		12		Ball		Bal.	1.5					199.95	With Toshiba IC cart.
V-M	1579	B	0.3		Sync.	11¾	2	Belt	Integ.	17 x 13 x 5	12	–	12	9½	Flex memb.	Cone	Bal. & Spg.	1.5	3-9	11	0-4	–	99.95	

Nothing is hard to get...

Elac / Miracord has spent a million dollars to bring you

NOTHING

True "NOTHING" would be the elimination of everything that interferes with the perfect reproduction of sound. So, the closer you get to "NOTHING" in sound, the better stereo equipment you own!

The ELAC 50H MARK II comes closer to the "NOTHING" in sound reproduction than any other automatic turntable. And for good reason. You see, we've spent a million dollars in research to eliminate motor noise, vibration, rumble, wow, and distortion. The closer we get to "NOTHING", the better it is for you. With rumble down to —40db, wow down to 0.06% and flutter to 0.02%, we're really coming close to "NOTHING."

And we've even reduced record wear. Imagine an automatic tonearm that lowers so slowly, so lightly to your records that you can hardly tell when it touches the groove. You certainly can't hear it. At your command, a touch of the exclusive pushbutton control picks the arm up automatically and a silicone-damped piston lowers it lighter than a floating feather to your record. It's the ultimate in protection for stylus and record.

Benjamin Electronic Sound Corp., Farmingdale, N.Y. 11735. A division of Instrument Systems Corp. Available in Canada.

ELAC

BENJAMIN puts more engineering in so you get more music out.

Check No. 57 on Reader Service Card

Automatic Turntables

BSR 810/X

Dual 1229

Garrard Zero 100

Speeds

A—33, 45, 78
B—33, 45
C—33 only
D—16, 33, 45, 78
E—16, 33, 45
F—Cont. variable

MANUFACTURER	MODEL	Speeds (see letter code)	Platter diameter, in.	Wow and flutter at 33⅓, %	Rumble (NAB) dB	Max. tracking error, deg.	Pivot-stylus dist., in.	Arm type	Cart. weight range, gms.	Arm resonance, Hz	Max. stack records	Change cycle at 33⅓ secs	Clearance below board, in.	Clearance above board, in.	Overall W x D, in.	Overall height, in.	Weight, lbs.	Price	SPECIAL FEATURES
BSR MCDONALD	810/X	B	12	0.05	-55	0.5	8½	Bal.	0-4	7	6	14	4½	3	17⅛ x 15	9¼	32	239.95	With wal. base, cover, Shure M91ED cart.; sync. mtr.; visc. cueing.
	610 A/X	A	11	0.12	-40	0.75	7½	Bal.	0-6	15	8	7	3	4	15¼ x 14⅛	7¼	17	130.45	With wal. base, cover, Shure M93E dart.; sync. mtr.; visc. cueing.
	510 A/X	A	11	0.12	-40	0.75	7½	Bal.	0-6	15	8	7	3	4	15¼ x 14⅛	7¼	14	80.00	With base, cover, Shure M75 cart.; sync. mtr.; cueing.
	310/X	A	11	0.15	-38	1.0	7½	Spg.	0-9	20	7	7	3	4	15¼ x 14⅛	7¼	12	105.45	With base, cover, Shure M75 cart.; sync. mtr.; vics. cueing.
BRAUN	PS 600	A	12	0.07	-45	2	8¾	Bal. & Spg.	0-4	8	10				17¼ x 12⅞	7⅞	27	299.95	Oil-hydrl. susp.; brushless d.c. mtr.; ill. strobe; with base, cover.
DUAL	1229	A	12	0.05	45	0.3	8¾	Bal. & Spg.	1-12	8-14	6	13	3	5	14¾ x 12	8	15½	199.50	Gimbal susp.; adjust. vert. track. angle; 6% pitch contl.; syc. mtr.; cueing; ill. strobe.
	1218	A	10⅝	0.08	45	0.5	8¼	Bal. & Spg.	1-12	8-14	6	11	2⅝	5	13 x 10¾	7⅝	10	155.00	As above less strobe
	1215S	A	10⅝	0.08	45	0.5	8¼	Bal. & Spg.	1-8	8-14	6	11	2⅝	5	13 x 10¾	7⅝	9¼	109.50	Pitch contl.; damped cueing; sep. anti-skate for con. & ellip. styli.
FISHER	502	A	11½	0.1	43	1.8	8	Bal. & Spg.	3-15	10	8	3¼	3⅛	4½	14⅛ x 12	8⅞	15¼	159.95	Stylus prot. sys.; vert. track. angle adj.; anti-skating contl.
	402	A	10⅝	0.15	40	1.8	8	Bal. & Spg.	3-15	10	8	3¼	3⅛	5⅛	13 x 10¾	8⅞	12	129.95	Anti-skating contl.; damped cueing.
	302	A	10⅝	0.15	37	1.8	8	Bal. & Spg.	3-15	10	8	3¼	3⅛	5⅛	13 x 10¾	8⅞	11¼	99.95	As above.
GARRARD (BIC)	Zero 100	B	11½	0.06/ 0.025			7½	Bal.	0-15	8	6	10	3	4⅜	15¼ x 14⅛	6½	12	199.95	Zero tang. track. arm; ill. strobe; var. spd.; mag. anti-skat.; visc. damp. arm.
	SL-95B	A	11½	0.07/ 0.025		0.75	8¼	Bal.	0-15	8	6	10	3	4⅜	16 x 14½	7⅜	11	149.95	Visc. damp. arm; 2-pt. disc support; oversize platter; anti-skat.; slide-in cart. clip.
	SL-72B	A	10½	0.08/ 0.025		0.75	7½	Bal.	0-15	8	6	10	3	4⅜	15¾ x 14½	7⅜	10½	109.95	Visc. damp. arm; anti-skating; cart. clip.
	SL-65B	D	10½	0.09/ 0.025		0.85	7½	Bal.	0-18	10	8	12	2⅞	4	15¼ x 13⅛	6⅞	9	84.95	As above.
	SL-55B	D	10½	0.12/ 0.025		0.85	7½	Bal. & Spg.	0-12	12	8	12	2⅞	4	15⅜ x 13⅛	6⅞	9	64.95	As above.
	40B	D	10½	0.14/ 0.03		0.85	7½	Bal. & Spg.	0-12	12	8	12	2⅞	4	15¾ x 13⅛	6⅞	9	49.95	Visc. damp. cueing; cart. clip; tubular tone arm; super-sens. trip.
JVC	VC-5203	D	11	0.1	.45		8	Bal. & Spg.			6	10			16⅜ x 14¼	7¼	13⅛	89.95	With mag. cart., base, cover.
	4VC-5244	B	11	0.1	.45		8	Bal. & Spg.			6	10			15¾ x 17¼	7⅛	19	189.95	CD-4 4-chan. demodulator built in; with base, cover, mag. cart.

The ultimate turntable for sophisticated systems.

The BSR McDonald 810 Transcription Series.

BSR makes more automatic turntables than any other manufacturer. More than all the other manufacturers in the world put together. But of all the turntables we make, the BSR McDonald 810 Transcription Series is the finest. It is a triumph of years of painstaking efforts and research in our Engineering Laboratories in Warley, Worcestershire, England.

The 810 offers an impressive group of design innovations for serious music lovers . . . for professional users of transcription turntables . . . and for the audiophile who revels in sophisticated high fidelity equipment. It has the tightest specifications for rumble, wow and flutter of any automatic turntable made. We would be pleased to send you detailed technical specs upon request. As a matter of fact, few—if any—automatic turntable manufacturers publish complete specifications as we do. Only your personal inspection can reveal the overall excellence of this fine instrument. We suggest a visit to your BSR McDonald dealer.

BSR
McDONALD

Sequential Cam System
New smoothness and quietness of operation and overall reliability. Eight independent pre-programmed cams eliminate the light stampings and noisy moving parts of conventional cam gear and swing plate used in every other turntable mechanism.

Transcription Tone Arm System
The 8.562" pivot-to-stylus length reduces tracking error to less than 0.5° per inch. Low-mass aluminum arm assures extremely low resonance. Counterbalanced horizontally and vertically.

Automatic Tone Arm Lock
Automatically locks arm to rest post when unit is off. Prevents damage to stylus or record. Automatically unlocks in any mode. (See large photo).

Stylus Setdown Adjustment
Adjusts stylus setdown to initial record groove. Once adjusted setdown correct for all record sizes on automatic or semi-automatic. (See large photo.)

Synchronous Power Unit
New high-torque, ultra-quiet synchronous induction power unit achieves unwavering constancy of speed independent of voltage input or record load.

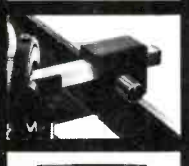
Concentric Gimbal Arm Mount
Gyroscopically pivoted on 4 pre-loaded ball-bearing races to assure virtually no friction in horizontal or vertical planes. Provides ¼ gram tracking capability.

Rotating Manual Stub Spindle
Rotates with platter eliminating record drag and center-hole wear. Interchanges with automatic spindle. (See large photo.)

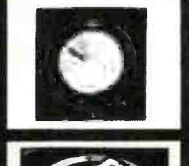
Viscous-Damped Cue and Pause Control
Gentle silicone oil-damped tone arm descent. Other anti-skate systems tend to move arm outwards on descent. Our positive friction Cue-Clutch prevents this. Arm returns to identical groove every time. Cueing operates in automatic and manual.

Viscous-Damped Tone Arm Descent
Same gentle cueing descent functions during automatic and semi-automatic play.

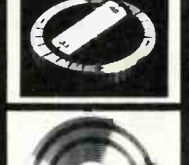
Stylus Overhang Adjustment
Cartridge slide has ±⅛" stylus overhang—quickly and accurately set by removable locating gauge. Once set, gauge replaced by stylus whisking brush provided.



Stylus Pressure Adjustment
Resiliently mounted cueing counterweight adjusts to zero-balance over full range of cartridge and stylus masses. Precision micrometer wheel allows continuous infinite stylus pressure settings 0 to 5.0 grams.

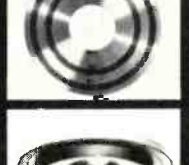


Dual-Range Anti-Skate Control
Dynamic anti-skate control system adjusts for all elliptical or conical stylii. Applies continuously corrected compensation regardless of stylus location.



Variable Pitch Control
Infinitely variable 6% range of speed adjustment (33⅓ and 45 RPM) to match pitch of record to live instrument or other playback device.

Integral Strobe Disc
Enables precise adjustment of turntable speed with pitch control for 33⅓ and 45 RPM.



Push-Button Operation
Unexcelled flexibility. Settings for manual, semi-automatic, infinite repeat of one record, or fully automatic play. (See large photo.)

12" Dynamically Balanced Turntable Platter
Full 12" die-cast, non-ferrous platter, approx. 7 lbs., machined and precision-balanced to run true for optimum performance and maximum record support.

Check No. 59 on Reader Service Card

BSR (USA) Ltd. Blauvelt, N.Y. 10913

Automatic Turntables

PE 3012

Miracord 50H/II

V-M 1542

Speeds

A—33, 45, 78
A—33, 45
C—33 only
D—16, 33, 45, 78
E—16, 33, 45
F—Cont. variable

MANUFACTURER	MODEL	Speeds (see letter code)	Platter diameter, in.	Wow and flutter at 33⅓, %	Rumble (NAB) dB	Max. tracking error, deg.	Pivot-stylus dist., in.	Arm type	Cart. weight range, gms.	Arm resonance, Hz	Max. stack records	Change cycle at 33⅓, secs	Clearance below board, in.	Clearance above board, in.	Overall W x D, in.	Overall height, in.	Weight, lbs.	Price	SPECIAL FEATURES
MGA	ST-10	D	11							8					17⅛ x 14⅜	7½		69.96	
	ST-123	D	10⅛	0.2						6					15⅛ x 13⅜	7½		49.95	
MIRACORD (BENJAMIN)	50H-II	A	12	0.06/ 0.02	40			Bal. & Spg.		8	10		3¾	5⅝	18½ x 14½	10	18	199.50	
	50H	D	12	0.06/ 0.025	40	0.5° in.	7¼	Bal. & Spg.	0-15	8	10	10	3¾	5⅝	14½ x 12½	10	18	179.50	Hys.-sync. mtr.
	770H	A		0.05/ 0.01	42	0.5° in.		Bal. & Spg.							14⅛ x 12½			225.00	
	650	D	10⅜	0.07/ 0.03	39	0.5° in.	7⅛	Bal. & Spg.	0-11	10	10	12	2⅝	5⅝	13⅜ x 11⅝	9	17	119.50	
	660H	D	10⅜	0.06/ 0.025	39	0.5° in.	7⅛	Bal. & Spg.	0-11	10	10	12	2⅝	5⅝	13⅜ x 11⅝	7	17	149.50	Hys.-sync. mtr.; overhang adj.; calibra. marker.
	625	D		0.07/ 0.03	38										13⅜ x 11⅝			99.50	
PE (IMPRO)	3060	A	10⅝	0.08	59	0.5	8¼	Bal. & Spg.			6	13	2½	4	13 x 10½		10½	149.94	Sep. anti-skat. for con. & ellip.; sync. mtr.; gimbal arm; track angle adjust.
	3015	A	10⅝	0.12	58	0.5	8¼	Bal. & Spg.			6	13	2½	4	13 x 10½		9½	119.95	Fail safe stylus contl.; pitch contl.; rotat. single play spindle; damp. cueing, anti-skating.
	3012	A	10⅝	0.15	56	0.5	8¼	Bal. & Spg.			6	13	2½	4	13 x 10½		9½	79.95	As above, less anti-skating.
RADIO SHACK	45	D	11⅞	0.1	50	0.6	7¼	Bal. & Spg.	3-4	12	6	12			16¾ x 14¼	4¼	20	149.95	Tracks ¾ to 6 gms.; with base and cart.
	40A	D	11⅞	0.1	50	0.6	7¼	Bal. & Spg.	5-7	12	6	12			16¾ x 14¼	4¼	20	109.50	Tracks 1 to 6 gms.; with base and cart.
	36	D	11	0.18	29			Bal. & Spg.			6				15¼ x 13¼	6½	10½	79.50	Tracks from 2 gms.; with base and cart.
	24A	D	11	0.18	29			Bal. & Spg.			6				15¼ x 13¼	6½	8	64.50	Tracks from 2 gms.; with base and cart.
SANYO	TP 80S	B	11½	0.1				Bal.							18½ x 15	7¼	22	129.95	
V-M	1555	B	11¾	0.3		1.5	9½	Bal. & Spg.	3-9	11	6	15	5½	5½	17 x 13	5½	18	179.95	Belt-drive sync. mtr.; with cart.; wal. base, cover.
	1542	D	11	0.3		5	7⅛	Spg.			6	9		6	14½ x 13½	6	10½	89.95	4-pole sync. mtr.; with cart., wal. base, cover.

The best time to upgrade your component system is before you buy it.

If you're a typical reader of this magazine, you most likely have a sizeable investment in a component system. So our advice about upgrading might come a little late.

What you might have overlooked, however, is the fact that your records are the costliest and most fragile component of all. As well as the only one you will continue to invest in.

And since your turntable is the only component that handles these valuable records, advice about upgrading your turntable is better late than never.

Any compromise here will be costly. And permanent. Because there is just no way to improve a damaged record.

If the stylus can't respond accurately and sensitively to the rapidly changing contours of the groove walls, especially the hazardous peaks and valleys of the high frequencies, there's trouble. Any curve the stylus can't negotiate, it may lop off. And with those little bits of vinyl go the high notes and part of your investment.

If the record doesn't rotate at precisely the correct speed, musical pitch will be distorted. No amplifier tone controls can correct this distortion.

If the motor isn't quiet and free of vibration, an annoying rumble will accompany the music. You can get rid of rumble by using the bass control, but only at the expense of the bass you want to hear.

Experienced component owners know all this. Which is why so many of them, especially record reviewers and other music experts, won't play their records on anything but a Dual. From the first play on.

Now, if you'd like to know what several independent test labs say about Dual, we'll send you complete reprints of their reports. Plus a reprint of an article from a leading music magazine telling you what to look for in record playing equipment. Whether you're upgrading or not.

Better yet, just visit your franchised United Audio dealer and ask for a demonstration.

You'll find Dual automatic turntables priced from $109.50 to $199.50. That may be more than you spent on your present turntable, or more than you were intending to spend on your next one.

But think of it this way. It will be a long, long time before you'll need to upgrade your Dual.

Dual®

Dual 1215 S, $109.50

Dual 1218, $155.00

Dual 1229, $199.50

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

Exclusive U.S. Distribution Agency for Dual.

Check No. 61 on Reader Service Card

Phono Cartridges

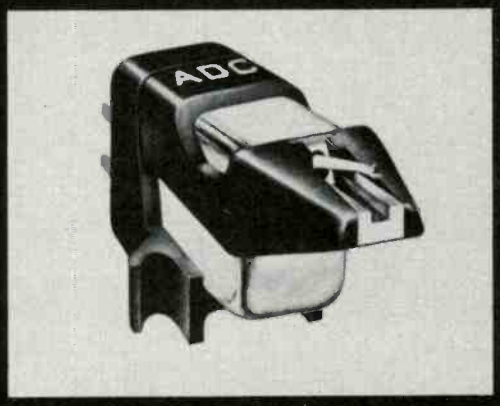
ADC XLM

Empire 1000 ZE/x

Grado F2

MANUFACTURER	MODEL	Frequency response, Hz ± 1 dB	Separation, 1000 Hz, dB	Separation, 10 kHz, dB	Output, mV/cm/sec.	Tracking force range, gms.	Load resistance, ohms	Stylus type (see letter code)	Stylus radius (radii) mils	Replacement	Weight, gms.	Price	Special Features (Stylus Type: C - Conical; E - Elliptical)
AUDIO DYNAMICS	XLM	10-25k	30	30	4	0.6	47k	E	0.3 x 0.7	User	3.8	50.00	IM=0.3% @ 14.2 cmS.
	VLM	10-22k	30	30	4	1-1¼	47k	E	0.3 x 0.7	User	3.8	40.00	
	10E1V	10-20k	30	28	4	¾-1	47k	E	0.3 x 0.7	User		50.00	
	20XE	10-18k	20	20	6	1-2½	47k	E	0.3 x 0.7	User		22.00	
B&O	SP-12	15-25k ± 3	25	20	1.0	1-1½	47k	E	0.2 x 0.7	User	8.5	75.00	
	SP-10	15-25k ± 3	25	20	1.0	1-1½	47k	C	0.6	User	8.5	65.00	
	SP-14	20-16k ± 2½	20		1.0	1½-2½	47k	C	0.6	User	8.5	40.00	
DECCA (PAOLI)	Mk V	40-16k	25	22	1.5	3.0	47k	C	0.6	Fty.	4.5	99.50	Positive scan. no cantilever; 1 mG tip mass; hand polished.
	4RC	40-16k	25	22	1.5	3.5	47k	C	0.6	Fty.	14	79.95	As above.
	C4E	40-16k	25	22	1.0	1-¾	47k	E	0.3 x 0.65	Fty.	14	99.50	As above.
	78C	40-16k				3.5	47k	C	2.5	Fty.	14	35.00	As above but for 78 rpm discs.
EMPIRE	1000 ZE/X	4-40k	35	25	1.5	¼-1¼	47k	E	0.2 x 0.7	User	7	99.95	
	999VE/X	6-36k	35	25	1.5	¼-1¼	47k	E	0.2 x 0.7	User	7	79.95	
	999SE/X	8-32k	35	25	1.7	½-1½	47k	E	0.2 x 0.7	User	7	59.95	
	999E/X	10-30k	35	25	1.7	¾-2	47k	E	0.3 x 0.7	User	7	39.95	
	909E/X	12-25k	35	25	2.0	1-4	47k	E	0.4 x 0.7	User	7	29.95	
	90EE/X	15-25k	35	25	2.0	1-4	47k	E	0.4 x 0.7	User	7	24.95	
GOLDRING (IMF)	800 Super E	10-23k	25	20	0.8	½-1¼	47k	E	0.3 x 0.8	User	7½	69.50	Frequency curve and calibration certificate supplied.
	800E Mk II	10-20k	25	20	1.0	¾-1½	47k	E	0.3 x 0.8	User	7½	39.95	
	850	40-12k	20	10	1½	2-5	47k	C	0.7	User	7	9.95	
GRADO	F1	10-70k	30		2.5	¾-2	5k	*	0.3	User	5	75.00	*Twin tip sty&us. F2 similar but with 0.3 x 0.6 elliptical stylus, $60.00.
	F3E	10-50k	28	25	4	1.5-3	5k	E	0.3 x 0.6	User	5	49.50	
	FCE	10-40k	25	25	5	1½-4	5k	E	0.3 x 0.7	User	5	35.00	FCR similar but with 0.6 conical stylus, $25.00.
JVC	4MD-20X	20-60k	30	25	2.0	1.5-2	47k-100k	*		User	8	69.95	*Shibata stylus; intended for use with 4-chan disc.
	4MD-30X	20-50k	25	22	2.0	2.5	47k-100k	*		User	7	39.95	*Shibata stylus; intended for use with 4-chan. discs.
OLSON	PC-195	15-25k	30		2.5	1½-4	47k	E	0.4 x 0.7	User	14	24.95	
PHILIPS	GP412	20-20k	30		6	½-2		E	0.3 x 0.7	User	7	69.50	With freq. resp. chart.
	GP401	20-20k	25		6	1-2		E	0.3 x 0.7	User	7	54.50	As above.
	GP400	20-20k	25		6	1½-3		C	0.6	User	7	39.50	As above.

The ADC-XLM "...in a class by itself."



That's the way Stereo Review described our XLM. High Fidelity headlined their review, "Superb new pickup from ADC" and went on to say, "...must be counted among the state of the art contenders." And Audio echoed them with, "The ADC-XLM appears to be state of the art."

With the critics so lavish in their praise of the XLM, there's hardly any necessity to add anything. Far better to let the experts continue to speak for us.

Frequency response The CBS STR-100 test record showed less than ±1.5dB variation up to 20,000Hz. *Stereo Review*
...response is within ±2dB over the entire range. *Audio*
Frequency response is exceptionally flat. *High Fidelity*

Tracking This is the only cartridge we have seen that is really capable of tracking almost all stereo discs at 0.4 grams. *Stereo Review*
The XLM went through the usual torture test at 0.4 grams (some top models require more than a gram). *High Fidelity*
The XLM is capable of reproducing anything found on a phonograph record. *Audio*

Distortion Distortion readings...are without exception better than those for any other model we've tested. *High Fidelity*
The XLM has remarkably low distortion in comparison with others. *Audio*
At 0.6 grams the distortion was low (under 1.5 per cent). *Stereo Review*

Hum and noise The XLM could be instrumental in lowering the input noise from the first stage of a modern transistor amplifier. *Audio*
The cartridge had very good shielding against induced hum. *Stereo Review*

Price This would be a very hard cartridge to surpass at any price. *Stereo Review*
We found it impossible to attribute superior sound to costlier competing models. *High Fidelity*
Priced as it is, it is a real bargain in cartridges. *Audio*

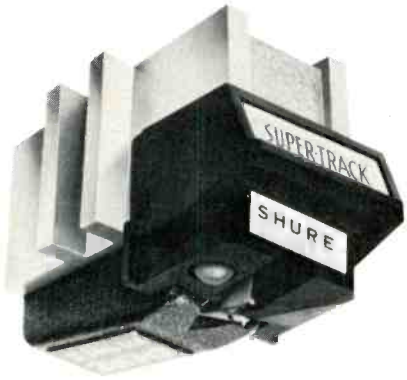
The Pritchard *High Definition*
ADC-XLM $50.

AUDIO DYNAMICS CORPORATION
Pickett District Road, New Milford, Connecticut 06776

Check No. 62 on Reader Service Card

Phono Cartridges

Pickering XV-15

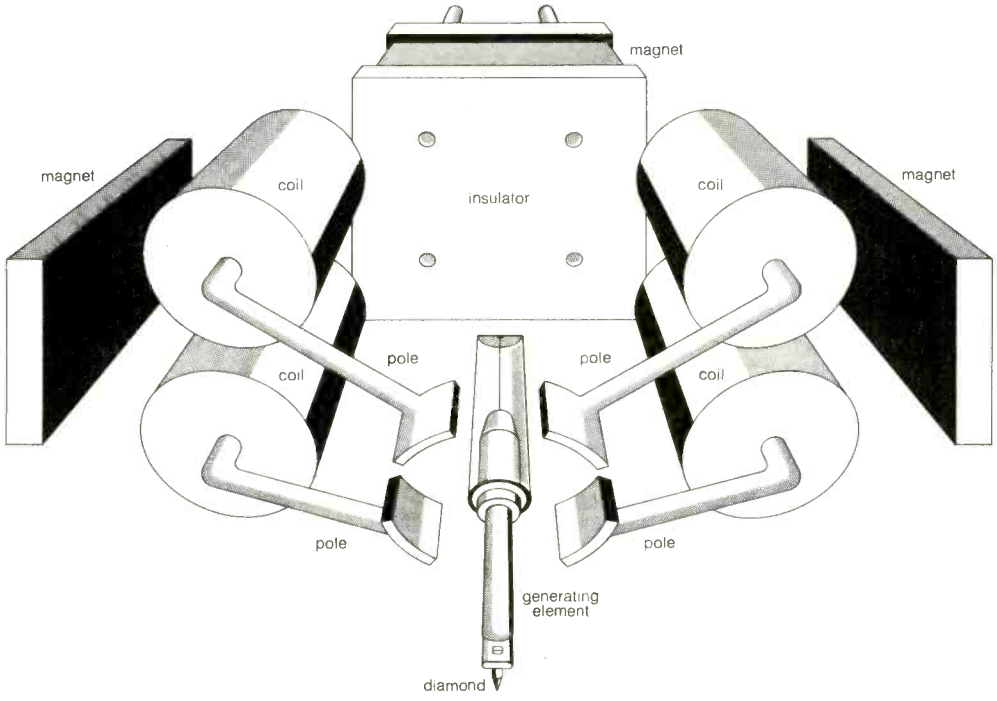


Shure V-15II

Stanton 681EE

MANUFACTURER	MODEL	Frequency response, Hz ± ? dB	Separation, 1000 Hz, dB	Separation, 10 kHz, dB	Output, mV/cm/sec.	Tracking-force range, gms.	Load resistance, ohms	Stylus type (see letter code)	Stylus radius (radii) mils	Replacement	Weight, gms.	Price	Special Features
													Stylus Type C - Conical E - Elliptical
PICKERING	XV15/1200E	10-30k	35	25	0.8	½-1¼	47k	E	0.2 x 0.7	User	5	79.95	
	XV15/750E	10-25k	35	25	0.8	½-1½	47k	E	0.3 x 0.7	User	5	65.00	
	XV15/400E	10-25k	35	25	1.0	1-2	47k	E	0.4 x 0.7	User	5	54.95	
	XV15/350	10-25k	35	25	1.1	1-3	47k	C	0.7	User	5	39.95	
	XV15/200E	10-25k	35	18	1.4	2-4	47k	E	0.4 x 0.7	User	5	49.95	XV15/150 similar but 0.7 mil conical stylus, $34.95.
	XV15/140E	10-20k	35	16	1.4	3-5	47k	E	0.5 x 0.7	User	5	34.95	XV15/100 similar but 0.7 mil conical stylus, $29.95.
	V-15 Micro IV AME	20-20k	30	24	1.0	1-2	47k	E	0.4 x 0.7	User	5	49.95	V-15 Micro IV AM, similar but 1.1 mV output, 0.7 mil conical stylus, $34.95.
	V-15 Micro IV ATE	20-18k	28	15	1.2	2-4	47k	E	0.4 x 0.7	User	5	39.95	V-15 Micro IV AT, similar but 1.4 mV output, 0.7 mil stylus, $29.95.
	V-15 Micro IV ACE	20-17k	26	14	1.4	3-5	47k	E	0.5 x 0.7	User	5	29.95	V-15 Micro IV AC, similar but 0.7 mil stylus, $24.95.
RADIO SHACK	R700E	10-25k	25		6.2	¾-1½		E	0.2 x 0.7	User		39.95	
	R27E	20-20k	25		6.2	1-1½		E	0.2 x 0.7	User		22.95	
	R47EB	20-20k	20		6.2	1½-3		E	0.4 x 0.7	User		17.95	
	R7C	20-20k	25		6.2	3-5		C	0.6	User		12.95	
SHURE	V-15 II	20-25k	25	17	3.4	¾-1½	47k	E	0.7 x 0.2		6.8	67.50	
	M91ED	20-20k	25		5.0	¾-1½	47k	E	0.7 x 0.2		5.5	54.95	M75ED Type 2 similar but with stylus guard.
	M91E	20-20k	25		5.0	¾-1½	47k	E	0.7 x 0.2		6	49.95	
	M93E	20-20k	25		6.2	1½-5	47k	E	0.4 x 0.7		6	39.95	
	M75G Type 2	20-20k	25		5.0	¾-1½	47k	C	0.6		6	38.45	
STANTON	681SE	10-20k ± 1	35	26	1.1	1½-3	47k	C	0.4 x 0.7	User	5	66.00	681A, similar but 0.7 conical stylus, $66.00.
	681EE	10-20k ± 1	35	26	0.8	¾-1½	47k	E	0.2 x 0.7	User	5	72.00	
	500E	20-20k	35	22	1.0	2-5	47k	E	0.4 x 0.7	User	5	35.00	500A, similar but 0.7 mil conical stylus, $30.00.
	500EE	20-20k	35	22	1.0	1-2	47k	E	0.3 x 0.7	User	5	40.00	500AA, similar but 1-2½ tracking force, 0.5 mil conical stylus, $35.00.

All cartridges are different. Empire cartridges are more different than others! Take a technical look for yourself.



How it works.

If you know how moving magnetic cartridges are made, you can see right away how different an Empire variable reluctance cartridge is. With others, a magnet is attached directly to the stylus, so that all the extra weight rests on your record. With Empire's construction (unique of its type), the stylus floats free of its three magnets. So naturally, it imposes much less weight on the record surface.

Less record wear.

Empire's light-weight tracking ability means less wear on the stylus, and less wear on your records. Laboratory measurements show that an Empire cartridge can give as much as 50 times the number of plays you'd get from an ordinary cartridge without any measurable record wear! HI-FI SOUND MAGAZINE summed it up very well by calling the Empire cartridge "a real hi-fi masterpiece . . . A remarkable cartridge unlikely to wear out discs any more rapidly than a feather held lightly against the spinning groove."

Superb performance.

The light-weight Empire cartridge picks up the sound from the record groove with amazing accuracy. Distortion is minimal. (None at all could be measured at normal sound levels with Empire's 1000ZE/X and 999VE/X.) AUDIO MAGAZINE said of the Empire cartridge "outstanding square waves . . . tops in separation." HIGH FIDELITY noted ". . . the sound is superb. The performance data is among the very best." While STEREO REVIEW, who tested 13 different cartridges, rated the Empire tops of all in light-weight tracking.

X Designates newest improved version.

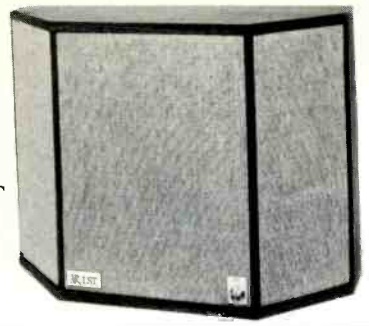
World Famous Long Playing Cartridges

empire

For further details write:
Empire Scientific Corp.,
Garden City, N.Y. 11530. Mfd. USA

Check No. 65 on Reader Service Card

Speakers



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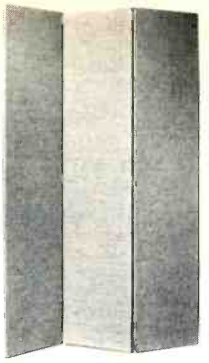
ADC 303AX



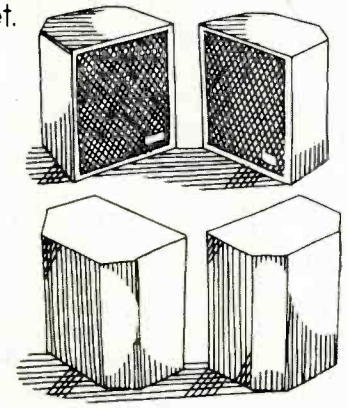
Audio Research Magneplanar

MANUFACTURER	MODEL	WOOFER: Diameter, in.	WOOFER: Resonance (in system), Hz	WOOFER: Enclosure type	MID-RANGE: Diameter, in.	MID-RANGE: Type	TWEETER: Diameter, in.	TWEETER: Type	Overall freq. resp., Hz to kHz ± ? dB	Ampl. pwr. for avg. room, W	Pwr. handling capacity (RMS cont)	Crossover frequency (ies), Hz	Impedance, ohms	Enclosure dimensions, W x D x H, in.	Wood finish	Grille material color	Weight, lbs.	Price	SPECIAL FEATURES
ACOUSTIC RESEARCH	LST	12	42	Acous. susp.	(4)-1½	Hemi. dome	(4)-¾	Hemi. dome	*	25	**	575; 5k	4	27⅛ x 20 x 9¾	Wal.	Cloth,	90	600.00	Prof. applications; at selected dealers. *Complete data available from AR on request.
	AR-3a	12	42	Acous. susp.	1½	Hemi. dome	¼	Hemi. dome	*	25	**	575; 5k	4	25 x 11⅜ x 14	***	Cloth, beige	53	250.00	**Depends on various factors; data on request. ***Wal., ch., teak, mah., bir., unfin.
	AR-5	10	56	Acous. susp.	1½	Hemi. dome	¾	Hemi. dome	*	20	**	625; 5k	8	24 x 11½ x 13½	***	Cloth, beige	39	175.00	
	AR-2ax	10	56	Acous. susp.	3½	Cone	¾	Dome	*	20	**	1.4k; 5k	8	24 x 11½ x 13½	***	Cloth, beige	36½	128.00	
	AR-6	8	56	Acous. susp.	–	–	1½	Cone	*	20	**	1.5k	*	19½ x 12 x 7	Wal.; unf.	Cloth, beige	20	81.00	
	AR-4x	8	65	Acous. susp.	–	–	2½	Cone	*	15	**	1.2k	8	19 x 9 x 10	Wal.; unf.	Cloth, beige	18½	63.00	
ADVENT		10	43	Acous. susp.	–	–	⅞	Dome	30-20k ± 4	20	120	1k	8	14¼ x 11½ x 25½	Wal.	Cloth, light	44	120.00	Also in wal. vinyl cab., $105.00.
		9½	43	Acous. susp.	–	–	⅞	Dome	30-20k ± 4	15	60	1.4k	4	11½ x 9¼ x 25½	*	Cloth, light	30	72.00	*Walnut vinyl.
AKAI	SW-155	12		Duct. port	5	Dome	2; 2½	Horn; Horn	25-21k ± 6	10	50	1.2k; 5k; 15k	8	16 x 11¾ x 25	Wal.	Wood, brn.	38½	149.95	Hi & mid contls.; quick-connect terminals.
	NDS-80	6½		Duct. port	3x6	Cone	–	–	55-18k ± 6	8	40	800	6	6 x 5¾ x 19¾	Wal.	Metal slvr.	17	239.95 pair	Hexagonal; omni; marbelized top.
	SW-175	15		Acous. susp.	5¼	Cone	2⅛ x2½; 3 (2) 3½	Horn;* cone; dome	20-23k		80	600; 5k; 10k; 15k	8	17 x 11¼ x 24½	Wal.	Wood, orn.	49		
ALTEC	846B	15		Bass reflex	–	–		Horn	35-20k	6	50	800	8	27½ x 20½ x 29¾	Wal.	Foam, blk.	91	375.00	A-7-8 "Voice of the Theater" home series.
	874A	12		Acous. susp.	4	Cone		Dome	30-20k	12	60	500; 5k	4	14⅝ x 11⅞ x 25⅝	Wal.	Brn.	53	250.00	Woofer has 3-in. voice coil, 17-lb. magnet.
	879A	15		Acous. susp.	–	–	3	Cone	35-18k	6	45	2.5k	8	20 x 17 x 24¾	Wal.	Cloth, blk.	46	199.00	
	891A	12		Acous. susp.	–	–	3	Cone	35-20k	12	50	1.6k	8	14½ x 12⅛ x 25½	Wal.	Foam, blk.	31	125.00	
AUDIO DYNAMICS	120	12		Acous. susp.	–	–	(2)	Dome	25-30k ± 3	10	70		8	14½ x 12 x 26	Wal.	Cloth, char.	60	250.00	120° dispersion tweeters.
	450a	12		Acous. susp.	–	–		Dome	25-30k ± 3	10	65		8	14 x 12⅜ x 25	Wal.	Cloth, char.	50	135.00	
	303ax	10		Acous. susp.	–	–	2	Cone	37-20k ± 3	10	45	1.5k	8	13 x 11¾ x 23¾	Wal.	Cloth, blk.	37	90.00	Mid & hi contls.
	404a	6		Acous. susp.	–	–	2	Cone	45-20k ± 3	12	26		6	10 x 7⅞ x 11⅞	Wal.	Cloth, beige	11	45.00	
AUDIO RESEARCH	T-10	Magneplanar const.; mylar diaphrams.							30-20k ± 6	75	500		8	48 x 1 x 71	*	*	140	995.00	*Fabric covered, 25 choices; ext. con. for bi-amp.
AUDIOTEX, DIV. HYDROMETALS	30-5106	8		Acous. susp.			(2) 2½		30-20k	30			8	11¾ x 18¼ x 9⅞	Wal.	Cloth; blk.	18	59.95	
	30-5104	8		Acous. susp.			3		35-20k	25			8	9½ x 15½ x 9	Wal.	Cloth; blk.	14	49.95	
	30-5102			Acous. susp.					35-20k	20			8	6½ x 12 x 7½	Wal.	Cloth; blk.	10	39.95	
	30-5100			Acous. susp.					40-20k	10			8	6½ x 10¾ x 6⅞	Wal.	Cloth; gold	5	29.95	
AZTEC	Gauguin	12		Bass reflex	6½	Cone	2x6	Horn	20-22k		65	500; 2k	8	22 x 15⅞ x 27	Wal.	Opt.	70	229.95	
	du Lane	8		Acous. susp.	8	Cone	3	Cone	30-19k		50	900; 5k	8	13½ x 9⅜ x 23	Wal.	Opt.	30	79.95	
	Matisse	12	35	Bass reflex	4½	Dome	3	Dome	20-22k		65	500; 2k	8	14¼ x 13½ x 25	Wal.	Opt.	65	159.95	
	Picasso	10		Bass reflex	6½	Cone	2x6	Horn	27-20k		50	700; 4k	8	13 x 11 x 23⅞	Wal.	Opt.	38	109.95	

Going 4-channel, simplified.

(Or it takes less space, effort and money than you ever imagined.)

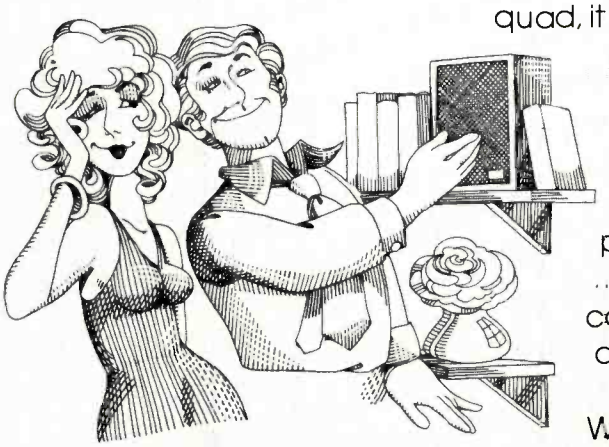
The Wharfedale W35 has been ready for quadraphonic ever since we introduced it. Ready to meet the requirements of space, performance and budget.

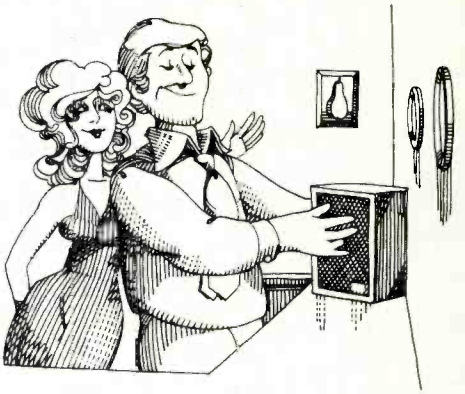


Two more speakers in the home isn't going to make anyone jump for joy—so we made it reasonably small in size (15x15x8") and shaped it to fit into corners, on a shelf or suspended on optional hide-away mounting brackets.

And corner placement of the W35s is more than a convenience. It insures bass enhancement and ideal sound dispersion. The W35 is full-fledged, 3-way speaker, with heavy-duty components capable of handling plenty of power over as broad a range as will ever be needed for rear channel work. It complements the best systems without compromise.

But W35 is not content to be known as only "the rear speaker of a 4-channel set up." It's a great speaker in its own right. It more than holds its own in stereo systems, and it can be easily shifted to the rear as you step up to quadraphonic. A W35 in each corner of the room brings out the full beauty of quadraphonic sound...and does nice things to the beauty of the room too. They're some of the handsomest, most adaptable of speakers for any application.





Which brings us to price, $79.95. Whether you multiply by two for stereo or four for quad, it doesn't take too much of a bite out of any budget.

The Achromatic W35 makes it so easy to enjoy quadraphonic sound today. ...just add the decoder, receiver and/or deck of your choice and you're ready! Write for our catalog.

Wharfedale Division, British Industries Company, Westbury, New York 11590.

Wharfedale W35

You're listening to the music, not the speakers.

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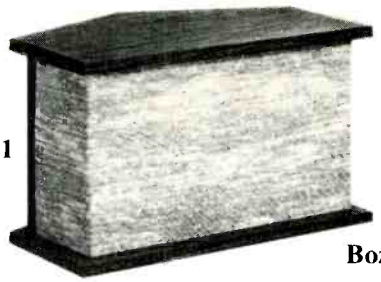
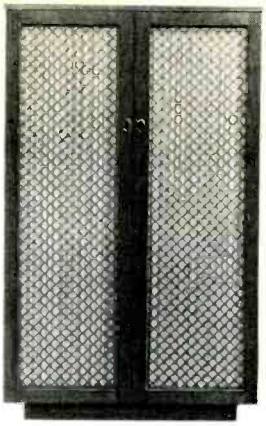
Speakers

B&W DM2A

Bose 901

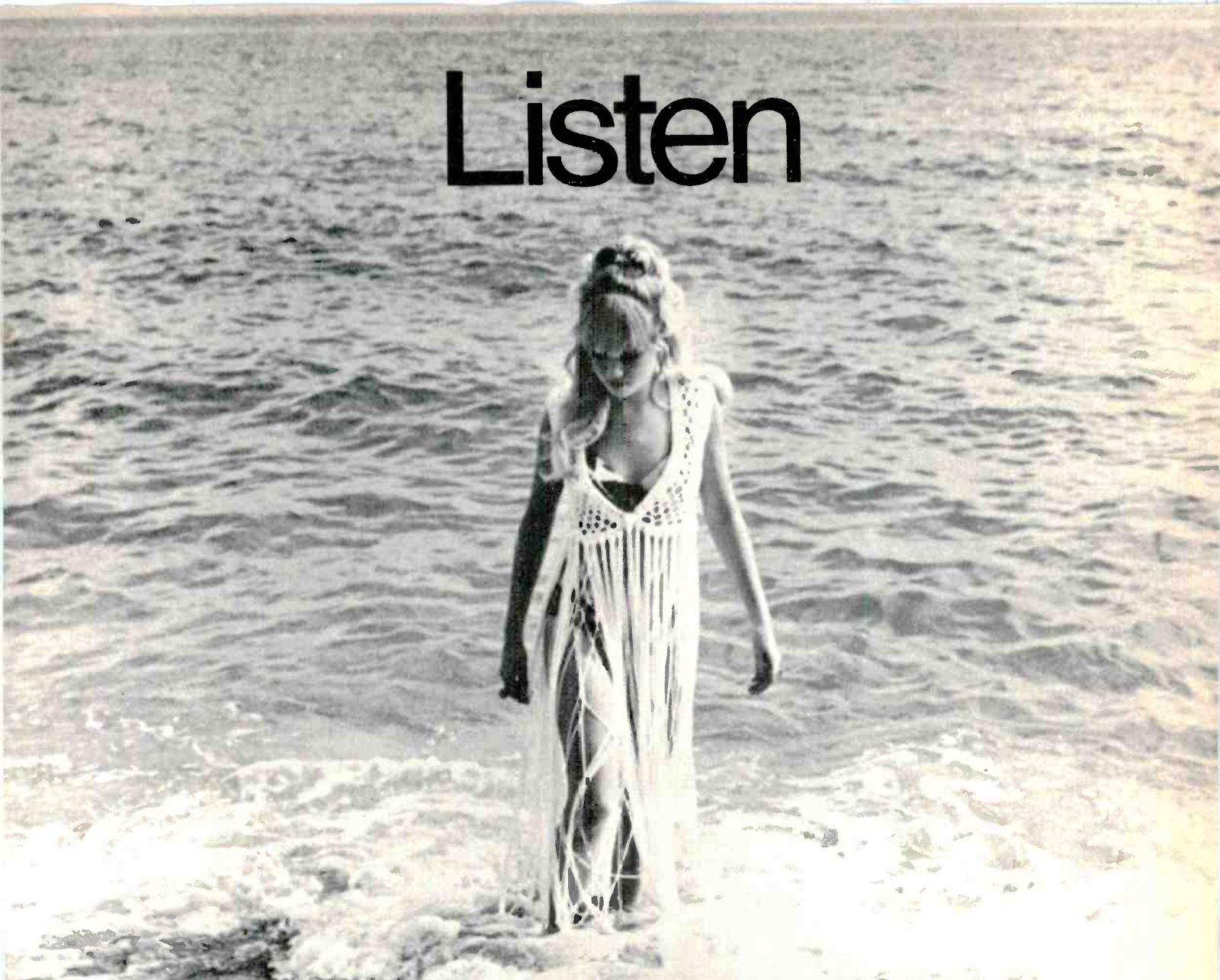


Bozak B-4000



MANUFACTURER	MODEL	WOOFER: Diameter, in.	WOOFER: Resonance (in system), Hz	WOOFER: Enclosure type	MID-RANGE: Diameter, in.	MID-RANGE: Type	TWEETER: Diameter, in.	TWEETER: Type	Overall freq. resp., Hz to kHz ± ? dB	Ampl. pwr. for avg. room, W	Pwr. handling capacity (RMS cont)	Crossover frequency (ies), Hz	Impedance, ohms	Enclosure dimensions, W x D x H, in.	Wood finish	Grille material color	Weight, lbs.	Price	SPECIAL FEATURES
B&O	5700	10	22	*	2¼	Dome	¾	Dome	25-20k +4-8	3	60	550; 6k	4,8	26 x 14¼ x 11¾	Rose., teak	Cloth, blk.	50	315.00	*Passive bass radiator, 10 in.
	4702	(2) 7½	30	Acous. susp.	5	Cone	1½	Dome	35-20k +4-8	3	60	500; 3k	4	11½ x 11½ x 23	Rose., teak	Cloth, blk.	28½	195.00	
	3702	8	29	Acous. susp.	3¾	Cone	1½	Dome	40-20k +4-8	3	40	800; 3k	4	9⅞ x 9⅞ x 19¾	Rose., teak, wte.	Cloth, blk.	20	130.00	
	2702	7	33	Acous. susp.	–	–	1½	Dome	45-20k +4-8	3½	25	3k	4	8 x 8 x 16⅛	Rose., teak, wte.	Cloth, blk.	12	90.00	
BSR MCDONALD	SS-2	6	45	Acous. susp.	–	–	2½	Cone	20-20k	4	18		8	14 x 8 x 7	Wal. vinyl	Cloth, brn.	16*	70.00*	* Pair.
B&W (LINEAR DEVICES)	70CA	13	30	Acous. susp.	11-element electrostatic				25-18k ± 3	50		400	8	26⅞ x 15⅜ x 32⅜	Wte.	Cloth, brn.	80	660.00	
	DM2A	8		Trans. line	2	Dome	1	Dome	40-20k ± 4	25		3.5k; 9k		13⅞ x 13⅝ x 25⅜	Wal. or Wte.	Cloth, blk.	50	299.00	Opt. pedestal.
BOSE	901	(9) 4		*	–	–	–	–		30	270	–	8	12⅞ x 12¾ x 20½	Wal.	Cloth, beige, blk.	33	476.00 pair	*Direct, reflecting; pentagonal shape; active equalizer.
	501	10		Acous. susp.	–	–	(2) 3	Cone		20	100		4	14½ x 14½ x 24	Wal. vyl.	Cloth, blk.	38	124.80	*Direct reflecting.
BOZAK	410	(4) 12	40	Acous. susp.	(2) 6	Cone	(8) 2½	Cone	28-20k	50	150	400; 2.5k	8	36 x 19 x 52	Wal.	Cloth & metal	229	1036.50	Bi-amp sys.
	4000	(2) 12	40	Acous. susp.	6	Cone	(8) 2½	Cone	35-20k	40	100	400; 2.5k	8	26 x 15⅝ x 44½	Wal.	Cloth & metal	190	658.00	Bi-amp sys.
	301	12	45	Acous. susp.	4½	Cone	2	Cone	40-20k	10	50	1.2k; 3.6k	8	14 x 11⅜ x 23⅛	Wal.	Cloth, brn.	40	169.00	Contour swit.
	227	8	60	Acous. susp.	–	–	2	Cone	40-16k	10	50	2k	8	11½ x 9¼ x 20	Wal. vyl.	Cloth, brn.	27	94.50	
BRAUN	L 710	(2) 7	48	Acous. susp.	2	Dome	1	Dome	25-25k ± 6	10	40	550; 4k	4	11¼ x 9⅝ x 21⅞	Wte.; Wal.	Opt.	44	225.00	
	L 810	(2) 8	45	Acous. susp.	2	Dome	1	Dome	20-25k ± 6	10	50	550; 4k	4	14⅜ x 11 x 25½	Wte.; Wal.	As above	66	325.00	
	LV 1020	12	45	Acous. susp.	2	Dome	1	Dome	20-25k ± 2.5	*	*	400; 3k	*	15 x 11¾ x 29½	Wte.; Wal.	As above	80	695.00	*tri-amp system with elect. xover; 100 W rms/spkr.
CRISMAN	Incredible Hulk	12	25	Laby.	12x6	Horn	2x5	Horn	20-18k	10	50	800; 3.5k	8	35 x 21½ x 18½	Wal.	Cloth, gold	90	398.00	
	Heffalump	15	30	Laby.	10x7	Horn	2x5	Horn	30-18k	10	30	1k; 3.5k	8	35 x 21½ x 18½	Wal.	Cloth, brn.	90	293.00	
	Glendenning	12	40	Laby.	10x4	Horn	2x5	Horn	30-18k	7	75	1k; 3.5k	8	15½ x 15⅜ x 29	Wal.	Cloth, choice	72	165.00	2 cont. adj. x-overs.
	Bookbinder	8	55	Laby.	–	–	2x5	Horn	40-18k	7	65	3.5k	8	21 x 12⅜ x 11½	Wal.	Cloth, choice	35	98.00	Cont. adj. x-over.
CROWN	ES-224	10		Acous. susp.	Electrostatic di-pole radiator				22-30k	150	200	350	4	26 x 28 x 60	Wal.	Cloth; brn.	135	1165.00	
	ES-212	10		Acous. susp.	Di-pole radiator				22-30k	75	120	375	4	26 x 21 x 42	Wal.	Cloth; brn.	110	795.00	
	ES-26	10		Acous. susp.	Direct radiator				25-30k	75	80	1500	2	24 x 12 x 27½	Wal.	Cloth;	70	495.00	
	ES-14	10		Acous. susp.	Direct radiator				30-30k	40	50	1500	2	18 x 12 x 27½	Wal.	Cloth; brn.	60	335.00	
DWD	15	12	20	Tuned port	5	Cone	2½; 2½	Cone; Cone	25-20k ± 4	15	60	350; 3.5k	8	11½ x 15½ x 25¾	Wal., rose	Cloth*	55	139.00	*Red, brn., blk., tan, blue.
	7	10	24	Tuned port	–	–	3	Cone	30-18.5k ± 4	15	55	2.5k	6	11 x 13 x 22	Wal.	Cloth*	34	89.00	*As above.
	5	8	30	Tuned port	–	–	3	Cone	40-18k ± 4	10	45	3.5k	7	8½ x 11 x 18	Wal.	Brn.	22	59.00	

Listen



to the irresistible sound of Martin Speakers

The sound of Martin Speakers can be as quiet and irresistible as the gentle meeting of sand and surf. Or vibrant and deepthroated as the roar of thunder in the summer sky.
Martin Speakers, for people who are attuned to the irresistible sounds of the audible universe.

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Martin Speakers from $44.50 to $350.00
"A new standard of performance built by people who listen."

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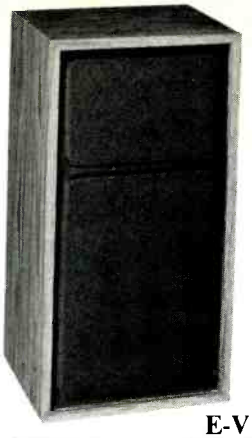
Speakers

Dynaco A-35

Design Acoustics D-12



E-V 7C

MANUFACTURER	MODEL	WOOFER: Diameter, in.	WOOFER: Resonance (in system), Hz	WOOFER: Enclosure type	MID-RANGE: Diameter, in.	MID-RANGE: Type	TWEETER: Diameter, in.	TWEETER: Type	Overall freq. resp., Hz to kHz ± ? dB	Ampl. pwr. for avg. room, W	Pwr. handling capacity (RMS cont.)	Crossover frequency (ies), Hz	Impedance, ohms	Enclosure dimensions, W x D x H, in.	Wood finish	Grille material	Color	Weight, lbs.	Price	SPECIAL FEATURES
DAYTON WRIGHT	XG8U/MT	Full-range electrostatic, hermetically sealed.							35-14k ± 3	20	350		8	40 x 11 x 49	Wal.	Opt.	54	1832.00 pair	XG8U, utility; MT = matching transformer; XG81, with screen, $200.00 extra; SA, stereo amp model, $167.00 extra.
DELTA-RET	810	(8) 10	70	Acous. susp.	–	–	(8) 3½	Cone	20-20k ± 3		400	2.5k	4	23 x 12 x 32	Wal.	Blk., beige		1100.00 pair	Direct, reflecting; active equalization.
	410	(4) 10	70	Acous. susp.	–	–	(4) 3½	Cone	30-20k ± 3		200	2.5k	8	14¾ x 12 x 32	Wal.	Blk., beige		700.00 pair	As above.
	210	(2) 10	70	Acous. susp.	–	–	(2) 3½	Cone	40-20k ± 3		100	2.5k	4	14¾ x 11 x 28	Wal.	Blk., beige		440.00 pair	As above.
DESIGN ACOUSTICS	D-12	10	30	Port	5	Cone	(9) 2½	Cone	30-15k ± 3	20	30	800; 1.6k	8	24 dia. 30 H.	Wal., blk., wte.	Opt.	45	325.00	Omnidirectional.
DYNACO	A-50	(2) 10		Acous. susp. *	–	–	1½	Dome	35-17k ± 5	25	50	1k	8	21½ x 10 x 28	Wal.	Linen, beige	47	179.95	*Dual chamber.
	A-35	10		Acous. susp. *	–	–	1½	Dome	38-17k ± 5	20	35	1.5k	8	12½ x 10 x 22½	Wal.	Linen, beige	30	119.95	*As above
	A-25	10		Resist. load. vent	–	–	1½	Dome	44-15k ± 5	20	35	1.5k	8	11½ x 10 x 20	Wal.	Linen, beige	24	79.97	Also in teak or rosewood, $89.95.
	A-10	6½		Resist. load. vent	–	–	1½	Dome	60-15k	15	25	2.5k	8	8½ x 8 x 15	Wal.	Linen, beige	30*	99.95*	*Pair.
ESS	Transtatic	12 x 9	18	Trans. line	5	Cone	(3) 3x6	ES	30-32k ± 3½	50	150	250; 1550	6	20 x 16 x 42	Wal.; rose.	Cloth, blk.	135	599.00	Side radiating; matched pairs.
	4-channel	12	38	Resis. port	6	Cone	2¼	Dome	30-20k ± 4	10	60	100; 2.2k	8	7 x 4½ x 11	Wal.		8	499.00	(Bass amp & woofer with equalizer, crossover.)
	Translinear	12 x 9		Trans. line	5	Cone	(2) 2¼	Dome	30-20k ± 3½	30	100	550; 2.5k	8	14 x 16 x 42	Wal.; rose	Cloth, blk.	95	299.95	
	ESS VII	12 x 9	40	Resis. port	5	Cone	2¼	Dome	40-20k ± 3½	25	100	550; 2.7k	8	16 x 14 x 27	Wal.; rose.	Cloth, blk.	65	299.95	
	ESS IX	12	40	Resis. port	5	Cone	2¼	Dome	35-20k ± 3½	25	100	550; 2.7k	8	16 x 14 x 27	Wal.	Cloth, brn.	65	189.00	
ELECTROMUSIC	450	15	55	Bass reflex	(2) 6 x 9	Cone	1	Dome		*	*	800; 5k	*	29½ x 19⅝ x 33	Wal.	Cloth, brn. & gold	227 pair	995.00 pair	*Input 1.5V rms across 10k; 2 built-in 50 W amps; moving baffle sys. cut standing waves.
	430	12	60	Bass reflex	3 x 9½	Horn	–	–		*	*	800	*	24⅞ x 18½ x 29⅜	Wal.	Cloth, brn.	200 pair	695.00 pair	*As above.
ELECTRO-VOICE	Patrician 800	30	15	Front loaded	12; 4 x 8	Cone; horn	2½ x 7	Horn	15-23k ± 3	2	20	100; 800; 5k	16	33 x 26½ x 51	Wal.	Cane	270	1400.00	Contemp. & trad. styles avail.
	Sentry III	15	40	Vented	8½ x 32	Horn	4 x 6	Horn	40-18k ± 3	2	50	600; 3.5k	8	34½ x 20½ x 28½	Wal.	Cloth, brn.	156	576.00	
	Nine A	10	60	Acous. susp.	5	Cone	2½	Cone	40-20k	8	15	700; 3k	8	13½ x 11¾ x 24	Wal.	Cloth, blk.	29	165.00	Tweeter level contl.
	Seven-C	8	75	Acous. susp.	–	–	2½	Cone	50-18k	8	15	1.5k	8	10 x 8½ x 19	Wal.	Cloth, blk.	14	72.00	Tweeter level contl.
ELITE	EE-65	12	35	Acous. susp.	6	Cone	3¾	Cone	30-20k	15	50	3k; 8k	8	14¾ x 12¼ x 23¾	Wal.	Cloth, gold			
	EE-4410	10	40	Acous. susp.	3⅜	Cone	3⅜	Cone	35-20k	10	30	4k; 10k	8	12⅝ x 9½ x 22	Wal.	Cloth, brn.			
	EE-338	8	50	Acous. susp.	–	–	3⅜	Cone	40-18k	8	25	4k	8	11 x 9 x 18	Wal.	Cloth, brn.			
	SS-10	5¼	55	Acous. susp.	–	–	–	–	50-17k	5	20	–	8	7 x 7 x 10	Wal.	Cloth, brn.			

For $279 we give you engineering. For an extra $20 we throw in some furniture.

To call the **Rectilinear III** a piece of engineering is a rather vigorous understatement.

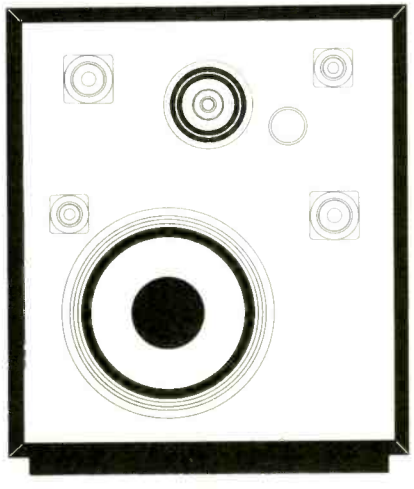
The equipment reviewers of leading hi-fi and other technical publications have gone on record that there's nothing better than this $279 floor-standing speaker system, regardless of type, size or price. (Reprints on request.)

But engineering is all you should expect when you buy this

original version of the **Rectilinear III.** Its cabinet is 35" by 18" by 12" deep, handsome but utterly simple. For $279, you get quality and taste but no frills.

However, if you're the last of the big-time spenders, you can now escape this austerity for an extra $20. Because, for $299, there's the stunning new lowboy version of the **Rectilinear III,** 28" by 22" by 12¼" deep, with a magnificent fretwork grille.

Mind you, the actual internal volume of the enclosure is the same in both versions. So are the



drivers and the crossover network. Only the cabinet styles and the dimensions are different. In the dark, you can't tell which **Rectilinear III** is which. They sound identical.

That's engineering.

(For more information, including detailed literature, see your audio dealer or write to Rectilinear Research Corp., 107 Bruckner Blvd., Bronx, N.Y. 10454. Canada: H. Roy Gray Co. Ltd., Markham, Ont. Overseas: Royal Sound Co., 409 N. Main St., Freeport, N.Y. 11520.)

Rectilinear III

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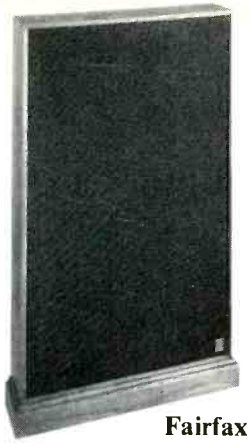
Speakers

EPI 100

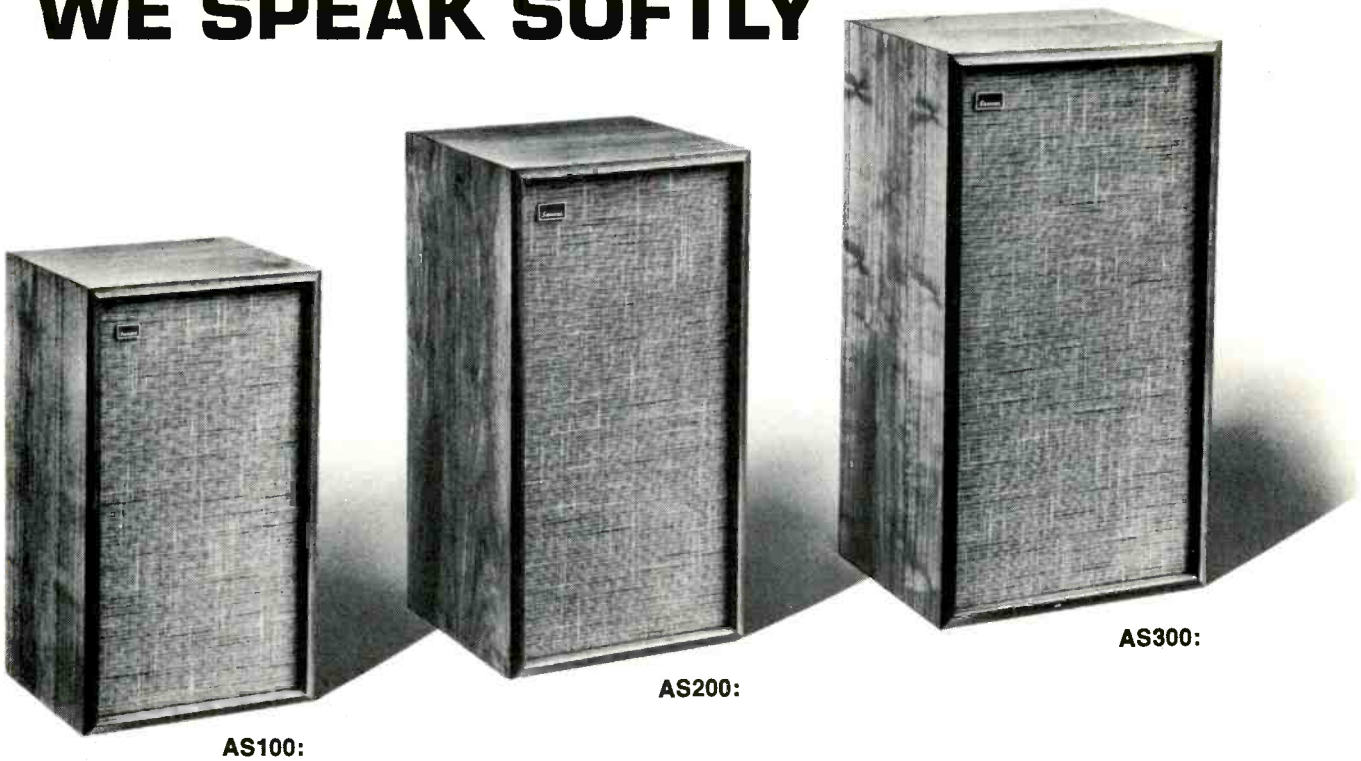


Fairfax Wall of Sound

Fisher 110S

MANUFACTURER	MODEL	WOOFER: Diameter, in.	WOOFER: Resonance (in system), Hz	WOOFER: Enclosure type	MID-RANGE: Diameter, in.	MID-RANGE: Type	TWEETER: Diameter, in.	TWEETER: Type	Overall freq. resp., Hz to kHz ± ? dB	Ampl. pwr. for avg. room, W	Pwr. handling capacity (RMS cont)	Crossover frequency (ies), Hz	Impedance, ohms	Enclosure dimensions, W x D x H, in.	Wood finish	Grille material color	Weight, lbs.	Price	SPECIAL FEATURES
EMPIRE	9500 MII	(2) 12		Horn load.	(2)	Cone	(2)	Dome	30-18k ± 3	10	100			30 x 20¾ x 28	Wal.			319.95	6-driver sys. with parallel hook-up offers stereo; opt. marble top, $29.95.
	9000MII	15	20	Acous. susp.	5	Dome	1	Dome	20-20k ± 3	10	100	450; 5k	8	22 dia. x 29	Wal.	None	120	329.95	With marble top.
	7500 M	15	25	Acous. susp.	5	Dome	1	Dome	20-20k ± 3	10	100	450; 5k	8	20 dia. x 27	Wal., oak	None	75	184.95	With marble top.
	7000MII	12	30	Bass reflex	5	Dome	1	Dome	25-20k ± 3	10	100	450; 5k	8	19 dia. x 26	Wal.	None	90	229.95	With marble top.
	6000M	10	40	Bass reflex	4	Dome	2	Cone	30-18k ± 3	10	75	500; 5k	8	18 dia. x 24	Wal., oak	None	60	119.95	With marble top.
EPICURE	1000	8	20	Acous. susp.	–	–	1	Cone	18-18k ± 3	20	250	1.8k	8	16 x 16 x 75	Wal.	Cloth, blk.	180	1000.00	
	601	8; 6	35	Acous. susp.	–	–	1	Cone	18-18k ± 3	35	150	1.8k	4	16 x 15 x 24	Wal.	Cloth, blk.	60	249.00	
	400	6	30	Acous. susp.	–	–	1	Cone	18-18k ± 3	30	200	1.8k	8	14 x 14 x 38	Wal.	Cloth, blk.	90	389.00	
	201	8	35	Acous. susp.	–	–	1	Cone	18-18k ± 3	20	100	1.8k	16/4	18 x 11 x 29	Wal.	Cloth, blk.	49	199.00	
	202	8	40	Acous. susp.	–	–	1	Cone	18-18k ± 3	20	100	1.8k	16/4	15 x 15 x 24	Wal.	Cloth, blk.	40	199.00	
	150	8	40	Acous. susp.	–	–	1	Cone	18-18k ± 3	17	50	1.8k	8	15 x 11 x 24	Wal.	Cloth, blk.	30	139.00	
	100	8	45	Acous. susp.	–	–	1	Cone	18-18k ± 3	17	50	1.8k	8	11 x 9 x 21	Wal.	Cloth, blk.	25	89.00	
	50	6	55	Acous. susp.	–	–	1	Cone	18-18k	10	25	1.8k	8	10 x 8 x 13	Wal.	Cloth, blk.	15	110.00 pair	
EQUASOUND	IIa	(2) 10		Acous. susp. *	2	Dome	(3) 2	Dome		3	75	2k; 7k	4	12 x 12 x 24	Wal., wte., rose	Cloth, **	70	219.00	*Mod. omni. pattern **choice, blk., org., blue, grn. w. leather top.
FAIRFAX	Wall of Sound I	(6) 8	30	Laby.	(2) 5	Cone	(2) 3; (2) 1	Cone; dome	20-20k	20	100	1k; 3k; 5k; 9k	6.5	23½ x 6½ x 39¼	Wal.	Cloth, brn.	125	239.95	1-in. board const.
	FTA2	(2) 8	30	Acous. susp.	4	Cone	1	Cone	24-20k	10	50	1k; 5k	4	14 x 12 x 24	Wal.	Cloth, brn.	44	139.95	Mid & Hi contl.; 1-in. board const.
	FX300	10	30	Bass reflex	–	–	4	Cone	24-20k	10	40	3k	8	14 x 10¾ x 22	Wal.	Cloth, gold	26	109.95	Treble contl.; 1-in. board const.
	F2A	8	40	Bass reflex	–	–	3	Cone	35-20k	8	25	5k	8	12 x 9¾ x 18	Wal.	Cloth, gold	22	69.95	Treble contl.; ¾ in. board const.
FISHER	550	15		Acous. susp.	(2) 1½	Dome	(2) 2; (2) 1½	Cone; dome	20-20k	20	50	600; 6k; 10k	8	17 x 12¾ x 30	Wal.	Cloth, blk.	75	349.95	
	530	15		Acous. susp.	1½	Dome	(4) 2	Cone	25-20k	20	50	600; 6k	8	16¼ x 13 x 27½	Wal.	Cloth, blk.	56	249.95	
	500	12		Acous. susp.	1½	Dome	(2) 2	Cone	30-20k	20	25	600; 6k	8	15 x 12 x 26	Wal.	Cloth, blk.	45	199.95	
	110S	12		Acous. susp.	(2) 4	Dome	(2) 2	Cone	32-22k	15	25	900; 3.5k	8	14 x 12 x 24½	Wal.	Cloth, brn.	37	199.95	
	XP-9C	15		Acous. susp.	(2) 5	Dome	(2) 1½	Dome	28-22k	20	30	500; 1.2k; 5k	8	16¼ x 13 x 27½	Wal.	Cloth, brn.	55	219.95	
	XP-7C	12		Acous. susp.	(2) 5¾	Cone	3	Cone	30-20k	20	25	350; 800; 3.5k	8	14 x 11⅞ x 24½	Wal.	Cloth brn.	40	169.95	Lattice-work grile. XP-7B, similar, $159.95.
	XP-66C	12		Acous. susp.	5¾	Cone	3	Cone	32-20k	15	25	400; 1.5k	8	13½ x 12 x 24⅛	Wal.	Cloth, brn.	33	129.95	
	XP-56	8		Acous. susp.	–	–	3	Cone	35-20k	10	15	1.5k	8	11½ x 9 x 21	Wal.	Cloth, brn.	20	79.95	

WE SPEAK SOFTLY



AS100:

AS200:

AS300:

AND CARRY A BIG SOUND

From the most delicate whisper to the thunder of a full orchestral climax, Sansui's new AS acoustic-suspension speakers reproduce the full dynamic range, distortion-free and with impartial precision.

Loud or soft—high volume setting or low—their special quality remains steadfast—and that quality will be a revelation to American ears. For the AS line was designed only after careful research into our listening preferences.

But traditional acoustic-suspension design was only the starting point. Next came new woofer cones blended of selected pulp and wool, then custom-impregnated for well-damped sound. Leakproof, mitred-joint cabinets. New wide-dispersion cone tweeters with excellent transient response. The results are lowered resonances, extended low-end response and smoother high-end performance. They add up to a new standard for reproduced sound, more natural yet more dramatic than anything you're accustomed to.

Listen to them yourself. You'll hear what we mean.

AS100: 2-way system with 10″ woofer and 3″ tweeter.
Response: 45 to 20,000 Hz. Peak power: 40 watts. $89.95.

AS200: 3-way system with 10″ woofer, 6.5″ midrange and 3″ tweeter.
Response: 40 to 20,000 Hz. Peak power: 50 watts. $119.95.

AS300: 3-way system with 12″ woofer, 6.5″ midrange and 3″ tweeter.
Response 35 to 20,000 Hz. Peak power: 60 watts. $149.95.

Sansui

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Check No. 73 on Reader Service Card

Speakers

Harman-Kardon Citation 13

Heath AS-103

Hitachi HS-500

MANUFACTURER	MODEL	WOOFER Diameter, in.	WOOFER Resonance (in system), Hz	WOOFER Enclosure type	MID-RANGE Diameter, in.	MID-RANGE Type	TWEETER Diameter, in.	TWEETER Type	Overall freq. resp., Hz to kHz ± ? dB	Ampl. pwr. for avg. room, W	Pwr. handling capacity (RMS cont)	Crossover frequency (ies), Hz	Impedance, ohms	Enclosure dimensions, W x D x H, in.	Wood finish	Grille material color	Weight, lbs.	Price	SPECIAL FEATURES
FRAZIER	Texan	12	25	Fold. horn	–	–	–	Horn	30-15k ± 5	⅛	30	600	8	24⅝ x 24 x 33	Util. grey	None	162	430.00	Front & rear loading
	Mark VI	12	25	Helm-holtz	8	Cone	3 x 7	Horn	25-24k ± 5	¾	30	800; 3.3k	8	25¾ x 16⅛ x 29	Wal.	Brn.	90	295.00	Adjustable network.
	Dixie-lander	10	50	Fold. horn	–	–	–	Horn	80-15k ± 5	⅛	30	800	8	22¾ x 15¾ x 26½	Util. grey	None		250.00	
	Mark V	12	25	Acous. susp.	(2) 4	Cone	3 x 7	Horn	30-14k ± 5	¾	30	800; 3.3k	8	14 x 12 x 25¾	Wal.	Dk. brn.	50	189.95	Hi & Mid controls. Also in util. blk., $159.95.
	Manhattan Deluxe II	8	100	Slotted port	–	–	3 x 7	Horn	40-15k ± 5	0.4	30	3k	8	23⅞ x 11⅞ x 19	Wal.	Brn.		134.95	Manhattan I, cone tweeter, $125.00.
	Wild Ones	10	50	Tuned port	–	–	3 x 7	Horn	35-15k ± 5	¾	30	2.5k	8	16 x 16 x 19	8	*	48	124.95	*Optional
	Mark IV	10	60	Helm-holtz	–	–	3 x 7	Horn	50-15k ± 5	¾	25	2k	8	14 x 12 x 24	Wal.	Brn.	41	99.95	
	Capsule	10	50	Acous. susp.	–	–	3 x 7	Horn	35-15k ± 5	¾	30	3.3k	8	16½ x 16 x 19	Blk.		35	85.00	
	Monte Carlo IV	8	100	Tuned port	–	–	3	Cone	90-12k ± 5	0.4	20	3k	8	19 x 11⅞ x 10¾	Wal.	Knit, brn.	24½	69.00	Hi control.
	Super Midget	4		Acous. susp.	–	–	–	–	100-12k ± 5	0.7	15	–	8	15⅞ x 19½ x 7½	Wal.	Blk.	10	32.95	
HARMAN-KARDON	Citation 13	(3) 7	32	Bass reflex*	1½	Dome	1	Dome	27-22k ± 3	15	60	1.5k; 6k	6-8	20⅝ x 14¾ x 29½	Wal.	Opt.	80	295.00	
HARTLEY	Concert-master VI	24	13	Acous. susp.	10	Cone	5⅝; 2	Cone; cone	16-25k ± 3	20	50	250; 3k	12	29 x 18 x 40½	Wal.	Cloth, brn. & gold	150	795.00	
	Concert-master Jr.	10	28	Acous. susp.	–	–	1	Dome	30-25k ± 4	15	30	2.5k	8	24 x 14 x 30	Wal.	Cloth, brn. & gold	85	320.00	Holton A, trad. cab., $300.00. Holton Jr., 15x12x30 cab., $250.00.
	Zodiac II	8	30	Acous. susp.	4	Cone	–	–	40-18k	10	20	2k	5	11½ x 8½ x 18	Rose., teak	Wood slats	16	90.00	
	Zodiac '72	10	30	Acous. susp.	–	–	1	Dome	38-25k	10	50	2.5k	8	15 x 12 x 30	Wal.	Cloth, brn.	50	120.00	
HEATH	AS-103	12	42	Acous. susp.	1.5	dome	0.75	dome	30-20k	25		575; 5k	4	14 x 11¾ x 25	Wal.	cloth brn & blk.	53	189.95	Kit; AR components.
	AS-101	15		Bass reflex	–	–		Horn	35-20k		50	800	8	27¾ x 19⅞ x 29⅝	Pecan	cloth gold & blk.	101	269.95	Kit; Altec components.
	AS-104	10	46	Acous. susp.	4½	cone	3½	cone	30-18k ± 5	10	60	500; 4500	8	24 x 13½ x 11½	Wal.	cloth drk brn.	36	89.95	
	AS-105	10	46	Acous. susp.	–	–	3½	cone	30-18k ± 5	10	60	1000	8	24 x 13½ x 11½	wal.	cloth gold & brn.	34	64.95 69.95	Unfinished AS-105U Walnut AS-105W
HEGEMAN	I	8	32	Acous. susp.	–	–	1	Dome	28-20k ± 2½	20	25	5k	8	11 x 8¾ x 26	Teak	Foam, blk.	32	99.50	Hemi dispersion.
HILL	850	10	50	Acous. susp.	1½	Dome	1	Dome	40-19½k ± 5	20	80	1.1k; 10k	4		Wal.	Cloth; brn.		129.50	Hi & lo fuses.
	750	10	50	Acous. susp.	–	–	1½	Dome	40-15k ± 5	20	80	1.1k	4		Wal.	Cloth, brn.		109.50	Hi & lo fuses.
	500B	8½	52	Acous. susp.	–	–	1½	Dome	50-15k ± 5	20	60	1.1k	*		Wal.	Cloth, brn.		79.50	*4 or 8 avail.; hi & lo fuses.
HITACHI	HS-500	8	50	Reflex	–	–	–	Horn	35-20k -8		50	3000	8	14¼ x 13¾ x 24	Wal.	Maroon	48½	315.00	Gathered edge, detachable grille.
	HS-350	8	65	Reflex	–	–	–	Horn	40-20k -8		50	3500	8	14⅜ x 9⅞ x 22⅜	Wal.	Gray	33	220.00	Gathered edge, toolless terminals, detachable grille.
	HS-420	10	65	Reflex	5	Cone	–	Horn	40-20k -8		40	2000 8000	8	14½ x 9⅞ x 26½	Wal.	Gray	33	160.00	Toolless terminals, detachable grille.
	HS-220	8	80	Acous. susp.	–	–	2½	Cone	60-20k -8		20	4000	8	11 x 9⅞ x 19¼	Wal.	Gray	15.5	80.00	Toolless terminals.

There's more behind the BOSE 901 than just a reflecting wall.

Research

The 901 DIRECT/REFLECTING® speaker system is the result of the most intensive research program that has been conducted into the physical acoustics and psychoacoustics of loudspeaker design. The research that gave birth to the 901 in 1968 began in 1956 and continues today to explore the frontiers of sound reproduction. Copies of the Audio Engineering Society paper, 'ON THE DESIGN, MEASUREMENT AND EVALUATION OF LOUDSPEAKERS', by Dr. A. G. Bose, are available from the Bose Corp. for fifty cents.

Technology

As might be expected, the product that emerged from 12 years of research is technologically quite different from conventional speakers. Some of the major differences are:

1) The use of a multiplicity of acoustically coupled full-range speakers to provide a clarity and definition of musical instrument sounds that can not, to our knowledge, be obtained with the conventional technology of woofers, tweeters, and crossovers.

2) The use of active equalization in combination with the multiplicity of full range speakers to provide an accuracy of musical timbre that can not, to our knowledge, be achieved with speakers alone.

3) The use of an optimum combination of direct and reflected sound to provide the spatial fullness characteristic of live music.

4) The use of a totally different frequency response criterion—flat power response instead of the conventional flat frequency response—to produce the full balance of high frequencies without the shrillness associated with conventional Hi-Fi.

Quality Control

It's a long way from a good theoretical design to the production of speakers that provide you with all the musical benefits inherent in the design. To this end BOSE has designed a unique computer that tests speakers for parameters that are directly related to the perception of sound. There is only one such computer in existence—designed by us and used for you. In January alone it rejected 9,504 speakers that will never be used again in any BOSE product. It is the speakers that survive the computer tests that provide your enjoyment and our reputation.

Reviews

The BOSE 901 DIRECT/REFLECTING® speaker is now the most highly reviewed speaker regardless of size or price. Read the complete text of reviewers who made these comments:*

Julian Hirsch STEREO REVIEW. ". . . I must say that I have never heard a speaker system in my own home which could surpass, or even equal, the Bose 901 for overall 'realism' of sound."

e/e HIGH FIDELITY. "It is our opinion that this is the speaker system to own, regardless of price if one wants the ultimate in listening pleasure."

Irving Kolodin SATURDAY REVIEW. "After a time trial measured in months rather than weeks, this one can definitely proclaim Bose is best, big or small, high or low."

Performance

You alone must be the judge of this. Visit your BOSE dealer. Audition the 901 with your favorite records. We make only one request. Before leaving, ask him to place the 901's directly on top of the largest and most expensive speakers he carries and then compare the sound. You will know why we make this request when you have made the experiment.

*For reprints of the reviews circle our number on your readers service card.

BOSE 901 DIRECT/REFLECTING® Speaker System, Stereo Pair, including Active Equalizer. Covered by patent rights issued and pending.

You can hear the difference now.

BOSE®

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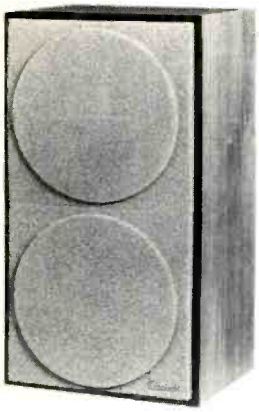
Speakers

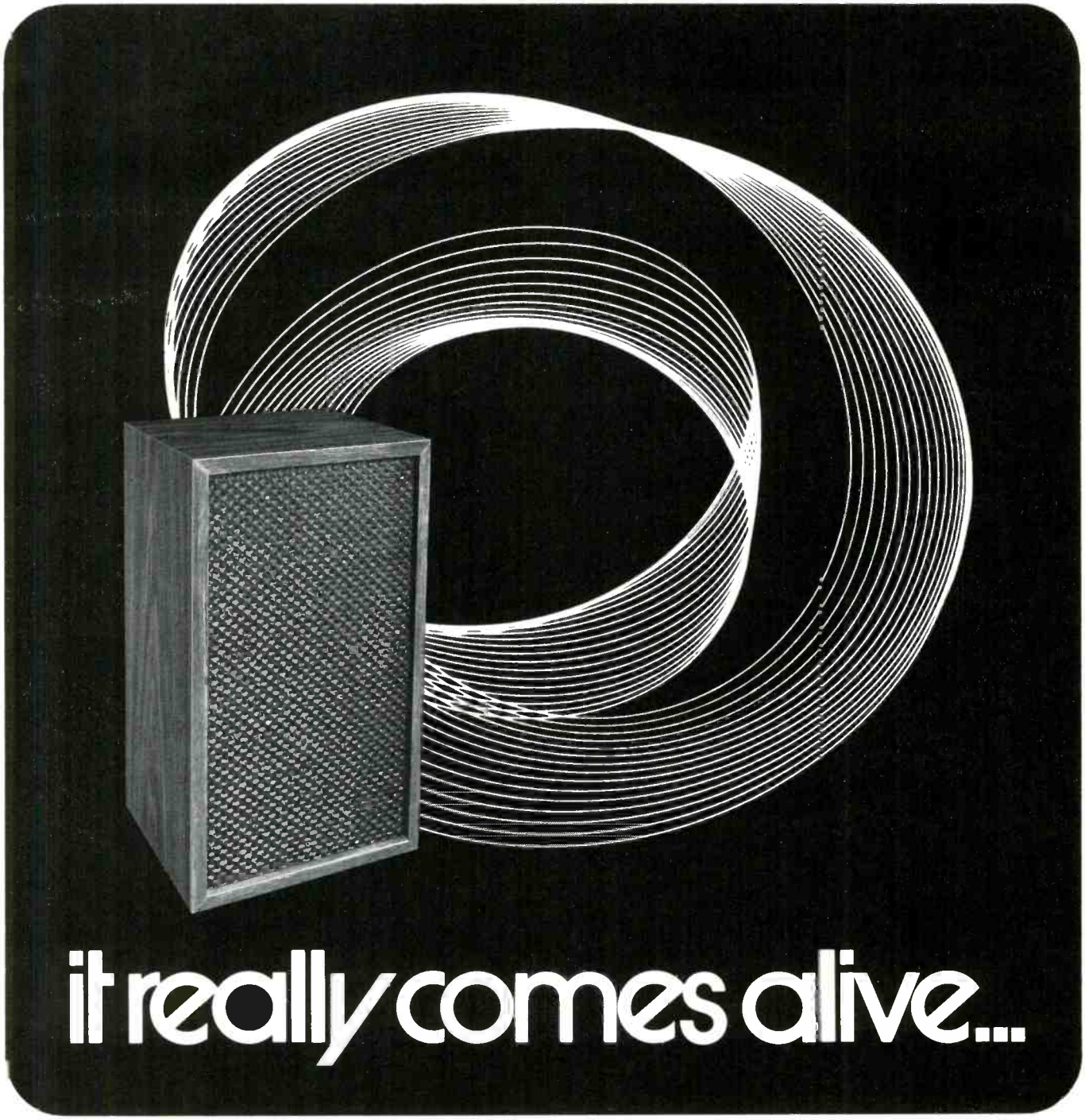


JansZen Z412

JBL L200

Jensen 6

MANUFACTURER	MODEL	WOOFER Diameter, in.	WOOFER Resonance (in system), Hz	WOOFER Enclosure type	MID-RANGE Diameter, in.	MID-RANGE Type	TWEETER Diameter, in.	TWEETER Type	Overall freq. resp., Hz to kHz ± ? dB	Ampl. pwr. for avg. room, W	Pwr. handling capacity (RMS cont.), W	Crossover frequency (ies), Hz	Impedance, ohms	Enclosure dimensions, W x D x H, in.	Wood finish	Grille material color	Weight, lbs.	Price	SPECIAL FEATURES
IMF	Studio Mk II	8	24	Dual trans. line	5	Cone	1½; ⅝	Dome; Dome	24-20k ± 5		25	375; 3.5k; 12k	8	15 x 14 x 14	Wal.	Cloth, blk.	70	320.00	Plastic laminate driver diaphragms.
	Studio	8	24	Dual trans. line	4	Cone	2½; ¾	Dome; dome	25-20k ± 3		25	375; 3.5k; 12k	8	15 x 14 x 35½	Wal.	Cloth, blk.	70	300.00	As above.
	Monitor II	9x12	14	Dual trans. line	5	Cone	2½; ¾	Dome; dome	20-25k ± 2		30	375; 3.5k; 12k	8	20 x 17 x 43	Opt.	Cloth, blk.	125	800.00	
INFINITY	Servo Static I	18		Servo sys.		ES		ES	15-30k ± 2½	60	100	100; 1.6k			Wal., rose.	Cloth, blk.	140	1995.00	2 electrostatic screens, w. bass amp & comode, x-over.
	2000A	12		Trans. line	4½	Cone		ES	28-30k ± 3	35	100	275; 1.7k	6	18 x 12 x 26	Wal., rose.	Cloth, blk.	60	289.00	Electrostatic tweeters radiate from rear above 17k.
	Holostatic I	12		Trans. line	–	–	(5) 2	Cone	27-21k ± 3½	20	75	1.3k	6	13¾ x 12½ x 39	Wal.	Blk.	65	210.00	
	1001	12		Trans. line	–	–	2	Dome	31-21k ± 4½	20	75	1.3k	6	14½ x 12¼ x 25	Wal.	Blk.	50	139.00	
JBL	L200	15		Bass reflex				Horn		1	100	1.2k	8	24 x 21 x 33	Wal.	Foam, opt.	140	597.00	
	L100	12		Bass reflex	5	Cone	1.4	Cone		2	50	1.5k; 6k	8	15 x 14 x 24	Wal.	Foam, opt.	55	273.00	
	L88P	12		Bass reflex	–	–	1.4	Cone		2	35	2k	8	15 x 13 x 24	Wal.	Foam, opt.	50	213.00	3-way convt. kit, M-12, $69.00.
	L25	10		Bass reflex	–	–	1.4	Cone		3	35	1.5k	8	16 x 15 x 19	Wal.	Cloth, opt.	35	126.00	
JVC	VS-5332	12	65	Acous. susp.	6½	Cone	3½; 2	Cone; cone	40-20k ± 5	8	40	1500; 7k; 10k	8	15½ x 13½ x 24¾	Wal.	Cloth, brn.	33⅛	149.95	Removable grille.
	VS-5307	12	50	Acous. susp.	6½	Dome	2; 2	Dome; horn	35-20k ± 5	20	30	600; 4k; 8k	8	14⅜ x 12⅝ x 26	Wal.	Cloth; brn. & wht.	40½	249.95	With two grille cloths.
	VS-5322	8	75	Acous. susp.	3½	Cone	2	Cone	50-20k ± 5	8	30	5k; 10k	8	13 x 9¾ x 21½	Wal.	Cloth; brn.	20	99.95	Removable grille.
	VS-5399	4¾ x12		Bass reflex	–	–	2	Cone	55-20k ± 5	7	10	6k	8	7⅞ x 7⅞ x 27½	Wal.	Metal; blk. & wht.	13⅛	89.95	Pedestal style.
JANSZEN	Z-408	8	49	Acous. susp.	–	–	(4) 36 total	ES	41-20k ± 3	20	50	1.8k	4	10½ x 9½ x 21	Wal.	Foam, opt.	25	99.95	Electrostatic level contl.
	Z-410	10	47	Acous. susp.			(4) 36 total	ES	39-20k ± 3	20	75	1.8k	4	12 x 11¾ x 24	Wal.	Foam, opt.	35	129.95	As above.
	Z-412A	12	41	Acous. susp.	–	–	(4) 64 total	ES	33-20k ± 3	20	100	1.8k	4	14½ x 11¾ x 27	Wal.	Cloth, opt.	45	229.95	As above.
	Z412HP	12	39	Acous. susp.	–	–	(4) 64 total	ES	32-20k ± 3	20	150	800	4	14½ x 11¾ x 27	Wal.	Foam, opt.	50	279.95	2½ in. voice coil; for bi-amp system.
	Z-812	12	39	Acous. susp.	–	–	(8) 128 total	ES	32-20k ± 3	20	150	500	4	16 x 16 x 48	Wal.	Foam, opt.	75	398.00	2½ in. voice coil; for bi-amp system.
	Z-130						(4)	ES	700-20k ± 3	20	100	700	8	22 x 13 x 7¼	Wal.	Cloth, brn.	16	199.95	for add-on applications.
JENSEN	6	15	40	Acous. susp.	8		5; 1	Cone; dome	40-20k ± 5	5	75	300; 1k; 4k	8	20½ x 15 x 27		Cloth, blk.	74	198.00	Mid & hi contls.
	4	10	50	Acous. susp.	5	Cone	1	Dome	45-20k ± 5	5	50	500; 4k	8	13 x 12 x 24		Cloth, brn.	46	99.00	Mid & hi contls.
	2	8	70	Acous. susp.	–	–	3½	Cone	60-18k ± 5	5	35	1200	8	11 x 8⅜ x 18¾		Cloth, wte.	22	48.00	Hi contl.
	1	8	100	Acous. susp.	–	–	–	–	70-13k ± 5	5	30		8	10 x 8½ x 14½	Wal.	Cloth, wte.	14	30.00	



it really comes alive...

and it's under $100...

True to the Bozak Tradition of "best in its class", our new **Sonora** (Model B-201) delivers dramatically clean sound at far higher levels than other speakers under $100 —and many costlier ones.

The secret of **Sonora** is our unique 8-inch Bass/Midrange driver. Its aluminum diaphragm radiates a solid, true-pitch Bass and a transparent, breakup-free Midrange, while serving as a heat-sink for the voice coil. As a result, it can easily handle the output of any amplifier up to 60 Watts RMS rating, with freedom from overloading.

Sonora is a two-way system, with an LC Crossover linking the 8-inch driver with a single-section of B-200Y, the tried-and-true Treble Speaker used in all Bozak systems.

The enclosure is a sturdy, resonance-free tightly-sealed box of ¾-inch compacted-wood material, covered with walnut-grain vinyl.

Be it rock or traditional, in stereo or quad, Music Really Comes Alive with **Sonora!** Hear them at your Bozak Dealer's.

11¾" x 20¼" x 10" deep; walnut-grain vinyl. 8 Ohms; 12.5 to 60 Watts RMS.

Bozak®

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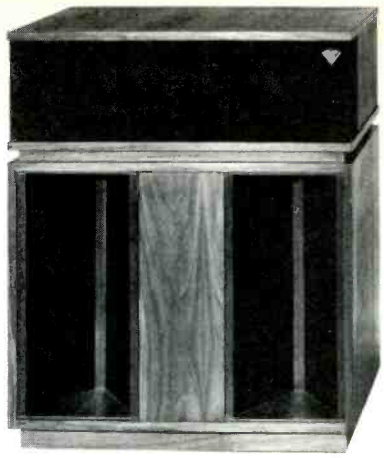
Speakers

KLH 32



Klipsch Belle

MANUFACTURER	MODEL	WOOFER: Diameter, in.	WOOFER: Resonance (in system), Hz	WOOFER: Enclosure type	MID-RANGE: Diameter, in.	MID-RANGE: Type	TWEETER: Diameter, in.	TWEETER: Type	Overall freq. resp., Hz to kHz ± dB	Ampl. pwr. for avg. room, W	Pwr. handling capacity (RMS cont), W	Crossover frequency (ies), Hz	Impedance, ohms	Enclosure dimensions, W x D x H, in.	Wood finish	Grille material color	Weight, lbs.	Price	SPECIAL FEATURES
KLH	Five	12	44	Acous. susp.	(2) 3	Cone	1¾	Cone		25		600; 2.5k	8	13¼ x 11½ x 26	Wal.	Cloth, brn.	54	189.95	2 3-pos. level contls.
	Six	12	55	Acous. susp.	–	–	1¾	Cone		15		1.5k	8	12⅝ x 11⅞ x 23½	Wal.	Boucle, off-wte.	40	134.00	3-pos. tweeter level cont.
	17	10	60	Acous. susp.	–	–	1¾	Cone		10		1.5k	8	11¾ x 9 x 23½	Wal.	Cloth, off-wte.	27	74.95	As above.
	32	8	59	Acous. susp.	–	–	1⅞	Cone		12		1.8k	8	10⅞ x 7¼ x 19⅜	Wal.	Cloth, brn.	21*	95.00*	*Pair.
	33	10	54	Resis. load. port	–	–	1¾	Cone		12		1.5k	8	12¾ x 10½ x 23⅜	Wal.	Cloth, brn.	33	99.95	3-pos. tweeter contl.
	38	10	50	Acous. susp.	–	–	1⅞	Cone		12		1750	8	12⅛ x 8½ x 21¼	Wal.	Cloth, brn.	28*	125.00*	*Pair.
KARLSON	X-15	15	25	Karl-son	–	–			20-15k ± 4	2	100	2k	16	28 x 19¼ x 14	Wal.	Cloth; blk.	90	400.00	
	X15	10	55	Karl-son	–	–	–	–	40-12k ± 3	2	60	–	16	25½ x 16¾ x 12¼	Wal.	Cloth; blk.	55	260.00	High efficiency, wide range spkr.
	AP-9C	6x9	65	Karl-son	–	–	–	–	50-15k ± 4	3	15	–	8	12 x 12	–	Metal; white	7	76.00	Flush mtg. ceiling spkr.
	HP-W	6x9	65	Karl-son	–	–	–	–	80-15k ± 4	3	15	–	8	20 x 10½ x 7	Wal.	Tan	10	108.00	Wall mtg.
KIRKSAETER	8000		30		(2)	Cone	(2)	Dome	18-25k		80	1k, 4k	8	14⅞ x 11⅞ x 31¼	Wal., wte.	Cloth	60	375.00	
KLEIN & HUMMEL (GOTHAM)	OY	10	20	Acous. susp.	4	Cone		Horn	40-16k ± 2			500; 8k		12 x 9 x 19	Wal.	Metal, silv.	44	580.00	Has 2 30-w amps with elect. x-over, level, bass, & treble contls.
KLIPSCH	Klipschorn	15		Horn	2	Horn	1	Horn	32-17.5k	20	100	400; 6k	8-16	31¼ x 28½ x 52	Wal.*	Opt.	218	645.00*	*To $1144 depending on finish.
	Belle	15		Horn	2	Horn	1	Horn	45-17.5k	20	100	400; 6k	8-16	30⅛ x 18⅞ x 35⅝	Wal.	Opt.	46	841.00	
	La Scala	15		Horn	2	Horn	1	Horn	45-17.5k	20	100	400; 6k	8-16	23¾ x 24½ x 34½	Blk.	None	126	625.00	
	Cornwall	15		Duct. port	2	Horn	1	Horn	32-17.5k	20	60	600; 6k	8-16	25½ x 15½ x 35¾	Wal.*	Opt.	108	369.00*	*To $497.00 depending on finish.
	Heresy	12		Acous. susp.	2	Horn	1	Horn	45-17.5k	20	40	700; 6k	8-16	15½ x 13⅛ x 21⅜	Wal.*	Opt.	47	228.00*	*To $276.00 depending on finish.
LAFAYETTE	Criterion 90	12		Acous. susp.	6½	Cone	3; (4) 1½	Cone; cone	18-25k	7	100	650; 3.5k; 5k	8	18 x 12 x 30	Wal.	Cloth, brn.	67	159.95	
	Criterion 5XB	12		Acous. susp.	6½	Cone	3; 1½	Cone; cone	18-25k	5	75	800; 4.5k; 10k	8	14⅜ x 11⅝ x 23⅜	Wal.	Cloth, brn.	46	139.00	2 level contls.
	Criterion 88	10		Acous. susp.	3	Cone	1½	Cone	20-20k		40	6.6k; 10k	8	15 x 9¼ x 24¼	Wal.	Cloth, brn.	32	89.95	3-push button x-over contls.
	Criterion ES 85	8		Acous. susp.	–	–	(4)	ES	45-25k	12	50	5k	8	11¾ x 8½ x 21⅜	Wal.	Cloth, brn.	20	64.95	Built-in power supply & A.C. line swit.; tweeter contl.
LEAK (ERCONA)	Mark III	13	19	Acous. susp.	–	–	3½	Cone*	30-18k	4	70	900	8	15 x 12 x 26	Wal.	Cloth, brn.	50	215.00	*Sandwich: polyethylene between alumin.
LINEAR DESIGN LABS	749	(9) 4½		*	–	–	–	–	30-20k	30	300	–	8	19¼ x 12½ x 12	Wal.	Cloth, brn. & blk.	44	149.97	*Direct, reflector.
MGA	SS-26	8	37		–	–	2		50-15k ± 3		25	2k	8	12¾ x 8½ x 19¾			24¼	129.95	
	SS-20	8			–	–	1	Dome	70-15k ± 3			2k	8	11¼ x 7½ x 20⅛				99.95	
	SS-19	8	45		–	–	2⅝		80-15k ± 3		16	3k	8	10⅝ x 7⅛ x 17			20	89.95	
	SS-16	8	53		–	–	2		100-15k ± 3		8	4k	8	10⅝ x 7 x 16¾			17¼	69.95	

JENSEN'S TOTAL ENERGY RESPONSE

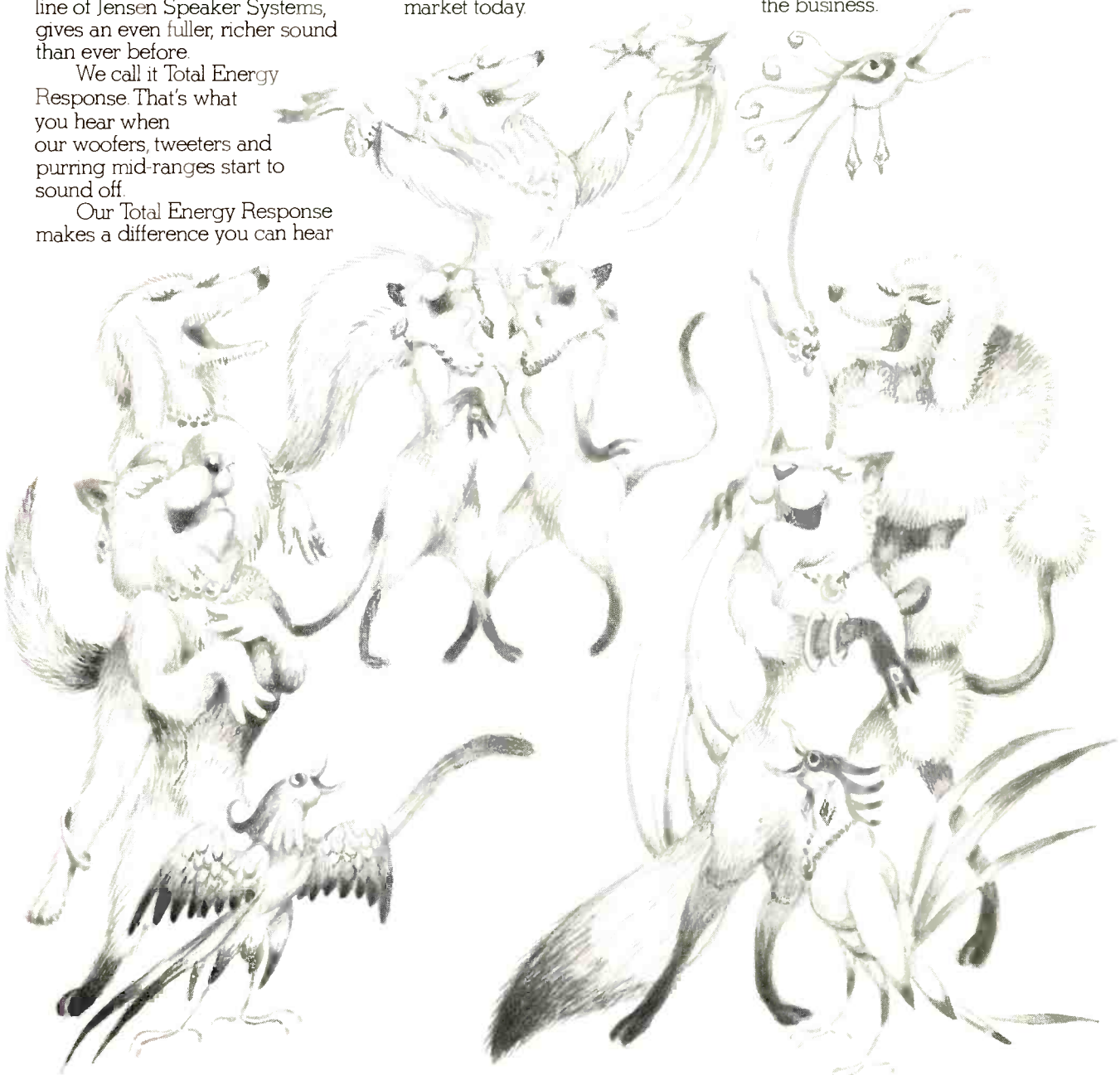
At Jensen Sound Laboratories, we have a reputation for building great speaker systems.

Our newest design, for the new line of Jensen Speaker Systems, gives an even fuller, richer sound than ever before.

We call it Total Energy Response. That's what you hear when our woofers, tweeters and purring mid-ranges start to sound off.

Our Total Energy Response makes a difference you can hear when you compare our systems to any others. Because in every price range, they give the best performance per dollar on the market today.

Consider these three new systems from Jensen. With more features, matched components and the best 5 year warranty in the business.



Model 4. A three way system introducing the first purr in speakers: Jensen's purring mid-ranges. There's a 10" woofer, 5" direct radiating mid-range and Sonodome® ultra-tweeter. $99.

Model 5. What a cast of characters. A three way system with a 12" woofer, two purring 5" direct radiating mid-ranges, Sonodome ultra-tweeter. $147.

Model 6. A fabulous four way, four speaker system, including a huge 15" woofer, 8" purring direct radiating mid-range, 5" direct radiating tweeter, and Sonodome ultra-tweeter. $198.

JENSEN SOUND LABORATORIES

A DIVISION OF PEMCOR, INC. CHICAGO, ILLINOIS 60638

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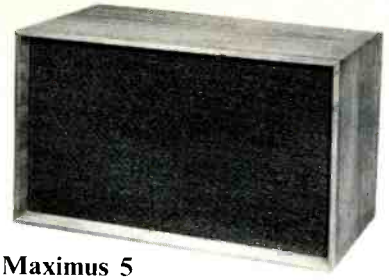
Speakers

Marantz Imperial 7



Maximus 5

Martin Magnificat

MANUFACTURER	MODEL	WOOFER			MID-RANGE		TWEETER		Overall freq. resp., Hz to kHz ± ? dB	Ampl. pwr. for avg. room, W	Pwr. handling capacity (RMS cont)	Crossover frequency (ies), Hz	Impedance, ohms	Enclosure dimensions, W x D x H, in.	Wood finish	Grille material color	Weight, lbs.	Price	SPECIAL FEATURES
		Diameter, in.	Resonance (in system), Hz	Enclosure type	Diameter, in.	Type	Diameter, in.	Type											
MAGNAVOX	8757	15	50	Acous. susp.	2	Dome	2	Cone	25-20k		100*	1.2k; 3k	8	26¼ x 18 x 34½	Wal.	Cloth, brn.	90		*Cons. V meth. @ 200 Hz; step mid & hi contls.
	8759	12	65	Acous. susp.	–	–	3x9	Horn	35-17k		75*	2.5k	8	20¾ x 18 x 24½	Pecan	Cloth; brn.	50		*As above; duo omni.
	8763	8	75	Acous. susp.	–	–	3½	Cone	45-15k		35*	5k	8	9½ x 9½ x 18¾	Wal.	Cloth, blk.	18		*As above.
	8762	6	75	Acous. susp.	–	–	3½	Cone	50-15k		25*	2.5k	8	8 x 7¾ x 15½	Wal.	Cloth, blk.	10		*As above.
MAGNUM OPUS	24	(4) 12		Acous. susp.	(4) 5	Cone	(4) 3; (12) 2	Dome; Cone	20-20k	30	200			30½ x 18½ x 31¼	Wal.	Cloth, blk.		795.00	
	7	(1) 12; (1) 10		Acous. susp.	5	Cone	(1) 3; (3) 2	Dome; Cone	25-20k	10	100			16¾ x 16¼ x 28	Wal.	Cloth, blk.		279.00	
	4	(2) 10		Acous. susp.	5	Cone	3	Dome	30-20k	10	100			13¼ x 13¼ x 21	Wal.	Cloth, beige		199.00	
	2	10		Acous. susp.	–	–	(1) 3; (3) 2	Dome; Cone	33-20k	20	50			14½ x 11 x 24	Wal.	Cloth, brn.		129.00	
MARANTZ	Imperial 7	12		Port.	3½	Cone	1¾	Dome	40-20k ± 5	7	100*		8	14¼ x 11½ x 25½	Wal.	Foam. brn.	45	179.00	*Integrated program material; 3-pos. freq. contl.
	Imperial 6	10		Port	–	–	2	Dome	40-18k ± 5		100*	3k	8	14¼ x 11½ x 25½	Wal.	Cloth; foam opt.	43	129.00	*As above; 2 lb alnico assy.
	Imperial 5	8		Duct. port	–	–	3½	Dome	50-15k ± 3		40*	2k	8	12 x 9½ x 23	Wal.	Cloth; foam opt.	25	89.00	*As above, 95 dB SPL .5 meter w. 1 W input.
	Imperial 4	8		Duct. port	–	–	1¾	Dome	40-18k ± 5							Cloth			
MARTIN (EASTMAN)	110 Micro-Max	8	65	Acous. susp.	–	–	3	Cone	45-14k ± 7	8	30	1050	8	10¾ x 9¾ x 18	Wal.	Cloth; brn.	23	59.50	Tweeter bal. cont.
	120 Super-Max	10	50	Acous. susp.	–	–	2½	Dome	30-18k ± 7	8	35	1050	8	10 x 12 x 21	Wal.	Cloth; brn.	30	89.95	Tweeter bal. cont.
	430 Cresendo	12	40	Acous. susp.	3½	Cone	2½	Dome	30-18k ± 5	7	36	1k; 5k	8	12 x 13 x 25	Wal.	Cloth; brn.	50	169.95	Mid & hi bal. conts.
	830 Magnificat	(2) 12	38	Acous. susp.	6	Cone	(2) 2½	Dome	28-20k ± 5	10	60	750; 4k	4	14 x 18 x 38	Wal.	Cloth; brn.	90	319.95	Mid & hi bal. conts.
MAXIMUS	5	12	40	Acous. susp.	6; 3	Cone; Cone	1	Dome	20-35k ± 5			1k; 5k; 8k	8	14 x 12 x 30	Wal.		52	187.50	4-way.
	55	12	45	Acous. susp.	6	Cone	3½	Cone	20-20k ± 5			2k; 5k	8	14 x 12 x 24	Wal.		30	137.50	
	44	10	45	Acous. susp.	–	–	3	Cone	30-18k ± 3			2k	8	12¾ x 9½ x 22	Wal.		28	105.95	
	1	5	55	Acous. susp.	–	–	1	Cone	45-20k ± 5			1.9k	8	7½ x 5½ x 10½	Wal.		10	69.50	
	MPL 10	6	100	Acous. susp.	–	–	2	Cone	50-17k	5	10	5k	8	8 x 8 x 15	Wal.	Blk., brn.	5	32.95	
MICRO/ ACOUSTICS	10	10	43	Acous. susp.	–	–	(3) 1¼; (2) 1¾	Cones	35-18k ± 4	10	60	1.8k	4	12 x 11 x 25	Wal.	Blk.	42	139.95	
	Microstatic	–	–	–	–	–	(2) 1¼; (2) 1¾	Cones	3.5k-18k ± 3	10	60	3.5k or 7.5k	16	9⅛ x 5¼ x 3¾	Wal.	Wte.	2½	117.00 pair	
NIKKO	SS-83	8		Acous. susp.	–	–	2¾	Cone	40-20k		15	4k	8	9 x 9 x 14¼	Wal.	Cloth, blk.	10¼		
	SS-85	8		Bass reflex	5	Cone	2	Horn	40-21k ± 5		25	1k; 5k	8	14¼ x 9 x 18⅜	Wal.	Cloth, brn.	15½		
	SS-88	12		Bass reflex	5	Cone	2¼	Horn	35-21k ± 5		35	600; 6k	8	16 x 11 x 26½	Wal.	Wood	38½		3-pos. tone contl.
OHM	A	18	26	Acous. susp.	–	–	–	–	20-20k ± 4	150	350	–	8	22 x 22 x 40	*	Brn.	125	650.00 to 750.00	Omni.; *choice, wal., oak, teak, rosewood.
	B	12	40	Acous. susp.	–	–	1	Dome	35-19k ± 5	30	85	1750	8	15 x 10¾ x 26	Wal.	Brn.	40	180.00	
	C	10	45	Acous. susp.	–	–	1	Dome	40-18k ± 5	35	85	750	8	14 x 9¾ x 25	Wal.	Brn.	35	145.00	
	D	10	50	Reflex	–	–	3	Cone	45-17k ± 5	20	85	2100	8	14 x 8 x 25	Wal.	Brn.	28	90.00	

(Continued on page 84)

HERE'S WHAT OUR CONSUMERS REPORT TO US!

CUT OFF AND

Please list any suggested improvements, changes, or other comments:
One Hell of an improvement TO good sounding what I Thought was a SYSTEM.
Purchased from HI-FI-Mart City Mt. Prospect State Ill. 60056

Please list any suggested improvements, changes, or other comments:
I thought my system was the best sounding system going, but this equipment makes it sound un-real . (Keep up good work)
Purchased from Lafayette radio City pennsauken State N.J.
P.S. send any literature that you may have.

CUT OFF AND

City Please list any suggested improvements, changes, or other commen
An excellent device - what my s
needed for total versatility with so
Purchased from Audio Club City Frankfurt

CUT OFF AN

Please list any suggested improvements, changes, or other comments:
Webster's Dictionary has a word that describes the 20-12 - SUPERLATIVE
M-D-Michigan ELECTRONICS City EAST LANSING State MICH.

Please list any suggested improvements, changes, or other comments:
WOW!!! WHAT A CHANGE IN MY SYSTEM!
Purchased from SOUNDEX City WILLOW GROVE State PA

CUT OFF AND

Purchased from Hickory Hop City Dallas
INCREDIBLE! Every System S
HAVE ONE.
Purchased from LEONARD RADIO City NYC

CUT OFF

LEAVE IT ALONE — IT'S PERF
Purchased from J & J ENGINEERING City KOKOMO

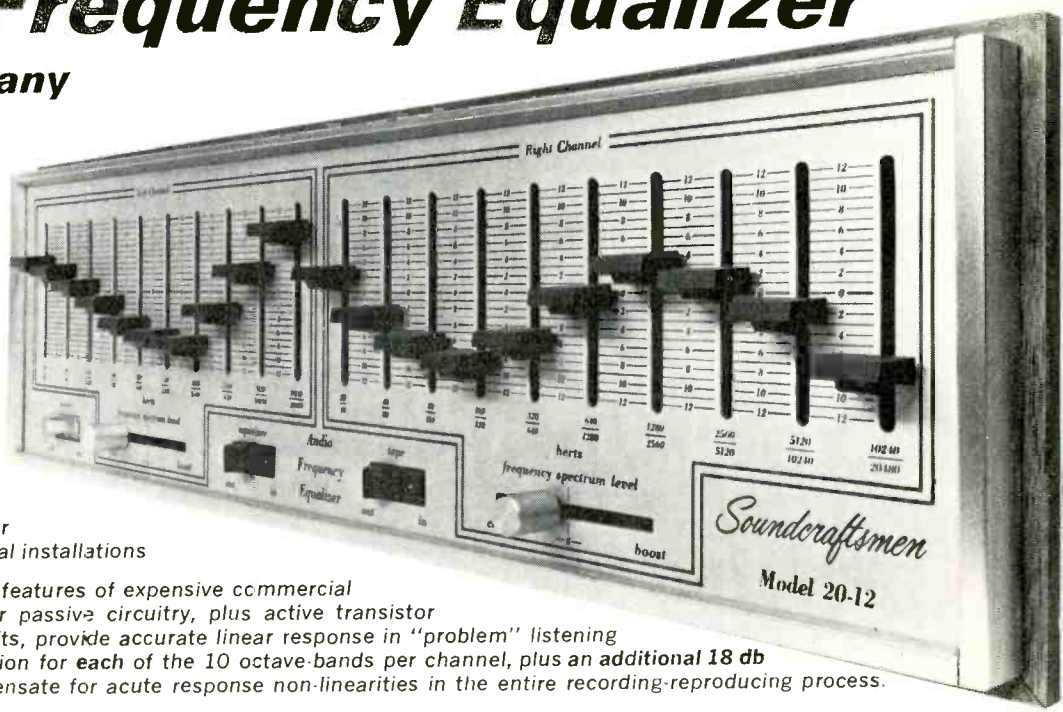
Soundcraftsmen presents

the new component that is a "must" with every fine stereo system...

the new Audio Frequency Equalizer

guaranteed to improve any fine stereo system!

*Now, in a few minutes, you can accurately "tune" the frequency response of your stereo system **and** room environment to a flat ±2 db! All you need are your own ears and the 20-12 (with its step-by-step instruction record) to transform **any** stereo system and room environment into an acoustically-perfect concert hall! Or, to provide any special acoustical effects you desire! The 20-12 enables you to instantly compensate for frequency response variations, in **system and room.***



$299.50 *includes walnut cabinet or rack mount for commercial installations*

*PATENT-PENDING design combines the best features of expensive commercial equalizers: **Toroidal** and ferrite-core inductor passive circuitry, plus active transistor circuits and active master level control circuits, provide accurate linear response in "problem" listening areas. Allows a **full 24 db** range of equalization for **each** of the 10 octave-bands per channel, plus an **additional 18 db** range of full-spectrum boost or cut to compensate for acute response non-linearities in the entire recording-reproducing process.*

ROOM EQUALIZATION, SPECIAL EFFECTS, PLAYBACK and RECORDING

EQUALIZING FOR ROOM CHANGES: For example, here are some factors that would call for definite changes in your Equalizer settings: (1) Draperies open or closed. (2) Sliding glass door open or closed. (3) Room full of people. (4) Seating arrangements changed. (5) Major changes in furniture arrangement. (6) Relocation of speakers. . . . **EQUALIZATION OF RECORDS:** You can compensate for old 78 record deficiencies (surface noise, absence of highs or lows, etc.) or favorite recordings that have never sounded quite the way you felt they should sound. . . . **COMPENSATING FOR RADIO STATIONS:** Some stations are noted for excesses in either low or high frequencies. Make out a Computone Chart for each of your favorite stations so that you can easily achieve the ideal tonal response each time you change stations. . . . **EQUALIZING TAPES:** Compensating for pre-recorded, or home-recorded, tapes that are under or overemphasized in certain frequency areas. . . . **CHANGING OVERALL BALANCE:** You can make up for many deficiencies in recordings to more accurately duplicate the sounds of the original performance, or shape each curve to your own listening interests to greatly enhance your enjoyment of your recordings. . . . **SPECIAL EFFECTS:** You can boost or cut the loudness of a specific instrument or groups of instruments to obtain more pleasing instrumental balance or to add presence to a solo. . . . **IMPROVING RECORDING OF TAPES:** Use the Equalizer for tape dubbing, to create a near-perfect tape out of one that may have serious deficiencies. (Make your own corrected recording of records, station programming, or other tapes, and no further adjustment of the Equalizer will be needed for playback.) (See Operating Instructions). . . .

COMPUTONE CHARTS: After you have achieved the equalization of sound that you prefer use the Computone Charts, supplied with each Equalizer, to mark the settings, so that you can duplicate the settings easily.

SPECIFICATIONS and SPECIAL FEATURES

***TOROIDAL** and ferrite-core inductors, ten octave-bands per channel.*
***FREQUENCY** response: ±½ db from 20-20, 480 Hz at zero setting.*
***HARMONIC DISTORTION:** Less than .1% THD @ 2 v., Typ: .05% @ 1 v.*
***IM DISTORTION:** Less than .1% @ 2 v., Typ: .05% @ 1 v.*
***SIGNAL-TO-NOISE RATIO:** Better than 90 db @ 2v. input.*
***INPUT IMPEDANCE:** Operable from any source 100K ohms or less — (any Hi-Fi Pre-amp, Receiver or Tape Recorder.)*
***OUTPUT IMPEDANCE:** Operable into 3K ohms or greater — (any Hi-Fi Amp, Receiver or Tape Recorder.)*
***CIRCUIT BOARDS:** Military grade G-10 glass epoxy.*
***RESISTORS:** Low-noise selected carbon-film.*
***RANGE:** 12 db boost and 12 db cut, each octave.*
***MASTER OUTPUT LEVEL:** "Frequency-spectrum-level" controls for left and right channels, continuously variable 18 db range, for unity gain compensation from minus 12 db to plus 6 db.*
***MAXIMUM OUTPUT SIGNAL:** variable Master "frequency spectrum level" Controls allow adjustment of optimum output voltage for each channel, to exactly match amplifier capability, up to 7 v.*
***SIZE:** designed to coordinate with receivers, comes installed in handsome walnut-grained wood receiver-size case, 5¼" x 18" x 11", or rack-mount*
***WARRANTY:** 2-year parts and labor.*

Soundcraftsmen: 1310 E. Wakeham Ave., Santa Ana, Cal. 92705 Ph: 714-836-8375

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Lancaster, Commerical Music, 303 Cedar Hill Rd.
Mentor, Lafayette Rad, 75 Bi Mentor Ave.
Parma, Winteradeo Elec., 5373 Ridge Rd.
Warren, Valley Electronics, 264 W Market St.
Warrensville, Lafayette Radio, 21907 Emery Rd.
Okla., Oklahoma City, Capitol Electronics, 6500 North May
Oklahoma City, Lafayette Radio, 2220 S W 74th St.
Ore., Portland, Hunters, 4059 NE Sandy
Portland, Oregon Hi Fi, SW 5th & Washington
Portland, Wassons, 631 NE Grand Ave.
Pa., Ambridge, Central Radio, 1194 Merchant St.
Camp Hill, C & S Distributors, 7 N 21st
Cornwells Hts., Franklin Music, Neshaminy Mall
Eynon, Eynon Drug, Rt 6
Greensburg, Wander Sales, Greengate Mall
McKeesport, Wander Sales, 325 Fifth Ave.
Monroeville, Wander Sales, Monroeville Mall
New Brighton, Television Parts, 518 5th Ave.
Philadelphia, Sam Goody, 1125 Chestnut St.
Philadelphia, Tech Hi Fi, 4034 Walnut
Pittsburgh, Soundpiper, 1835 Murray Ave.
Pittsburgh, Horne Music, 510 Market St.
Pittsburgh, Lafayette Rad, 4801 McKnight Rd.
Pittsburgh, Record-Rama, 639-41 Butler St.
Pittsburgh, Opus One, 400 Smithfield St.
Pittsburgh, Wander Sales, 7901 McKnight Rd.
Pittsburgh, Wolks Kamera, 312 Forbes Ave.
Plymouth Mtg., Franklin Music, Plymouth Meeting Mall
Reading, Electronics Dist., 201 S 4th St.
No Versailes, Wander Sales, Eastland Shopping
R.I., Cranston, Sound-O-Rama, 758 Reservoir Ave.
Tenn., Chattanooga, College Hi-Fi, 5768 Brainerd
Kingsport, Watkins Stereo, 1019 Center St. E
Memphis, Stuber's, 1523 Union Ave.
Nashville, Electra Dist., 1914 W End Ave.
Nashville, Nicholsons, 115 19th Ave. SO
Nashville, Miller Clinic, 602 Gallatin Rd.
Tex., Amarillo, Capitol Electronics, 1800 Washington
Austin, High Fidelity Inc., 1710 Lavaca St.
Austin, Home Entertainment, 7530 Burnet Rd.
Dallas, Discount Records, 4003 Northwest Pkwy.
Dallas, Hillcrest Hi Fi, 6307-09 Hillcrest Ave.
El Paso, Howell Electronics, 2873 Pershing
Houston, R & M Electronics, 3717 S Shepard Dr.
Houston, Home Entertainment, 5310 Kirby Dr.
Houston, Home Entertainment, Nassau Bay Shppg. Ctr.
Lubbock, Hi Fidelity, 2217 34th St.
McAllen, McAllen Radio, 415 S Broadway
Midland, Barton Elec., 1023 N Midkiff
Midland, Midland Camera, 317 N Colorado
Richardson, Electronics Unlimited, 61 Richardson Hts. Vilg.
San Antonio, Case Sound, 3522 Broadway
Tyler, Cole Electronic, 335-337 S Bonner
Ut., Salt Lake City, House of Music, 156 S Main
VA., Arlington, Audio Associates, 3441 Fairfax Dr.
Blacksburg, Audio-Tronics, 113 N Main St.
Blackburn, Carver's, 153 College Ave.
Falls Church, Lafayette Radio, Wilson & Roosevelt Aves.
Norfolk, Lafayette Rad, 1730 E Little Creek Rd.
Norfolk, Sound Shop, 7862 Tidewater Dr.
Richmond, Audio Fidelity Corp., 6521 W Broad St.
Roanoke, Audio Fidelity Corp., 3032 Trinkle Ave. NW
Springfield, Capitol Recording, 7085 Brookfield Plz.
Virginia Bch., Lafayette Rad, 5112A Virginia Bch Blvd.
Woodbridge, Lafayette Radio, 14402 Jeff Davis Hwy.
W.Va., Morgantown, Stereo Component Ctr., 465½ High St.
Wash., Seattle, Electricraft, 5030 Roosevelt Way N E
Spokane, Huppins Hi Fi, 419 W Main Ave.
Spokane, Hal's Stereo N 2514 14 Div St.
Wis., Appleton, Consumer Electr., 518 N Appleton St.
Janesville, TV-Hi Fi Center, 117 W Milwaukee St.
Milwaukee, Discount Records, 434 W Wisconsin Ave.
Milwaukee, Hi-Fi Fo-Fum, 2532 W Wisconsin Ave.
Milwaukee, Hi Fi Salon, 7204 W Greenfield

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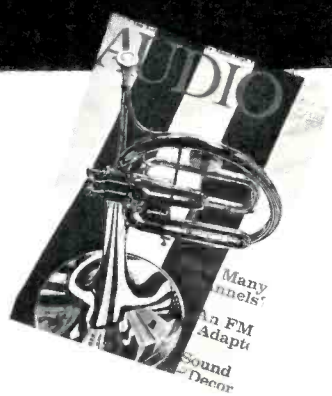

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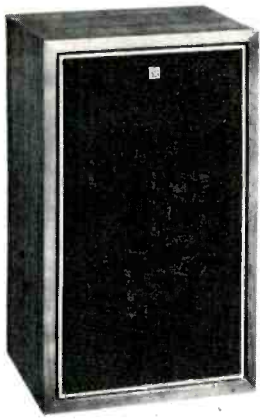
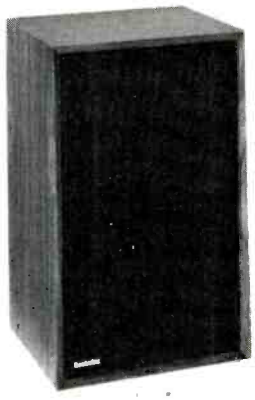
Speakers



Olson S-82



Quadraflex 77

Pioneer CS-A500

(Continued from page 80)

MANUFACTURER	MODEL	WOOFER Diameter, in.	WOOFER Resonance (in system), Hz	WOOFER Enclosure type	MID-RANGE Diameter, in.	MID-RANGE Type	TWEETER Diameter, in.	TWEETER Type	Overall freq. resp., Hz to kHz ± ? dB	Ampl. pwr. for avg. room, W	Pwr. handling capacity (RMS cont)	Crossover frequency (ies), Hz	Impedance, ohms	Enclosure dimensions, W x D x H, in.	Wood finish	Grille material color	Weight, lbs.	Price	SPECIAL FEATURES
OLSON	SS-82	12	48	Acous. susp.	12	Horn	6	Horn	20-30k ± 1	10	60	800; 5k	8	14⅜ x 11¾ x 23⅜	Wal.	Cloth, brn.	42	329.98	Front mtd. level contls.
	SS-72	12	48	Acous. susp.	5	Cone	2	Cone	25-25k ± 1	10	50	800; 5k	8	14⅜ x 11¾ x 23⅜	Wal.	Cloth, brn.	40	249.00	As above.
	SS-184	10	55	Acous. susp.	5	Cone	2½	Cone	25-20k ± 1	8	60	750; 6.2k	8	17½ x 11¼ x 12½	Wal.	Cloth,	30	149.98	
	SS-175	12	58	Acous. susp.	5	Cone	2½; 1¼	Cone; cone	20-27k ± 1½	10	50	700; 6k; 12k	8	14¼ x 11½ x 25½	Wal.	Cloth, brn.	40	149.98	
ONKYO	30	12	45	Acous. susp.	3½ x 10½	Horn	2¼	Horn	20-20k	15	30	700; 5k	8	16½ x 15½ x 28½	Wal.	Cloth, beige	51	299.95	
	25	14	53	Acous. susp.	2	Dome	1	Dome	30-20k	10	30	700; 7k	8	14¾ x 11⅝ x 25½	Wal.	Cloth, beige	54½	249.95	
	20	12	60	Acous. susp.	2	Dome	1	Dome	35-20k	10	25	700; 7k	8	13½ x 11⅜ x 23¼	Wal.	Cloth, beige	40	199.95	
	15	10	60	Acous. susp.	1⅜	Dome	1	Dome	30-20k	10	20	1k; 7k	8	11⅜ x 12⅝ x 23	Wal.	Cloth, beige	33	149.95	
PANASONIC	SB750	12		Acous. susp.	(2) 6	Dome	(2) 4	Dome	20-20k		85	600; 5k	8	29 x 19 x 11¼	Wal.	Wood; wal.	55	239.95	4-pos. level contls.; multi-chan. swit.
	SB550	12		Acous. susp.	6	Dome	4	Dome	30-20k		70	600; 5k	8	25 x 15 x 11	Wal.	Wood; wal.	41	199.95	two 4-pos. level contls.; multi-chan. swit.
	SB-400	10		Acous. susp.	8 cell	Horn	6 cell	Horn	35-20k		50	650; 6k	8	23 x 12 x 11	Wal.	Cloth; brn.	26	149.95	
	SB300	10		Acous. susp.	5	Cone	3½; 1½	Dome, tweet	30-20k		38	800; 5k; 10k	8	22 x 13 x 11	Wal.	Cloth; brn.	22	119.95	
PIONEER	CS-R700	12		Bass reflex	–	Horn	–	Horn	35-20k		75	750; 14k	8	15 x 14 x 26	Wal.	*	50	229.95	*Blk. & brn. removable grille cloth.
	CS-R500	10		Bass reflex	5	Cone	2	Dome	35-20k		60	800; 5.2k	8	14 x 12 x 24	Wal.	*	38	159.95	*Blk. & blue removable grille cloth.
	CS-R300	10		Bass reflex	–	–	2	Dome	45-20k		40	6.3k	8	13 x 11 x 23	Wal.	*	26	119.95	*Blk. & org. removable grille cloth.
	CS-E400	8		Acous. susp.	–	–	2	Dome	35-20k		30	2.8k	8	11⅝ x 7⅛ x 20⅛	Wal.	Cloth; beige	23	79.95	Level contl.; removable grille.
QUAD (HARMONY HOUSE)									45-18k	30	60			34½ x 31 x 10½	Wal.	Anod. alum. bronze		260.00	Full-range electrostatic doublet; 70% hor., 15% vert. disp.
QUADRAFLEX	77	15	48	Acous. susp.	(2) 6	Cone	(2) 3	Cone	30-20k ± 5	30*	50	700; 7k	8	19 x 15 x 36	Wal.	Cloth, brn.	75	199.95	*30 w/1000 ft3 vol. for 107 dB SPL. Equalizer avail.
	66	12	45	Acous. susp.	6	Cone	3	Cone	35-20k ± 5	20*	40	500; 5k	8	16 x 13¼ x 25⅞	Wal.	Cloth, brn.	42	139.95	*20 w/1000 ft3 vol. for 103 dB SPL.
	44	10		Acous. susp.	–	–	3½	Cone	50-20k ± 5	12*	25	750	8	13½ x 11 x 23	Wal.	Cloth, brn.	32	69.95	*12 w/1000 ft3 vol. for 100 dB SPL.
	22	6		Acous. susp.	–	–	3	Cone	65-20k ± 5	6.2*	10	1200	8	10½ x 7¾ x 18	Wal.	Cloth, brn.	20	39.95	*6.2 w/1000 ft3 vol. for 95 dB SPL.
	11	6		Acous. susp.	–	–	–	–	90-18k ± 3	2.4*	10	–	8	9 x 7¾ x 14	Wal.	Cloth, brn.	16	24.95	*2.4 w/1000 ft3 vol. for 95 dB SPL.
RADFORD (AUDIONICS)	Studio 360	(2) 12		Trans. line	(4) 4	Cone	(4) 1	Dome	30-25k ± 3½	25	100	500; 5k	8	18¾ x 15 x 45	Wal.	Gray	130	650.00	Direct radiat.; omnidirect.
	Studio 270	15		Trans. line	(3) 4	Cone	(3) 1	Dome	35-25k ± 3½	20	100	500; 5k	8	17½ x 12 x 38	Wal.	Gray	100	525.00	Dispersion, 270° H, 100° V.
	Monitor 180	12		Acous. susp.	(2) 4	Cone	(2) 1	Dome	50-25k ± 3½	10	50	500; 5k	8	13½ x 10 x 30	Wal.	Gray	60	325.00	Dispersion, 180° H, 100° V.
	Tri-Star 90	12		Acous. susp.	4	Cone	1	Dome	55-25k ± 3½	10	50	500; 5k	8	12 x 9 x 21	Wal.	Gray	38	195.00	

Speakers

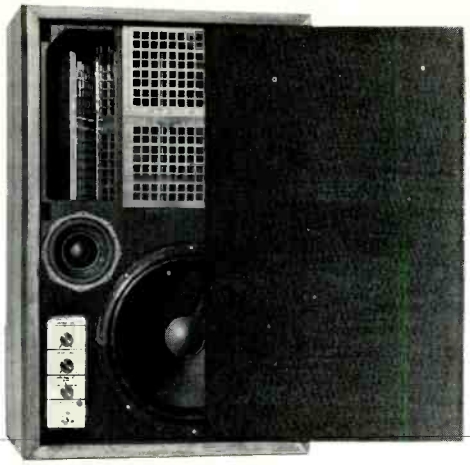
Rectilinear III Lowboy

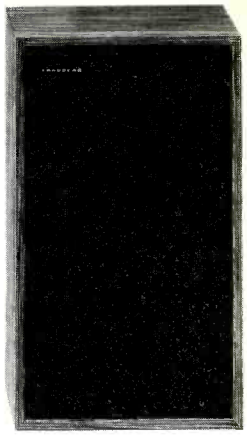
SAE Mk 12

Scott Design 61

MANUFACTURER	MODEL	WOOFER Diameter, in.	WOOFER Resonance (in system), Hz	WOOFER Enclosure type	MID-RANGE Diameter, in.	MID-RANGE Type	TWEETER Diameter, in.	TWEETER Type	Overall freq. resp., Hz to kHz ± ? dB	Ampl. pwr. for avg. room, W	Pwr. handling capacity (RMS cont)	Crossover frequency (ies), Hz	Impedance, ohms	Enclosure dimensions, W x D x H, in.	Wood finish	Grille material/color	Weight, lbs.	Price	SPECIAL FEATURES
RADIO SHACK	Optimus 7	12		Acous. susp.	6½		2½	Cone	20-25k ± 3			850; 5k	8	27 x 24 x 15¾	Wal.	Brn. *	55	198.50	*Metal & cloth.
	Nova 9	15		Tuned port	4	Cone	2	Dome	20-25k ± 3		50	300-3k	8	27 x 20½ x 13½	Wal.	Neut.	47	159.95	2 contls.
	Optimus 5	12		Acous. susp.	–	–	(3) 4		20-20k ± 3		100	800; 5k	8	25 x 14 x 11½	Wal.	Neut.	35	99.95	
	MC-500	5		Acous. susp.	–	–	2		75-20k ± 3		25		8	11¾ x 9 x 15½	Wal.	Neut.	10	30.00	
RECTILINEAR	III	12	40	Duct. port	5	Cone	(2) 2½; (2) 2	Cone; Cone	22-18.5k ± 4	20	100	500; 8k; 11k	8	18 x 12 x 35	Wal.	Cloth, brn.	70	279.00	III Low Boy, 22x12¼x28, $299.00.
	Xa	10	35	Acous. susp.	5	Cone	2½	Cone	30-18.5k ± 4	30	75	100; 8k	4	14 x 10¾ x 25	Wal.	Cloth, brn.	65	199.00	
	XII	10	45	Duct. port	5	Cone	2½	Cone	35-18k ± 4	10	85	350; 7.5k	8	14 x 10¾ x 25	Wal.	Cloth, brn.	40	139.00	
	Mini III	8	50	Acous. susp.	5	Cone	2	Cone	50-18k ± 4	20	70	400; 8k	4	12 x 9½ x 19	Wal.	Cloth, brn.	25	99.50	
	XI	10	45	Duct. port	–	–	3	Cone	45-17k ± 4	10	85	1.8k	8	12 x 10½ x 23	Wal.	Wood, fretwork	28	79.50	
ROGER-SOUND	Studio II	(2) 12	30	Bass reflex	3x9	Horn	(2) 2x6	Horns	27-19k ± 5	10	100	800; 5k	4	36 x 28 x 18	Util. Blk.	Blk.	100	199.95	Also in walnut
	Max	12	38	*	–	–	(2) 2½	Cones	35-20k ± 4	15	65	1800	8	18 x 32 x 12	Wal.	Blk.	55	159.95	*Aborption type. Rear tweeter.
	Eros	(2) 8	58	*	–	–	2½	Cone	49-20k ± 4	20	65	1800	4	12 x 28 x 20½	Wal.	Brn.	40	139.95	*Twin trans. line; pentagon-shape reflecting spkr.
	Studio Monitor	12	52	Bass reflex	5	Cone	2x6	Horn	48-19k ± 4	6	65	800; 5k	8	25 x 14½ x 12	Util. blk.	Blk.	45	95.00	Also in walnut
SAE	Mk XII	12	38	Acous. susp.	5	Cone	(3)	ES		60		120-240; 480-1440	8	17 x 12¼ x 27	Wal.; rose.	Cloth, blk.; sand	87	850.00	Adjst. x-overs; elect. prot. cir.
	Mk XIV	12	32	Acous. susp.	(2) 5	Cone	(6)	ES				120-240; 480-1440	8	24 x 18 x 42	Wal.; rose.	Cloth, blk.; sand	110	1450.00	As above.
SANSUI	AS-300	12		Acous. susp.	6½	Cone	3	Cone	35-20k		60	2k; 4.5k	8	14¼ x 12 x 26½	Wal.	Cloth, beige	49¼	149.95	Mid & hi contls.
	AS-200	10		Acous. susp.	6½	Cone	3	Cone	40-20k		50	2k; 7k	8	12½ x 11⅞ x 23½	Wal.	Cloth, beige	40	119.95	As above.
	AS-100	10		Acous. susp.	–	–	3	Cone	45-20k		40	2k	8	12 x 9⅜ x 20¾	Wal.	Cloth, beige	25	89.95	Hi contl.
SCHOBER	LSS-100	(2) 12	30	Bass reflex	8	Cone	(2)	Horns	30-18k ± 5	1	100	150; 1k, 3.5k	8	32 x 16 x 54	Wal.	Cane, beige	180	544.00	
	LSS-10A	12	32	Bass reflex	8	Cone	(1)	Horn	30-18k ± 5	2	40	250; 3.5k	8	24 x 16 x 34	Wal.	Cane, beige	105	196.00	Opt. tweeter horn kit.
SCOTT	Design 71	12		Acous. susp.	4½	Cone	(2) 1	Domes	28-20k	20	100	900; 4.5k	8	15¼ x 11¾ x 25	Wal.	Linen, gray	54	169.90	
	Design 61	10		Acous. susp.	4½	Cone	1	Dome	30-20k	18	75	1k; 5k	8	14½ x 11½ x 25	Wal.	Linen, gray	51	129.90	
	Design 51	10		Acous. susp.	–	–	3½	Dome	30-20k	18	60	1.2k	8	14½ x 11¾ x 24	Wal.	Linen, gray	46	89.90	
	Design 41	8		Acous. susp.	–	–	1	Dome	35-20k	10	35	2.2k	8	10½ x 9¾ x 19	Wal.	Linen, gray	45	69.90	
SHERWOOD	Woodstock	8	40	Acous. susp.	–	–	3½		40-18k	5	25	4k	8	18 x 11 x 9	Wal.	Cloth, brn.	35	59.95	
SONY	SS-9500	(6) 4		Omni.	–	–	–	–	50-18k	6	30		6	16 dia. 23⅝H	Wal.	Cloth, brn.	30¾	149.50	
	SS-4200	8	85	Acous. susp.	8	Cone	3	Cone	50-20k ± 5	6	30	600; 10k	8	13¾ x 11⅞ x 23¼	Wal.	Cloth, blk.	30¾	99.50	

Speakers





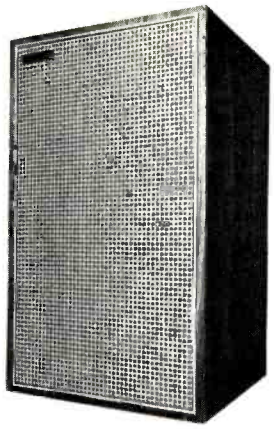
Tandberg 5010

Soundcraftsmen SC-12ES

MANUFACTURER	MODEL	WOOFER: Diameter, in.	WOOFER: Resonance (in system), Hz	WOOFER: Enclosure type	MID-RANGE: Diameter, in.	MID-RANGE: Type	TWEETER: Diameter, in.	TWEETER: Type	Overall freq. resp., Hz to kHz ± ? dB	Ampl. pwr. for avg. room, W	Pwr. handling capacity (RMS cont)	Crossover frequency (ies), Hz	Impedance, ohms	Enclosure dimensions, W x D x H, in.	Wood finish	Grille material color	Weight, lbs.	Price	SPECIAL FEATURES
SOUND INDUSTRIES	Quatre 8000	8		Duct port	5	Cone	2¼	Cone	35-20k ± 5	10	60	400; 2.5k	8	14½ x 11¼ x 25¼	Choice	Foam, choice	50	75.00	Midrange & tweeter contls.
	Quatre 12 M	12		Duct port	5	Cone	(9) 2¼	Cones	26-20k ± 5	15	100	400; 2.5k	8	16½ x 12⅛ x 30	Choice	Foam, choice	125	160.00	Midrange & tweeter contls.
SOUND-CRAFTSMEN	SC-12ES	12		Acous. susp.	5	Cone	(2) 6 x 6	ES	20-30k	20	150	*	8	18 x 14 x 28	Wal.	Cloth; blk. & brn.	76	399.50	*Cont. var. 240-1k & 1.5k-6k; doublet ES
	Lancer SC-6	12		Reflex				Horn	18-22k	10	60	1k; 3k	8	16 x 14⅛ x 27	Wal.	Cloth, red	57	249.50	4-way; cont. var. hi freq. contl.
	Lancer SC-3X	12		*				Horn	26-22k	10	60	1k; 3k	8	15¾ x 12½ x 23½	Wal.	Cloth, red	45	199.50	3-way; *ducted port reflex, resist. loaded.
	Lancer SC-5	12		*				Horn	28-20k	5	40	1k; 3.5k	8	15¼ x 12½ x 23½	Wal.	Cloth, beige	38	149.50	3-way; *dual ducted port reflex.
SPEEDEX, DIV. HYDROMETALS	31-7212			Acous. susp.					40-20k	10			8	6½ x 10¾ x 6⅞	Wal.	Cloth, gold	5		
SUPERSCOPE	S-8	8	75	Acous. susp.	–	–	–	–	75-16k ± 5	1	15		8	11¼ x 8½ x 19⅛	Wal.	Cloth, brn.	17	44.95	
	S-82	8	60	Acous. susp.	–	–	1¾	Dome	60-18k ± 5	1½	25	5k	8	11½ x 10 x 23¼	Wal.	Cloth, brn.	23	69.95	
	S-122	12	50	Port.	–	–	2	Dome	50-18k ± 5	3	50	2k	8	14½ x 11 x 23½	Wal.	Cloth, brn.	40	99.95	
SYLVANIA	AS125A	12	42	Acous. susp.	1½	Dome	1	Dome	20-25k ± 3	10	100	600; 8k	8	15½ x 12¾ x 28½	Wal.	Char. brn.	54	149.95	3-way mid & hi contls.
	AS105W	10	50	Acous. susp.	1½	Dome	1	Dome	30-20k ± 3	10	65	800; 8k	8	13¾ x 11¾ x 24	Wal.	Char. brn.	43	109.95	3-way mid. contl.
	AS85W	8	55	Acous. susp.	–	–	1½	Dome	40-20k ± 3	6	50	2k	8	10⅝ x 10½ x 18⅝	Wal.	Char. brn.	25	69.95	2-way contl.
TDC	6A	10	52	Duct. port	–	–	2¼	Cone	35-20k	12	80	1.5k	8	13¾ x 8 x 24½	Wal. vyl	Cloth, blk. & brn.	76 pair	199.90 pair	Bal. contl.
	4A	10	62	Acous. susp.	–	–	2¼	Cone	40-20k	10	40	2k	8	11¼ x 8 x 21¼	Wal. vyl.	Cloth, blk. & brn.	44 pair	129.95 pair	
	2A	6½	68	Acous. susp.	–	–	2¼	Cone	55-20k	8	25	2k	8	10½ x 6¼ x 17	Wal. vyl.	Cloth, blk. & brn.	34 pair	79.90 pair	
TANDBERG	TL-5010	12	50	Acous. susp.	5	Cone	1	Dome	20-25k	15	45	800; 2k	8	11⅝ x 8½ x 20¾	Wal., Rose	Cloth, Wood	37¼	249.80	
TANNOY	Windsor GRF	15	35	Rear horn loaded	–	–	2½	Horn	35-20k ± 4	15	50	1k	8	23¾ x 17 x 42	Wal.	Wood & wte. cloth	120	477.00	Dyn. & freq. bal. contl. GRF, less carved grille, $420.00.
	Lancaster	15	48	Duct. port reflex	–	–	2½	Horn	40-20k	15	40	1k	8	26 x 19⅜ x 29	Wal.	Wood & wte. cloth	80	366.00	Dyn. & freq. bal. contl.
	Orbitus I	12	40	Omni.	–	–	2½	Horn	35-20k	20	30	1k	8	17 x 17 x 29	Wal.		50	255.00	As above.
TEAC	LS-80M	12		Acous. susp.	5	Cone	2	Horn	30-20k		60	450; 5k	8	16 x 12 x 26	Wal.	Cloth, brn.	42	199.00	LS-80, similar but 700 & 5k x-overs, $179.00.
	LS-30	8		Acous. susp.	–	–	2	Horn	40-20k		30	5k	8	12 x 10 x 18	Wal.	Cloth, brn.	15½	99.50	
	LS-1	–			5	Cone							4					29.50 pair	

Speakers

V-M 93



Video-Tone DP-202E

Warfedale W25

MANUFACTURER	MODEL	WOOFER: Diameter, in.	WOOFER: Resonance (in system), Hz	WOOFER: Enclosure type	MID-RANGE: Diameter, in.	MID-RANGE: Type	TWEETER: Diameter, in.	TWEETER: Type	Overall freq. resp., Hz to kHz ± ? dB	Ampl. pwr. for avg. room, W	Pwr. handling capacity (RMS cont), W	Crossover frequency (ies), Hz	Impedance, ohms	Enclosure dimensions, W x D x H, in.	Wood finish	Grille material color	Weight, lbs.	Price	SPECIAL FEATURES
TOSHIBA	SS36	12	60		6½	Cone	3x1½; 3	Horn; Cone	30-20k		30	1k; 5k; 9k	8	15⅜ x 11¾ x 25½	Wal.	Cloth, brn.	33	279.95	4-way contl.
	SS26	10	70		5	Cone	1½x3	Horn	35-20k		25	1k; 5k	8	13⅜ x 10¼ x 22½	Wal.	Cloth, brn.	26½	114.95	Tweeter contl.
	SS840	8	65		5	Cone	2½	Cone	40-20k		10	2k; 9k	8	19¾ x 15½ x 28¼	Wal.	Cloth, brn.	31	199.95 pair	Acoustic lens for tweeter.
TRUSONIC	T-28-A	8		Port	–	–		Dome	32-20k	20	20	4k	8	12½ x 10¼ x 20½	Wal.	Cloth, gold & brn.	29	69.95	Treble contl.
	T0210-A	10		Port	–	–		Horn	30-20k	20	26	4k	8	13½ x 10½ x 22	Wal.	Cloth, brn. & gold	38	99.95	Treble contl.
	VR-200	12		Port	5	Cone		Dome	20-20k	20	45	2.5k; 7k	8	15¼ x 12 x 24	Wal.	Cloth, brn. & gold	46	149.95	Mid & hi contls.; opt. formed-foam grille.
	T-350	12		Port	5	Cone		Horn	20-20k	20	50	700; 5k	8	15 x 14 x 25¾	Wal.	Cloth, brn. & gold	49	179.95	Mid & hi contls,
UTAH	HSI-C-12	12		Acous. susp.		Horn	5							15 x 14 x 25¾	Wal.	Cloth	46	99.95	
	WD-90	12		Acous. susp.	8	Cone	3½	Cone						14 x 10 x 23	Wal.	Cloth	33	89.95	
	AS-2A	8		Acous. susp.	–	–	3½	Cone						11 x 9 x 18	Wal.	Cloth	22	49.95	
V-M	93	10	42	Acous. susp.	4½		1	Dome	37-22k	15	40	1k; 5k	8	13½ x 23 x 11⅞	Wal.	Cloth; blk.	41	100.00	12 dB/oct. LC crossover network.
	85	8	45	Lab.	–	–	3½	Cone	35-20k	5	40	2k	8	20⅜ x 26 x 26	Pecan	Cloth; gold	65	165.00	
	39	8	60	Duct. port	–	–	3½	Cone	55-15k	5	25	2k	8	9½ x 17¼ x 8¼	Wal.	Cloth; blk.	12	99.95 pair	
	91	8	56	Acous. susp.	–	–	3	Cone	40-18.5k	15	25	1850	8	11¾ x 20 x 10	Wal.	Cloth; blk.	28	50.00	
VIDEO-TONE	D 132 E			Acous. susp.					45-20k	7	30		8	6½ x 8¾ x 10¼	Wal.	Beige	10	86.00 pair	
	DP 202E	8		Acous. susp.					45-20k	5	30		8	9½ x 8¾ x 14½	Wal.	Beige	14	130.00 pair	
	D253E	10		Acous. susp.					35-20k	7	50		8	14 x 13 x 24	Wal.	Beige	35	250.00 pair	
	Ultra I	(9) 4½		*					20-20k	5	200		8	23½ x 11 x 13	Wal.	Beige	35	399.95 pair	*Direct, reflective.
WHARFEDALE (BIC)	W70E	15		Acous. susp.	5	Cone	1	Dome	25-20k	15	75		8	22¼ x 24 x 13⅝	Wal.	Cloth, brn. & gold	63	199.95	Cont. var. mid & hi contls., vert. or horiz. mtg.
	W60E	12½		Acous. susp.	5	Cone	1	Dome	30-20k	15	60		8	24 x 15 x 12	Wal.	Cloth, brn.	52	149.95	Cont. var. mid & hi contls.
	W45	10		Acous. susp.	3¼	Cone	2½	Cone	30-18.5	10	45		8	12 x 22 x 10	Wal.	Cloth, brn.	35	110.00	As above.
	W35	8		Acous. susp.	3¼	Cone	2½	Cone	35-18.5k	10	40		8	15 x 15 x 8	Wal.	Cloth, brn.	21	79.95	Shaped for shelf or corner use.
	W25	8		Acous. susp.	–	–	2½	Cone	35-18.5k	10	30		8	10 x 15½ x 8	Wal.	Cloth, brn.	16	54.95	Cont. var. treble contl.

Open-Reel Tape Recorders

AKAI GX-370D

Dokorder 7200

Crown SX824

Speeds by letter code:

	A	B	C	D	E	F	G	H	J
15					x	x	x		
7½	x	x	x		x	x	x		
3¾	x	x	x		x		x	x	
1⅞	x		x	x			x	x	
15/16			x						

MANUFACTURER	MODEL	Speeds (see letter code)	Power amp(s) built in?	Max. reel size, in.	No. of heads	No. of tracks	No. of motors	Drive motor type	Drive to capstan	Frequency response* Hz to kHz, ± ? dB	Wow and flutter, %*	Signal-to-noise ratio, dB*	Fast wind, 1200 ft., sec.	Mic input Z, ohms	Rec'ng level indicator type	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
AKAI	GX-370D	B	No	7	3	4	3	Servo	Direct	30-26k ±3	0.07	50	60	10k	2 Mtrs.	17¾ x 19¾ x 9¾	57	699.95	Lo-noise tape swit.; auto rev. rec./PB; AGC; SOS; SWS; auto stop/off
	280D-SS 4-chan.	B	No	7	4	4*	3	Servo	Direct	30-22k ±3	0.1	50	60	10k	4 Mtrs.	17½ x 20¼ x 10	37¼	649.95*	*2/4-chan.; auto/cont. rev. PB; lo-noise tape swit.; SOS; remote contl.
	1800D-SS 4-chan.	A	No	7	3	4*	1	Ind.	Idler	30-22k ±3	0.12	50	120	10k	4 Mtrs.	16¾ x 9¾ x 17¾	46	549.95	*2/4-chan.; lo-noise tape swit.; built-in 8-tk.; auto stop; pause.
	X-2000 SD	A	No	7	3	4	1	Ind.	Idler	30-22k ±3	0.2	48	75	4.7k	2 Mtrs.	13¾ x 18⅜ x 10⅝	49½	599.95	Built-in cass. & 8 tk.; pause; auto off; transfer sys.
	GX-1900D	B	No	7	2	4	1	Hys.	Idler	30-22k ±3	0.12	50	120	10k	2 Mtrs.	15 x 17⅜ x 9⅞	45	499.95	Built-in cass. w. transfer; auto stop/off pause.
	X-1810D	A	No	7	3	4	3	Hys.	Belt	30-22k ±3	0.08	50	60	10k	2 Mtrs.	17⅜ x 18 x 9⅝	47	449.95	Built-in 8-tk. w. transfer; auto rev.; lo-noise tape swit.; pause; auto stop/off & cont. PB.
	4000DS	B	No	7	3	4	1	Ind.		30-20k ±3	0.15	50	120	5k	2 Mtrs.	15⅞ x 12⅜ x 7⅝	25	229.95	Lo-noise tape swit.; SOS; SWS; auto off; pause.
ASTROCOM	407A	B	No	7	4	4	3	Hys.	Idler	30-20k ±3	0.06	60	45	10k	2 Mtrs.	21 x 14½ x 10½	40	459.95	Auto rev.
	711 4-chan.	B; F	No	10½	4	4	3	Hys.	Idler	30-20k ±3	0.03	65	60	Lo	4 Mtrs.			Under 2000.00	Headphone amps; mixing.
BRAUN	TG 1000 4-chan.	A	No	8¾	¼	2; 4	3	D.C. servo	Belt	20-25k ±1.5	0.04	60	30	1k	2 Mtrs.	17⅜ x 12½ x 5¼	44	749.50	Elect. tape tension contl.; peak read mtrs.; 4-chan. PB; remote contl.; opt. auto rewind.
CONCORD (BENJAMIN)	Mark VIII	A	No	7	2	4	2	Ind.	Belt	50-12k	0.1	45			2 Mtrs.	16¾ x 17¼ x 8¼	40	329.95	Has built-in 8-tk. deck.
CROWN	SX724	B	Opt.	10½	3	4	3	Hys.	Belt	20-25k ±2	0.09	60	45	350k	2 Mtrs.	19 x 9 x 15¾	45	995.00	Dual mic, line mixing; 5-in. VU mtrs.; also in ½ track.
	SX824	B; F	Opt.	10½	3	4	3	Hys.	Belt	20-25k ±2	0.09	60	45	350k	2 Mtrs.	19 x 9 x 15¾	48	1495.00	Complete logic; Wal. cab.; counter opt.; also in 2 track.
	CX822	E	Opt.	10½	3	2	3	Hys.	Belt	30-30k ±2	0.06	60	45	250 bal.	2 Mtrs.	19 x 9 x 17½	53	1790.00	As above. Also in ¼ track or 4-chan.
	SX744	B	Opt.	10½	3	4	3	Hys.	Belt	20-25k ±2	0.09	60	45	350k	4 Mtrs.	19 x 9 x 21	60	1895.00	8 mic inputs.
DOKORDER	9100/1	B	No	7	6	4	3	Hys.		40-21k ±3	0.06	55	65	10k	2 Mtrs.	17¾ x 20 x 15¼	55	699.95	Bi-directional rec./PB; auto repeat.
	7200	B	No	7	4	4	3	Hys.							2 Mtrs.			469.95	Auto PB repeat; auto off; adj. reel height; SOS; SWS; echo; lock. pause contl.
	6020	B	No	7	4	4	3	Hys.		20k-20k	0.12	55	45	10k	2 Mtrs.	14½ x 7½ x 15¾	36¼	279.95	Bi-directional rec./PB; auto repeat; auto off.
	7500	B	No	7	6	4	3	Hys.		40-23k ±3	0.08	55	65	10k	2 Mtrs.			579.95	

TEAC AN-80 Dolby noise reduction unit

TEAC 3300: the strong, silent type

If you've been shopping the field for a semi-pro deck with studio-size reels, you've probably had to cut your way through a lot of noise about silence. And you've probably wondered why you haven't heard TEAC blowing its horn on the subject. The answer is simple—we didn't feel we had to. Long before the dawning of Dolby,* TEAC perfected the kind of electronics that lets you use the most advanced low-noise/high-output tapes on decks like the 3300 with startling results. We effectively reduced tape noise and hiss below audible levels. And let Dolby take it from there. But we wanted to keep the 3300 a truly versatile semi-pro deck for the audiophile. So instead of building Dolby in, we outboarded it, as you can see—in the AN-80 Dolby Noise-Reduction Unit. Now you could get better signal-to-noise than was dreamed of in your ratio. Not only on your 3300 but on any other existing deck.

At the same time, we addressed ourselves to making the 3300 transport (already world-renowned for its superlative quality and unmatched reliability) a near-perfect mechanism. By manufacturing all critical components in-house—and to specs and tolerances we wouldn't dare impose on anyone else. By quality control tantamount to paranoia—for example, we adjust, check, and readjust our heads as many as 17 times during manufacture. Over and above this, we provide audiophile conveniences overlooked on other decks. Like a bias-level switch that lets you select the proper bias for your tape. And the famous Edi-Q symmetrical control that allows smooth one-hand operation in editing and cueing. Two full-size VU meters with wide-excursion, expanded scales. Now would you really expect a machine as strong as all this to be anything but silent?

*Dolby is a trademark of Dolby Laboratories, Inc.

TEAC® TEAC Corporation of America,
7733 Telegraph Road, Montebello, California 90640

TEAC Corporation, 1-8-1 Nishi-shinjuku, Shinjuku-ku, Tokyo, Japan
TEAC EUROPE N.V., Kabelweg 45-47, Amsterdam—W.2, Holland
In Canada: White Electronic Development Corp., Ltd., Toronto

Check No. 29 on Reader Service Card

Open-Reel Tape Recorders

JVC 4RD-1401

Panasonic RS-740US

Pioneer T-6600

Speeds by letter code:

	A	B	C	D	E	F	G	H	J
15					x	x	x		
7½	x	x	x		x	x	x		
3¾	x	x	x		x		x	x	
1⅞	x		x	x			x	x	
15/16			x						

MANUFACTURER	MODEL	Speeds (see letter code)	Power amp(s) built in?	Max. reel size, in.	No. of heads	No. of tracks	No. of motors	Drive motor type	Drive to capstan	Frequency response* Hz to kHz, ± ? dB	Wow and flutter, %*	Signal-to-noise ratio, dB*	Fast wind, 1200 ft., sec.	Mic. input Z, ohms	Rec'ng level indicator type	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
FERROGRAPH (ELPA)	704-Aw	E, G	No	8¼	3	2-4	3	Ind.	Idler	30-17k ± 2	0.08	60	60	10k	2 Mtrs.	14⅞ x 16 x 8¾	37½	649.00	Model 704ADW, Dolby, $850; 724ADW, $900.
JVC	4RD-1401 4-chan.	B	No	7	3	4	1	Ind.	Belt	30-20k ± 3	0.1	53	160	600	4 Mtrs.	16 x 8 x 18	27	449.95	2/4-chan.; lo-noise & mon. swt's; retract. pinch roller.
	RD-1553 4-chan.	B	No	7	3	4	3	Hys.	Belt	20-24k ± 3	0.1	53	80	600	2 Mtrs.	16 x 8 x 18	33	429.95	2/4-chan.; lo-noise & mon. swt's.; retract. pinch roller.
	RD-1552	B	No	7	3	4	3	Hys.	Belt	20-24k ± 3	0.1	52	80	600	2 Mtrs.	16 x 8 x 18	33	329.95	Solenoid buttons; SOS; flip-up head cov.; retract. pinch roller.
	RD-1450	B	No	7	3	4	3	Ind.	Belt	30-20k ± 3	0.1	52	160	600	2 Mtrs.	16 x 7 x 13	21	199.95	Tape/Source swt.; auto stop; flip-up head cov.; retract. pinch roller.
MAGNAVOX	1K8982	B	No	7	4	4	1	Ind.	Idler	50-15k ± 5	0.15	45	180	10k-50k	2 Mtrs.	14½ x 16½ x 7			Auto rev. rec./PB.
	1K8877	A	No	7	3	4	1	Ind.	Idler	50-15k ± 5	0.1	45	150	10k-50k	2 Mtrs.	15½ x 13¾ x 7			Auto noise supp.; std/lo-noise bias swit.; echo; SOS.
	1K8981	A	No	7	2	4	1	Ind.	Idler	50-15k ± 5	0.15	45	180	10k 50k	2 Mtrs.	12¾ x 15¾ x 7			SOS.
	1K8980	A	No	7	2	4	1	Ind.	Idler	50-15k ± 5	0.15	45	180	10k-15k	2 Mtrs.	12¾ x 15¾ x 7			
NAGRA	4.2	E	No	7	4	1				30-20k ± 2	*	70		100k	Mtr.	12½ x 8.7 x 4.3	11½	1735.00	*0.1% speed varia.; D-cell powered; film sync.; AGC.
	SD	E	No	7	3	2				30-18k ± 2	*	70		50; 200	Mtr.	12½ x 8.7 x 4.3	11½	1985.00	*0.1% speed varia.; features as above, but film sync. $400 extra.
	SN	H*	No	**	3	1				10-15k ±	0.1	60		200	Mtr.	5.8 x 4 x 1	1.3	1295.00	*Plus 15/16, **special, supplied.
PANASONIC	RS736	E	No	7	3	4	1	Hys.		30-23k ± 3	0.09	53		20k	2 Mtrs.	18 x 17 x 8½	33	329.95	Built-in mixer; SOS; SWS, hot pressed ferrite heads.
	RS714	B	No	7	4	4	3	Hys.		30-23k ± 3	0.09	53		20k	2 Mtrs.	20 x 17 x 7⅞	49	499.95	Mic Z swit., SOS; SWS, hot pressed ferrite heads; 4-dig. counter.
	RS715	B	No	7	4	4	3	Hys.		30-22k ± 3	0.09	53		20k	2 Mtrs.	20 x 17 x 7⅞	49	549.95	Auto rev., bias swit.; hot pressed ferrite heads.
	RS740 4-chan.	B	No	7	3	4	1	Hys.		30-22k ± 3	0.09	53		20	4 Mtrs.	20 x 17 x 7⅞	28	449.95	2-chan./4-chan. rec. & PB; 2 phone jacks; hot pressed ferrite heads.
PIONEER	T-8800	B	No	7	6	4	2	Hys.	Belt	40-15k	0.08	55		330k	2 Mtrs.	22 x 16½ x 9½	50	549.95	Rec/PB auto rev.; bias select.; SOS; remote pause contl.
	T-6600	B	No	7	4	4	1	Hys.	Belt	50-15k	0.12	55		330k	2 Mtrs.	17¼ x 17 x 7¼	28	299.95	REC/PB auto rev.; pause contl.
	T-6100	B	No	7	4	4	1	Hys.	Belt	50-15k	0.12	55		330k	2 Mtrs.	16 x 15 x 7	26	249.95	PB auto rev.
	QT-6600 4-chan.	B	No	7	4	*	1	Hys.	Belt	30-20k	0.12	55		330k	4 Mtrs.	18⅜ x 17 x 8⅜	37	599.95	4-chan. rec/PB auto reverse; pause control.

Open-Reel Tape Recorders

Revox A77 Dolby

Sansui SD7000

Sony 366-4

Speeds by letter code:

	A	B	C	D	E	F	G	H	J
15					x	x	x		
7½	x	x	x		x	x	x		
3¾	x	x	x		x		x	x	
1⅞	x		x	x			x	x	
15/16			x						

MANUFACTURER	MODEL	Speeds (See letter code)	Power amp(s) built in?	Max. reel size, in.	No. of heads	No. of tracks	No. of motors	Drive motor type	Drive to capstan	Frequency response* Hz to kHz, ± ?, dB	Wow and flutter, %	Signal-to-noise ratio, dB*	Fast wind, 1200 ft., sec.	Mic input Z, ohms	Rec'ng level indicator type	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
RADIO SHACK	494 4-chan.	A	No	7	3	4	1	Ind.	Belt	50-18k	0.13	48	160	10k	4 Mtrs.	14¾ x 6⅝ x 16	27	299.95	Two or four chan.
	999B	A	No	7	3	4	1	Ind.	Belt	40-20k	0.2	47		10k	2 Mtrs.	13¼ x 7⅜ x 16	20	179.95	
	909B	A	Yes	7	2	4	1	Ind.	Belt	50-18k	0.25				2 Mtrs.	24¼ x 14 x 7½	26	199.95	Detach. Spkrs.; with 2 dyn. mics.
REVOX	A77	B	Opt.	10½	3	2, 4	3	Servo	Direct	30-20k +2-3	0.08	58	60	Hi. lo	2 Mtrs.	16 x 14 x 5	34	679.00	A77-HS, 7½ & 15 ips, $779.00; A77D, Dolby, $879.00.
SANSUI	SD7000	B	No	7	4	4	3	Hys.		20-20k ± 2	0.06	60	66	600 50k	2 Mtrs.	17⅛ x 10¼ x 21⅛	59½	679.95	Auto reverse, repeat, rewind, off; multi mic mix., opt. remote; tension adj., phone jack w. vol. contl.
SONY/SUPERSCOPE	TC-854-4S 4-chan.	E	No	10½	4	4	3	Servo		30-25k ± 2	0.03	59	130	Lo	4 Mtrs.	17⅜ x 22 x 10	61⅜	1795.00	Syncro-Trak; mic-line mix; opt. remote contl.
	TC-850	E	No	10½	4	4	3	Servo		30-25k ± 2	0.03	57	130	Lo	2 Mtrs.	17½ x 19¾ x 10	57¼	895.00	Opt. 2 or 4 tk. head assy.; opt. remote contl.
	TC-654-4 4-chan.	B	No	7	4	4	3	Hys.		30-22k ± 2	0.04	57	60	Lo	4 Mtrs.	16¾ x 20 x 9⅜	48½	875.00	Mic-line mix; plug-in head blocks.
	TC-650	B	No	7	3	4	3	Hys.	Belt	30-22k ± 2	0.04	59	90	Lo	2 Mtrs.	16⅜ x 17¼ x 9½	46	499.95	Opt. remote contl.; Opt. plug-in head assy.
	TC-580	A	No	7	3*	4	3	Servo	Belt	30-25k ± 3	0.06	56	60	Lo	2 Mtrs.	17½ x 18 x 8⅞	37⅜	499.95	*6 head function; auto off; mic-line mix.; select. rev.
	TC-366-4 4-chan.	B	No	7	3	4	1	Ind.	Idler		0.09	55	120	Lo	4 Mtrs.	17 x 18¾ x 9⅜	28¼	499.95	Mic-line mix.; servo contl. tension.
	TC-630	A	Yes	7	3	4	1	Ind.	Idler	30-22k	0.09	50	150	Lo	2 Mtrs.	17⅞ x 20 x 11⅜	40¼	419.95	SOS, auto off.
	TC-640	B	No	7	3	4	3	Hys.		20-25k ± 3	0.07	55	90	Lo	2 Mtrs.	14½ x 15½ x 9½	33	379.95	SOS; mic-line mix.
	TC-277-4 4-chan.	A	No	7	2	4	1	Ind.	Idler	50-18k ± 3	0.12	0.12	150	Lo	4 Mtrs.	15½ x 15¾ x 9½	23⅛	339.95	SOS; auto off; pause.
	TC-377	A	No	7	3	4	1	Ind.	Idler	30-25k ± 3	0.09	55	120	Lo	2 Mtrs.	15½ x 16½ x 8¼	22	289.95	Mic-line mix.; auto off; servo-contl. tension.
	TC-800B	C	Yes	5	2	2	1	Servo	Idler	20-22k	0.09	56	180	Lo	Mtr.	12¼ x 10¼ x 4¼	11¾	239.95	Built-in cond. mic; ALC with defeat; a.c./d.c.
	TC-106AV	A	Yes	7	2	2	1	Ind	Idler	40-18k	0.15	47	140	Lo	Mtr.	16⅛ x 12 x 7	17¾	189.95	Auto off; pause; ALC with defeat.

Open-Reel Tape Recorders

Tandberg 9041X

Tapesonic 70A-TRSH

TEAC 3340

Speeds by letter code:

	A	B	C	D	E	F	G	H	J
15					x	x	x		
7½	x	x	x		x	x	x		
3¾	x	x	x		x		x	x	
1⅞	x		x	x			x	x	
15/16			x						

MANUFACTURER	MODEL	Speeds (see letter code)	Power amp(s) built in?	Max. reel size, in.	No. of heads	No. of tracks	No. of motors	Drive motor type	Drive to capstan	Frequency response* Hz to kHz, ± ? dB	Wow and flutter, %*	Signal-to-noise ratio, dB*	Fast wind, 1200 ft., sec.	Mic input Z, ohms	Rec'ng level indicator type	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
STELLAVOX (GOTHAM)	SP-7	*	Yes	10½	4	3	1	D.C. servo	Direct	30-15k ± 2	0.12	60	120	200	2 Mtrs.	10½ x 8½ x 3	7	1880.00	*3¾ to 30 ips; HD assembly interchangable for mono/stereo, or with film sync.
TANDBERG	3041X	A	No	7	4	4	1	Asysn.		40-20k ± 2	0.07	60	105	200	2 Mtrs.	15½ x 12⅜ x 6½	20	349.96	3041X, ½ tk., $369.00; 3041XQ, 4-chan. PB, $449.95.
	4041X	A	Yes	7	4	4	1	Asyn.		40-20k	0.07	60	105	200; 600	2 Mtrs.	15½ x 12⅜ x 6½	23	469.50	4041X, ½ tk., $485.50; 4041XQ, 4-chan. PB, $569.50.
	6041X	A	No	7	4	4	1	Asyn.		40-20k	0.07	61	105	200; 600	2 Mtrs.	15½ x 12⅜ x 6½	21	529.80	6041X, ½ tk., $559.80; 6041XQ, 4-chan. PB, $629.80.
	9041X	A	No	7	4	4	3	Asyn.		40-20k	0.07	61	105	200; 600	2 Mtrs.	15½ x 12⅜ x 6½	21	649.50	
TAPESONIC (PREMIER)	70A-TRSH	E	No	10½	3	2	3	Hys.	Direct	35-26k ± 2	0.08	56	30	50k	2 Mtrs.	19 x 8½ x 21	69*	675.00**	*With case; **less case; also in ¼ tk., Model 70A-TRSQ.
TEAC	7010GSL	B	No	10½	4	4	3	Hys.	Belt	25-24k ± 3	0.06	58	90	600; 10k	2 Mtrs.	21⅛ x 17⅜ x 9½	62	999.50	Auto rev. PB.
	7030GSL	F	No	10½	4	2	3	Hys.	Belt	25-26k ± 3	0.04	60	90	600; 10k	2 Mtrs.	21⅛ x 17⅜ x 9½	62	949.50	
	3340 4-chan.	F	No	10½	3	4	3	Hys.	Belt	25-24k ± 3	0.04	55	90	600; 10k	2 Mtrs.	20½ x 17¼ x 8¾	50	849.00	Simul-Sync stereo.
	6010GSL	B	No	7	4	4	3	Hys.	Belt	25-24k ± 3	0.06	58	90	600; 10k	2 Mtrs.	21⅛ x 17⅜ x 9¼	46½	799.50	Auto rev. PB.
	2340 4-chan.	B	No	7	3	4	3	Hys.	Belt	30-22k ± 3	0.08	55	90	600; 10k	2 Mtrs.	18¾ x 17½ x 8¾	46¼	759.50	Simul-Sync stereo.
	4070G	B	No	7	4	4	3	Hys.	Belt	25-24k ± 3	0.06	58	90	600; 10k	2 Mtrs.	18 x 17⅞ x 9¾	51	599.50	Bi-directional rec./PB.
	4010GSL	B	No	7	4	4	3	Hys.	Belt	30-22k ± 3	0.08	55	90	600; 10k	2 Mtrs.	18 x 17⅜ x 9¼	45⅛	599.50	Auto rev. PB.
	3300-10	B	No	7	3	4	3	Hys.	Belt	25-24k ± 3	0.06	58	90	600; 10k	2 Mtrs.	17¼ x 17¼ x 9¼	44½	499.50	3300-12, similar but 10½ reels, ½ tk., 60 S/N, $499.50; 3300-11, similar but F speeds, 10½ reels, resp. to 26k, ½ tk., 0.04 wow, $499.50.
	1230	B	No	7	3	4	3	Hys.	Belt	30-22k	0.08	55	90	600; 10k	2 Mtrs.	15 x 17¼ x 8	37¼	359.50	1250, similar but auto rev., $459.50.
TELEX	2001	B	No	8¼	3	4	3	Hys.	Belt	45-18k ± 2	0.08	52		HiZ	2 Mtrs.	19½ x 14½ x 8		799.95	Die cast mainplate; tape/source swit.
	433	A	No	7	3	4	3	4-p	Belt	40-18k ± 3	0.2	54	70	50k	2 Mtrs.	15¾ x 8¾ x 14⅜	34	394.95	Wal. base
WOLLENSAK (3M)	6154	A	No	7	3	4	2	Ind.	Idler	35-20k ±	0.12	54	90	2.2k	2 Mtrs.	16½ x 13½ x 6½	18	299.95	4-chan. PB; 2-chan. rec./PB
	6150	A	No	7	2	4	2	Ind.	Idler	35-20k ± 3	0.12	54	90	2.2k	2 Mtrs.	16½ x 13½ x 6½	18	219.95	Bias swit.; tape/source mon.

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Cassette & Cartridge Recorders

AKAI GXC-65D

Advent 201

Harmon-Kardon HK 1000

MANUFACTURER	MODEL	Cassette	Cartridge; no. of tracks	Type: portable, P; home, H; car mount, C	Power amp. built in	Rated power output, W	Mode: stereo, S; mono, M	Frequency response, Hz, ± 7 dB	Wow and flutter, %	S/N, dB	Supply voltage	Speakers—built in or external	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
ADVENT	201	X		H	No	–	S	35-15k ±2	0.15	60	A.C.	Not furn.	13¾ x 9¼ x 4½	18	280.00D	Dolby; CrO_2 bias swit.; mic pre-amp opt., $25.00.
	202	X		H	No	–	S	35-15k ±2	0.2	60	A.C.	Not furn.	9 x 10½ x 4	10	130.00D	PB only; Dolby; CrO_2 bias swit.
AKAI	CR80DSS 4-chan.		8	H	No	–	S	30-16k ±3	0.25	47	A.C.	Not furn.	19⅜ x 11¼ x 5½	24	289.95	2/4-chan.; auto stop/cont. play; 4 mtrs.
ASTROCOM	307 4-chan.	X		H	No	–	*	40-16k	0.12	52	A.C.	Not furn.			499.95	*4-chan.; dual capstan; 4 Mtrs., auto rev./off; solenoid contls.
BRAUN	TCR 1000	X		H	No	–	S	30-15k ±3	0.1	60	A.C.	Not furn.			D	2 large mtrs.
CONCORD (BENJAMIN)	Mark IX	X		H	No	–	S	30-15k	0.2	50	A.C.	Not furn.	16 x 10⅝ x 4	13½	319.95D	Rec.; CrO_2 /std. bias swit.; pause contl.; auto stop; 3 mic inputs.
	Mark 6	X		H	No	–	S	30-15k	0.13	48	A.C.	Not furn.	7¼ x 11¾ x 3½	7	169.95	Auto stop; pause; CrO_2/std. bias swit.; 2 mic inputs; rec. Mark 7 similar with Dolby. $229.95.
	F-106EB	X		H	No	–	S	40-12k	0.2	46	A.C.	Not furn.	10¼ x 10½ x 3½	4½	139.95	Bias swit.; auto off; pause; remote start/stop.
	F-128		8	H	No	–	S	50-10k	0.3	45	A.C.	Not furn.	16⅝ x 9 x 4¾	13	169.95	Rec.; auto repeat/eject; 2 mtrs.; counter.
	CD-8-4 4-chan.		8	H	No	–	*	100-9k	0.15	44	A.C.	Not furn.			119.95	*4-channel PB.
DOKORDER	MC-60		8	H	No	–	S	30-12k	0.3	47	A.C.	Not furn.	18½ x 14½ x 8⅞	11	479.95	Auto eject; cont. PB.
FISHER	RC-80B	X		H	No	–	S	30-14k	0.2	50	A.C.	Not furn.	7⅛ x 11⅛ x 3½	6	229.95D	CrO_2 swit.; 2 Mtrs.; dual rec. level contl.
	CP-100 4-chan.		8	H	No	–	4	50-12k			A.C.	Not furn.	10½ x 10⅛ x 4⅝	10	169.95	2/4-chan.; repeat, change, consec. modes; wal. cab.
HARMAN-KARDON	CAD-5	X		H	No	–	S	30-15k ±2	0.15	55	A.C.	Not furn.	12½ x 9 x 3¼		199.95D	Dolby B; overload indicator; 2 mtrs.; bias swit.
	HK1000	X		H	No	–	S	20-15k ±1½	0.15	70	A.C.	Not furn.	15¾ x 10¼ x 4⅛	13	299.95D	Peak-read mtrs.
HEATH	AD-110	X		H	No	–	S	30-14k ±3	0.25	47	A.C.	Ext.	13⅝ x 11 x 3¼	7.5	129.95	Records; 2 mic inputs; contl. on hi-level input; 2 mtrs.; end-of-tape sensing.
	GD-28		8	H	No	–	S	50-10kHz ±6	0.3	40	A.C.	Ext.	10⅜ x 4½ x 8¼	6¾	59.95	
HITACHI	TRQ-262	X		H	No	–	S	20-13k	0.32	45	A.C.	No	13¼ x 9¾ x 3⅜	10	149.95	Auto off.
	TRQ-2000	X		H	No	–	S	30-16k	0.25	45	A.C.	No	17¼ x 9¾ x 4½	12	229.95D	Dolby, auto stop.
	TPQ-134		8	H	No	–	S	40-12k	0.15	53	A.C.	No	15¾ x 11 x 4⅜	12¼	149.95	Records, soft loading, auto eject.
	TPQ-144 4-chan.		8	H	No	–	4-Chan.	40-12k	0.15	55	A.C.	No	11¼ x 10 x 3⅝	11	129.95	4-chan. player, soft loading, auto eject.

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Cassette & Cartridge Recorders

JVC CD-1668

Lafayette RK-D40

Kenwood KX-700

MANUFACTURER	MODEL	Cassette	Cartridge: no. of tracks	Type: portable, P; home, H; car mount, C	Power amp. built in	Rated power output, W	Mode: stereo, S; mono, M	Frequency response, Hz, ±1 dB	Wow and flutter, %	S/N, dB	Supply voltage	Speakers—built in or external	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
JVC	ED-1261		8	H	No	–	S	30-14k ±3	0.2	50	A.C.	No	17 x 11 x 5	16	149.95	Stereo rec./play; pause; FF; auto repeat & stop; 2 VU mtrs.
	CD-1668	X		H	No	–	S	30-16k ±3	0.13	50	A.C.	No	17 x 15 x 6	13	269.95	Noise reduc. sys.; CrO2 sw.; counter; peak level indicator.
	CD-1667	X		H	No	–	S	30-16k ±3	0.15	50	A.C.	No	15 x 11 x 5	10	199.95	Noise reduction sys.; CrO2 sw.; auto stop.
	CD-1666	X		H	No	–	S	30-16k ±3	0.15	50	A.C.	No	15 x 11 x 5	10	149.95	Noise supp. sw.; CrO2 sw.; auto stop; counter.
KENWOOD	KX-700	X		H	No	–	S	12-15k	0.15	58	A.C.	Not furn.	15½ x 11¼ x 4½	13	259.95D	Double-drive, hys.-sync. mtr.;
	KX-7010A	X		H	No	–	S	40-10k	0.2	45	A.C.	Not furn.	10½ x 9 x 4	7	159.95	Rec.; tape bias swit.; Hys.-sync. mtr.; front panel phone jack; high filter.
LAFAYETTE	RK-760B	X		H	*	–	S	30-12k	0.25	48	A.C.	Not furn.	10⅜ x 10⅝ x 4½	13	124.95	Rec.; 2 mic inputs; CrO2 bias swit, *headphone amp only.
	RK-D40	X		H	*	–	S	30-13k	0.25	49	A.C.	Not furn.	11¾ x 11¾ x 4¾	17	179.95D	Rec.; 2 mic & 2 line inputs; CrO2 bias swit.; *headphone amp only.
	RK-890A		8	H	No	–	S	30-12k	0.25		A.C.	Not furn.	12 x 9⅛ x 3¾	12	139.95	Rec.; 2 mic inputs; auto rec. & stop.
	RK-48A 4-chan.		8	H	No	–	S	30-10k	0.2		A.C.	Not furn.	9½ x 10½ x 4½	10¼	97.95	2/4-chan. PB; continuous repeat.
MGA	SM-80		8	H	Yes		S	50-15k ±3		60		Ext.	20 x 9⅞ x 4¾	15½	159.95	
	TC-32	X		P	Yes	1.2	M	150-10k ±6				Built-in	11¾ x 7⅛ x 2⅝	5¾	49.95	
	TC-30	X		P	Yes	1.2	M	100-6k ±6				Built-in	12¼ x 7 x 2¾	5¼	39.88	
	TD-80		8	H	No		S	50-10k	0.3			Ext.	8⅛ x 10¼ x 3⅞	5¾	49.95	
MAGNAVOX	1K8844	X		H	No	–	S	50-12k ±5	0.35	40	A.C.	Not furn.	18½ x 11 x 9¼			Auto changer; auto PB/rec.; dual capstan; CrO2 swit.; cover.
	1K8843	X		H	No	–	S	50-12k ±5	0.3	40	A.C.	Not furn.	17¼ x 10 x 5¾			Auto rev. PB/Rec.; swit. AGC; noise filt.; CrO2 swit.; auto off/eject.; dual capstan.
	1K8842	X		H	No	–	S	50-12k ±4	0.2	40	A.C.	Not furn.	15 x 10½ x 5			Auto noise reduc. sys.; CrO2 swit.; auto off/eject.
	1K8871	X		H	No	–	S	50-10k ±5	0.2	40	A.C.	Not furn.	11¼ x 9 x 4			Auto stop/eject.

Cassette & Cartridge Recorders

Pioneer T-3500

Panasonic RS-277US

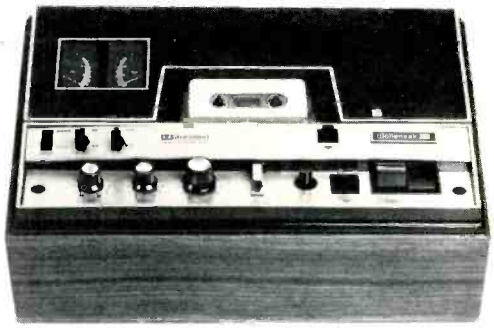
Sansui SC-700

MANUFACTURER	MODEL	Cassette	Cartridge: no. of tracks	Type: portable, P; home, H; car mount, C	Power amp. built in	Rated power output, W	Mode: stereo, S; mono, M	Frequency response, Hz, ± 3 dB	Wow and flutter, %	S/N, dB	Supply voltage	Speakers—built in or external	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
NIKKO	CR-301		8	H	Yes	25	S	40-12k ± 3	0.3	45	A.C.	Not furn.	18¾ x 13½ x 6	24	259.95	W. AM/FM recr.
OLSON	RA-389	X		H	No	–	S	40-12k	0.3	50	A.C.	Ext.	7½ x 12¼ x 3½	10	94.98	2 mtrs.; slide contls.
	RA-689		8	H	No	–	S	50-10k	0.35	55	A.C.	Ext.	11½ x 7½ x 4½	8	34.98	
PANASONIC	RS275US	X		H	No	–	S	30-15k	0.1	45	A.C.	Ext.	16½ x 12 x 5	18	249.95	2 Mtrs.; auto stop; memory rewind; slide vol. contls.; hot pressed ferrite heads.
	RS263US	X		H	No	–	S	30-14k	0.2	55	A.C.	Ext.	14 x 9 x 5	10	179.95D	CrO2bias swit.; memory rewind; auto locking pause.
	RS277US	X		H	No	–	S	20-14k	0.25	55	A.C.	Ext.	17 x 11⅜ x 5	14	299.95D	CrO2 bias swit.; continuous auto stop; locking pause.
	RS276US	X		H	No	–	S	20-17k	0.10	60	A.C.	Ext.	16 x 13 x 5	19	399.95D	CrO2 bias swit.; 2 mtrs.; auto stop; memory rewind; locking pause; hot pressed ferrite head.
PHILIPS	2100	X		H	No	–	S	50-13k ± 4	0.2	47	A.C.	Not furn.	12½ x 10½ x 3⅞	6¾	219.95	Rec.; 2 mic inputs; headphone output; noise limiting cirt.; CrO2 bias
PIONEER	CT-4141D	X		H	No	–	S	30-16k	0.13	58	A.C.	Ext.	15½ x 9½ x 3¾	11	249.95D	Cro2 /std. select; skip button; peak indicator; memory rewind; slide vol. & PB contls.
	T-3500	X		H	No	–	S	40-12k	0.14	45	A.C.	Ext.	14¼ x 9 x 4⅝	12	199.95	Cro2, std, Lo noise tape select; pause contl.; slide vol & PB contls.; auto up & stop.
	T-3300	X		H	No	–	S	40-12k	0.2	45	A.C.	Ext.	13 x 82 x 4¼	10	149.95	Pause contl.; auto up & stop; slide vol. & PB contls.
RADIO SHACK	SCT-6	X		H	No	–	S	30-14k ± 2	0.14	56	A.C.	Not furn.	16½ x 10¼ x 4½	9	199.95D	CrO2/std. bias swit.; records.
	SCT-5	X		H	No	–	S	50-12k ± 2	0.2		A.C.	Not furn.	13¾ x 9¾ x 3⅞	7	129.95	Lo noise/std bias swit.; records.
	TR-800		8	H	No	–	S	30-15k	0.2		A.C.		15¾ x 11¼ x 4¾	22	139.95	Records; 2 mic inputs; FF.
	TR-284B 4-chan.		8	H	Yes		*				A.C.	Ext.	15 x 11¾ x 5	23	159.95	With 4 spkrs. *4-channel.
SANSUI	SC700	X		H	No	–	S	40-16k	0.12	58	A.C.	Not furn.	15¼ x 10¼ x 4⅛	12⅝	299.95D	Rec.; 3 mic inputs; mic-line mix.; servo mtr. spd. contl.; phone jack; auto off.
SANYO	RD 4300	X		H	No	–	S	40-15k ± 2	0.2	50	A.C.	Not furn.	17 x 9 x 5	12	249.95D	Bias swit.; phone jack; rec.; 2 mic inputs.

Cassette & Cartridge Recorders

Sony TC-161SD

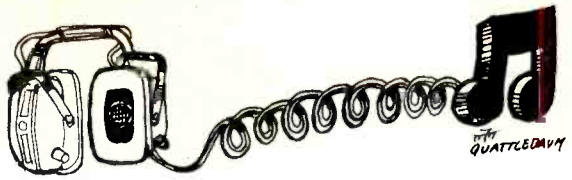
TEAC 350



Wollensak 4760

MANUFACTURER	MODEL	Cassette	Cartridge: no. of tracks	Type: portable, P; home, H; car mount, C	Power amp. built in	Rated power output, W	Mode: stereo, S; mono, M	Frequency response, Hz, ± 3 dB	Wow and flutter, %	S/N, dB	Supply voltage	Speakers: built in or external	Dimensions, W x D x H, in.	Weight, lbs.	Price	SPECIAL FEATURES
SONY/SUPERSCOPE	TC-161SD	X		H	No	–	S	20-16k	0.1	59	A.C.	Not furn.	15¾ x 10⅞ x 5	14¼	299.95D	Peak limiter; dual capstan; memory tape counter; slide contls.
	TC824 4-chan.		8	H	Yes	20	*	50-12k	0.28	48	A.C.	4 ext.	15¾ x 10 x 4¾	14⅜	299.95	*Auto 2/4-chan. swit.; sep. bal. contls.; bass boost; auto/man. program select.
	TC-134SD	X		H	No	–	S	30-15k	0.2	59	A.C.	Not furn.	16½ x 8¾ x 4½	10½	239.95D	Peak limiter; bias swit.; locking pause; 2 mtrs.; slide contls.
	TC-165	X		H	No	–	S	30-14k	0.1	49	A.C.	Not furn.	15¾ x 10⅞ x 3⅛	6¼	219.95	Auto rev. rec./PB; peak limiter; dual capstan; 2 mtrs.
	TC-160	X		H	No	–	S	20-16k	0.1	49	A.C.	Not furn.	15¾ x 10⅞ x 5	13¼	179.95	Peak limiter; dual capstan; bias swit.; 2 mtrs.
	TC-248 4-chan.		8	H	No	–	4	30-13k	0.17	45	A.C.	Not furn.	13 x 8⅜ x 5⅛	11¼	169.95	3-way eject.; manual program select.; auto off.
	TC-127	X		H	No	–	S	30-12k	0.2	48	A.C.	Not furn.	16¼ x 8¾ x 4¼	10½	159.95	Peak limiter, 2 mtrs.; bias swit.; locking pause; slide contls.
	TC-122	X		H	No	–	S	40-10k	0.22	45	A.C.	Not furn.	11⅞ x 8 x 3⅛	6¼	115.95	Bias swit.; ALC; 2 each mic & line inputs; 2 mtrs.
SYLVANIA	CT160W	X		H	No	–	S	30-12k ± 4	0.15	50	A.C.	Not furn.	5½ x 12 x 3½	7	139.95	Rec., w. 2 mics; line in/out; dual VU mtrs.
TANDBERG	TCD-300	X		H	No		S	30-16k ± 3	0.15		A.C.	Not furn.	18½ x 9¼ x 4¼	14½	329.95D	3 mtrs.; rec.; dual capstan; CrO_2 bias swit.
TEAC	350	X		H	No	–	S	30-16k	0.13	58	A.C.	Not furn.	17 x 9⅞ x 4⅜	11¾	289.50D	Rec.; 2 each mic, line inputs; headphone jack.
	250	X		H	No	–	S	30-16k	0.15	58	A.C.	Not furn.	16¾ x 9⅞ x 4	10	249.50D	As above.
	220	X		H	No	–	S	30-16k	0.15	50	A.C.	Not furn.	16⅛ x 9¾ x 4	10	199.50	As above.
	210	X		H	No	–	S	30-12.5k	0.15	50	A.C.	Not furn.	16⅛ x 9¾ x 4	8⅞	159.50	As above.
TELEX	811R		8	H	No	–	S	40-15k	0.3	50	A.C.	Not furn.	15 x 11 x 4½		169.95	Records; Hi Z mic input.
	48H		8	H	Yes	10	S	40-12k	0.2	42	A.C.	Opt.	18¼ x 16¼ x 9	32	299.95	Changer, holds 12; 4 operation modes; 48-D, deck, $249.95.
TOYO	751 4-chan.		8	H	No	–	4	50-10k ± 2	0.25	50	A.C.	Not furn.	8¾ x 12 x 6	9½		PB only
	702 4-chan.		8	H	Yes	20	4	60-12k	0.3	50	A.C.	Not furn.	18¾ x 10¼ x 5½	17¼		PB only.
	355		8	H	No	–	S	100-10k	0.3	50	A.C.	Not furn.	12¼ x 11¼ x 5	13¼		Records
	591	X		H	No	–	S	50-12k	0.3	50	A.C.	Not furn.	12⅜ x 11⅝ x 4	9¼		Records; rev./repeat.
WOLLENSAK (3M)	4760A	X		H	No	–	S	35-15k ± 2	0.15	49	A.C.	Not furn.	13⅞ x 9¼ x 4½		299.95D	
	4755	X		H	No	–	S	35-15k ± 2	0.15	49	A.C.	Not furn.	13⅞ x 9¼ x 4½		219.95	
	8050A		8	H	No	–	S	30-12k	0.25	52	A.C.	Not furn.	16½ x 11½ x 5½	15	159.95	
	8054 4-chan.		8	H	No	–	S	30-15k	0.25	52	A.C.	Not furn.	13⅜ x 9⅜ x 4¾	10	119.95	4-chan. PB; 2-chan. rec./PB.

Stereo Headphones

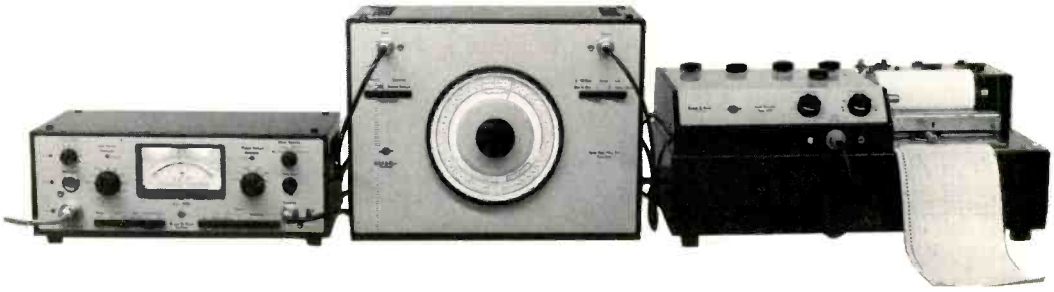


MANUFACTURER	MODEL	Type	Frequency response, Hz ± 7 dB	Impedance, ohms	Sensitivity mW input for 100 dBm out	Maximum input, mW	Distortion, %	Cord length, ft.	Weight, oz.	Price	SPECIAL FEATURES
AKG (PHILIPS)	K-180		16-20k	600	0.06	20	1.0	7	20	69.00	Resp. contl.
	K-150		20-20k	600	0.06	20	1.0	7	9	39.00	With 2 sets of earcushions.
	K-100		20-20k	600	0.06	20	1.0	7	13	29.00	Adjust. headband.
AKAI	ASE-22	Dyn.	20-20k	8		500	1	10	18		
	ASE-20	Dyn.	20-18k	8		500		6	16		
	ASE-9S	Dyn.	25-15k	8		500		6	18		
AUDIOTEX, DIV. HYDROMETALS	30-5206	Dyn.	40-15k	8			1.0	12	23	59.95	
	30-5204	Dyn.	40-18k	8				9	19	29.95	
	30-5202	Dyn.	50-15k	8				6	18	19.95	
	30-5200	Dyn.	20-15k	8				10	16	13.95	
BSR MCDONALD	EP-1	Dyn.	20-20k	8			1.5	10	5	34.95	Indiv. vol. contls.
BEYER (GOTHAM)	DT48S	Dyn.	16-18k	5	0.063	200	0.3	10	17	98.00	Spec. x-former matches 600 ohm line output, TR48/2.
BEYER (REVOX)	DT480	Dyn.	20-18k	Opt.	*	200	0.1	7	16	75.00	*115 dB/mW over 2x10 μ Bar at 400 Hz.
	DT100	Dyn.	30-18k	Opt.	*	200	0.2	7	9	57.50	*110 dB/mW over 2x10 μ Bar at 400 Hz.
	DT900	Dyn.	30-18k	Opt.	*	200	0.5	6½	9	29.95	*114 dB/mW over 2x10 μ Bar.
BRAUN	KH 1000	Dyn.	16-20k	400	1 mW/ 110 dB	400	0.3	8	10	75.00	
FISHER	HP-100	Dyn.	18-22k	50	2.0	700	0.1	8	10	49.95	Foam cushions; slot-loaded, reverse driver mic elements.
	HP-70	Dyn.	30-18k	16	2.5	500	0.1	8	12	29.95	Foam cushions; adj. headband; coil cord.
JVC	STH-10E	Dyn.	20-20k	8		500	1.0	7	13	29.95	2 built-in vol. conts.
	5944	Dyn.	20-20k	8		100	0.5	7	21	49.95	4-chan.; built-in phase-rev. swt.
KLH	80	Dyn.	20-20k ± 4	600	0.06	1.66	0.5	10	11¼	49.95	Coil cord; headband conforms to head.
KENWOOD	KH-71		20-20k	8		500		12	16	49.95	Open-back sys. w. 3-in. spkr.; foam cushions; leather covering, coil cord.
	KH-51		20-20k	8		500		12	16	29.95	As above.
KOSS	ESP-9	ES	15-15k ± 2	8-50			0.5	6	19	150.00	Fluid-filled cushions.
	ESP-6A	ES	30-19k ± 5	8-50			0.5	10	27	95.00	Fluid-filled cushions; with T-3 box.
	K2+2 4-chan.	Dyn.	10-20k	225	0.45	2500	0.5	10	26	85.00	2/4-chan. swit.; vol. contls.; fluid-filled cushions.
	Pro-5Q 4-chan.	Dyn.	20-20k	90	0.45	2500	0.5	10	21	70.00	As above.
	Pro-600AA	Dyn.	10-20k	600	10	1250	0.5	10	19	65.00	Fluid-filled cushions.
	Pro-4AA	Dyn.	10-20k	20	7	1250	0.5	10	19	60.00	As above.
	KO-747Q 4-chan.	Dyn.	20-19k	90	1.4	2500	1	10	22	55.00	Same as K2+2.
	KO-747	Dyn.	10-19k	225	13	1250	1	10	21	45.00	Vol. contls.; fluid-filled cushions.
	K-6LCQ 4-chan.	Dyn.	20-17k	90	1.4	2500	1	10	22	39.95	Same as K2+2.
	KO-727B	Dyn.	10-18k	3.2	0.1	2000	1	10	18	34.95	Foam-filled cushions.
	K-711	Dyn.	10-17k	300	10	1250	1	10	12	29.95	Foam-filled cushions. Red Devil model, KRD-711
	K-6	Dyn.	10-16k	3.2	0.1	2000	1	10	18	22.95	Foam-filled cushions.
LAFAYETTE	F2001	ES	5-35k	8-16				10	10	49.95	4½x5 in. earcushions; with energizer.
	F4400 4-chan.	Dyn.	20-20k	4-16				6	26	39.95	Built-in matrix circuitry.
	F1000	Dyn.	20-20k	8				6	6	39.95	2 2-way 2½ in. units; indiv. vol. contls.
	SP55	Dyn.	30-15k	8				5	5	11.95	Air-cushioned headband.
MAXIMUS	HP-3	Dyn.	18-20k ± 3	8					15		
	HP-2A	Dyn.	25-18k ± 3	8					13		
	HP-1	Dyn.	25-18k ± 3	8					12		
MURA	QP-300 4-chan.	Dyn.	20-20k ± 3	8				15	24	49.95	
	SP-205	Dyn.	20-20k ± 3	8				15	15	29.95	Slide vol. & tone contls.; Mylar cones.
	SP-600	Dyn.	20-20k ± 3	8				10	8	15.95	Mylar cones.
	SP-202	Dyn.	30-15k ± 5	8				10	12	8.95	Vol. contls.; stereo/mono swit.; coil cord.

Stereo Headphones

MANUFACTURER	MODEL	Type	Frequency response, Hz ± 3 dB	Impedance, ohms	Sensitivity mW input for 100 dBm out	Maximum input, mW	Distortion, %	Cord length, ft.	Weight, oz.	Price	SPECIAL FEATURES
OLSON	PH-219	ES	25-19.5k ± 3	8	1.2V		0.5	10	14	59.98	Coil cord.
	PH-220 4-chan.	Dyn.	20-18.5k ± 1.8	8	2.0	600	0.32	10	12	44.98	
	PH-213	Dyn.	20-20k ± 1.5	8	2.0	650	0.3	10	10	42.98	Slide vol. & tone contls. for each earpiece.
	PH-222	Dyn.	25-18k ± 1.5	8	2.5	500	0.38	10	8	24.98	
PML (ERCONA)	D 42 Deluxe	Dyn.	30-20k	200	0.3		2.0	6	9½	29.95	
	RDF 224	Dyn.	20-18k	8	1.0	100	1	8	12	24.95	Coil cord; mono/stereo swit.
PICKERING	PH-4955	Dyn.	30-18k ± 6	8	0.11 V	500	1	10	28	59.95	Coil cord; two-way w. L-C x-over.
	PH-4933	Dyn.	50-71k ± 6	8	0.11 V	500	1	10	22	39.95	
PIONEER	SE-50	Dyn.	20-20k	8		0.5		16	24	49.95	Vol. & treble contls.; padded band & cups; storage box.
	SE-30A	Dyn.	20-20k	8		0.5		8	14	34.95	Padded band & cups; storage box.
	SEL 40	Dyn.	20-20k	8	96 dB @ 0.1 V	0.5		10	8	39.95	Open air type; real leather band & storage box.
	SEL-20	Dyn.	20-20k	8	97 dB @ 0.1 V	0.5		8	7¼	29.95	Open air type.
RADIO SHACK	Nova 44 4-chan.	Dyn.	20-20k	4-16				15	21	39.95	4-channel, 2 spkrs. in each cup.
	Pro 1	Dyn.	10-24k	4-16				10	19	49.95	Liquid-filled earcushions.
	Custom Pro	Dyn.	20-20k	4-16				10	16	23.95	Bassport design.
	Nova 15	Dyn.	20-20k	4-16				10	6	19.95	Open-back earcup.
SANSUI	SS10	Dyn.	20-20k	8		500	1.0	9.8	22	32.95	2-way; 2 level contls.; w. "Y" connector.
	SS2	Dyn.	20-18k	8		500	1.0	6	12.6	16.95	Removable, washable earpads.
SHARPE	770	Dyn.	20-20k ± 3	4-16	0.82	1000	0.6	16	19	100.00	Indiv. vol. contls. & fuses.
	660	Dyn.	20-20k ± 3	4-16	0.82	1000	0.6	16	18	60.00	Indiv. fuses.
	Mk II	Dyn.	30-15k ± 3	4-16	0.23	2000	0.3	16	18	45.00	
	10	Dyn.	30-14k ± 3	4-16	0.28	2000	0.4	16	18	39.95	
	9	Dyn.	15-20k	4-16	0.1	1000	0.25	16	16	29.95	
	7	Dyn.	15-20k	4-16	0.34	1000	0.9	16	9	19.95	
SONY	DR-7A	Dyn.	25-18k	8		500		10	8	10.95	Coiled cord, three conductor phone plug.
	DR-6A	Dyn.	20-20k	8	110 dB SPL @ 1 KHz	110	0.5	6	13.5	34.95	Padded headband, three conductor phone plug
STANTON	5700	ES	30-15k ± 3	*	2V	**	1	11	15	159.95	*4, 8, or 16 ohm source; **prot. cir. cuts out at 110 dB SPL.
	Dynaphase 75	Dyn.	30-18k ± 6	8	0.11V	500	1	10	28	74.95	2-way sys. w. L-C x-over; remote contl. w. vol. & tone contls, stereo/mono swit. Dynaphase 60, less remote contl., $59.95.
	Dynaphase 50	Dyn.	50-17k ± 6	8	0.11 V	500	1	10	22	49.95	2 level contls.
	Dynaphase 40	Dyn.	50-17k ± 6	8	0.11 V	500	1	10	22	39.95	Dynaphase 40/600, similar but 600 ohms, w. built-in match. x-former, $47.95.
SUPEREX	Pro B-IV	Dyn.	15-22.5k ± 5	20	80	2,000		15	18	60.00	Woofer-tweeter; acous. susp.; clothing clip; Hi Z model avail.
	PEP-79	ES	15-18k ± 2	40		10W	0.5	15	12	85.00	Self-excited console included; spkr./phones swit.; auto circuit prot.
	STF	Dyn.	25-17.5k ± 4	16	50	500		15	8	24.95	Semi-isolating cushions; clothing clip.
	SST	Dyn.	20-20k ± 6	20	80	2,000		15	19	40.00	Woofer-tweeter; level & tweeter contls.; clothing clip.
SYLVANIA	SP 40	Dyn.	20-20k ± 4	8	1	800	1	8	4	39.95	Foam-padded headband.
	SP20	Dyn.	20-20k ± 6	16	3	1000	1	14	2	19.95	Liquid-filled earcups; adj. headband.
TEAC	HP-101	Dyn.	18-20k	8		500		6½	13½	37.00	HP-102, similar but 10k Z, $37.00.
TELEX	Studio I	Dyn.	20-22k	3-16	105 dB SPL/mW	1000	1.0	15	24	69.95	Slide vol. & tone contls. for each chan.; silicone ear cushions; padded headband; coiled cord. Studio II, less contls., $59.95.
	400	Dyn.		8				15		44.95	Vol. contls. for each chan.; padded headband. Model 300, less contls., $34.95.
	200	Dyn.		8				10		24.95	Vol. contls. for each chan.; padded headband. Model 100, less contls. with 8-ft. cord, $15.95.
TOSHIBA	HR50	Dyn.	20-20k ± 6	8				6½	15	24.95	2-way system

AUDIO Tests 14 Small Speakers



SMALL LOUDSPEAKER systems, and here we mean systems of one-cubic-foot or less, have improved enormously over the past few years, and many of those tested in our survey would prove quite acceptable to the most critical listener. Compared with full-sized systems, the main deficiencies are a reduced power handling capacity and lower output below 100 Hz or so. Sensitivity tends to be a little less too—nothing we can do about *that* but judicious use of the amplifier bass control can often improve balance although care must be taken to avoid overloading and consequent distortion. Placing the speakers in the corner positions will also improve the low-end response.

How were these speakers tested? First, they were given full-scale listening tests using a variety of program material which included speech, jazz groups, and symphony orchestras. Two high quality reference systems were used, an AR LST monitor and a dynamic-electrostatic combination. Comparisons were made with particular reference to smoothness, overall balance, and freedom from coloration. These tests, which involved a listening panel, took a considerable amount of time (and patience) and then the speakers were measured in the laboratory using mostly B&K equipment as shown above. Here the tests included tonebursts, frequency response, distortion, dispersion, and sensitivity. The results are tabulated on the following pages. As might be expected, the most expensive systems came out the best. These were the ADC 404B, EPI 50, Dyna A-10, Martin 110, and two Video-Tones. The Quadraflex 11 at $24.95 and the Lafayette 25A at $20.45 must be considered excellent value for money. The former needs a little treble lift to achieve balance and the latter both bass and treble adjustment.

Glossary

System Resonance: This is the fundamental frequency at which the bass speaker has its natural resonance in the enclosure. Bass output usually falls sharply below this frequency although output can be boosted if the speaker unit has a linear excursion at low frequencies. All the systems tested are totally enclosed except the Dyna A-10 which has a resistance loaded port and the Frazier Super Midget which has two 6-by-½-in. ports.

Sensitivity: Power output was measured one meter away with one watt input at 400 Hz. It is expressed in decibels SPL (Sound Pressure Level). A more recent standard stipulates pink noise instead of a single tone frequency, but cross-checks showed that the 400 Hz. tests give a reasonable correlation.

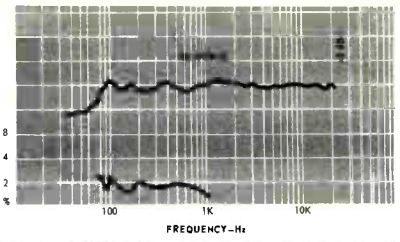
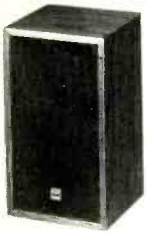
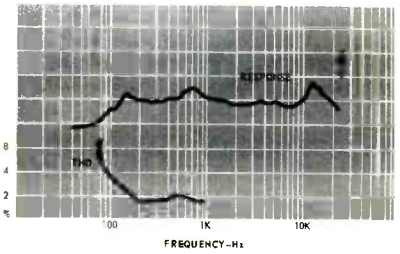
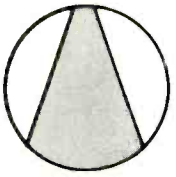
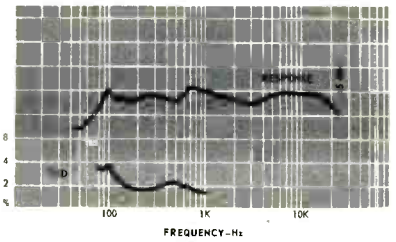
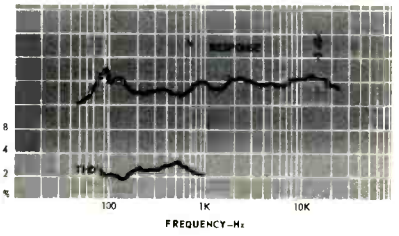
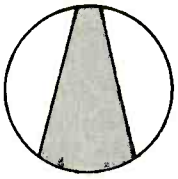
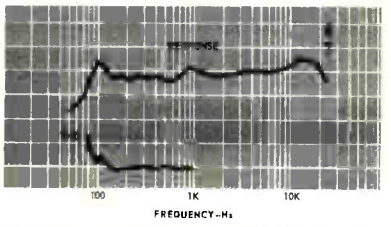
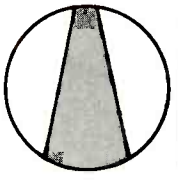
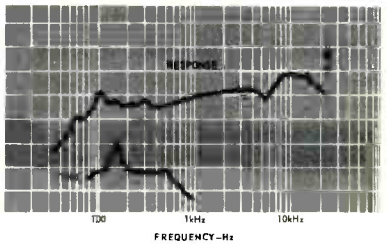
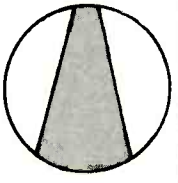
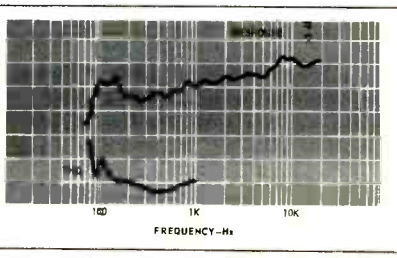
Dispersion: Polar radiation plots were made from 5 to 10 kHz and the information was used to make the small diagrams which show *relative* patterns.

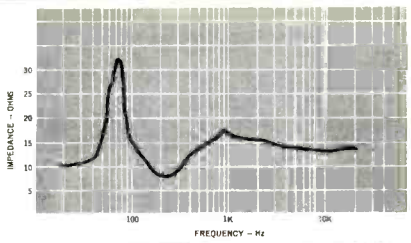
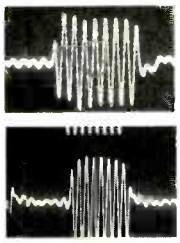
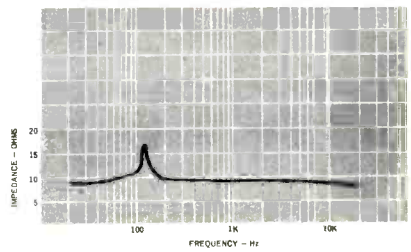
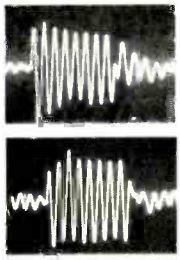
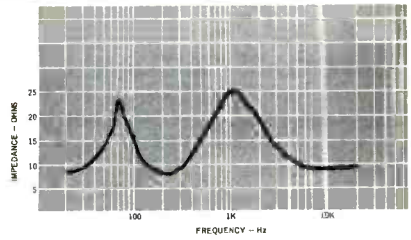
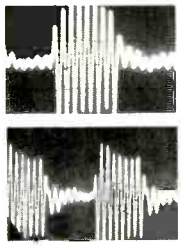
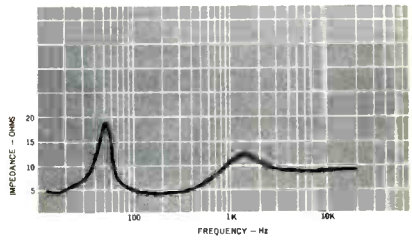
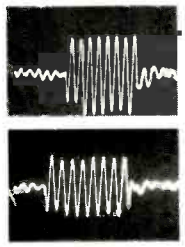
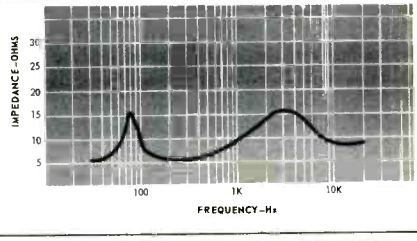
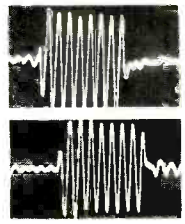
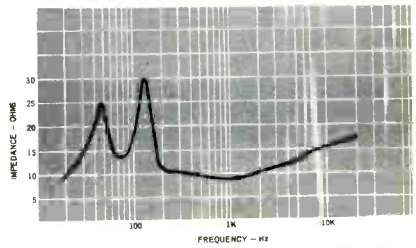
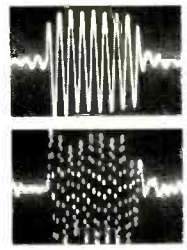
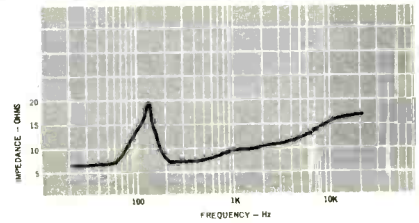
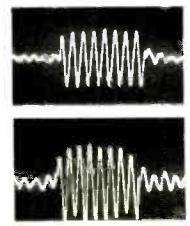
Frequency Response: Following our usual custom, measurements were made with pink noise which is less affected by room acoustics than sine wave signals.

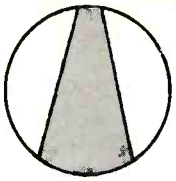
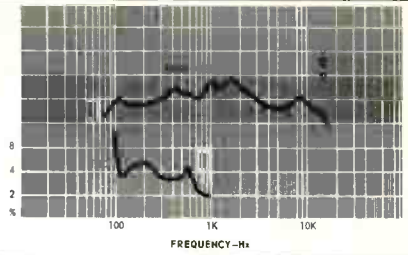
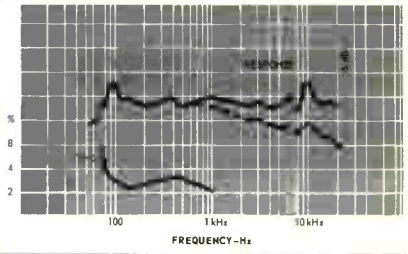
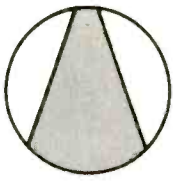
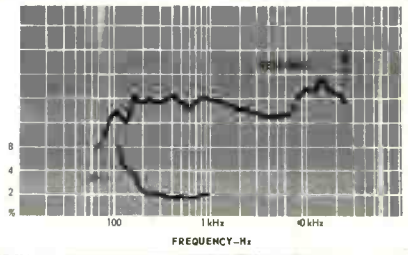
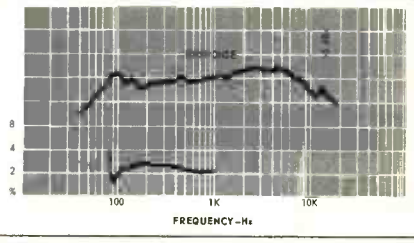
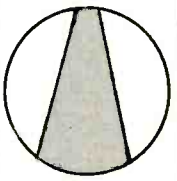
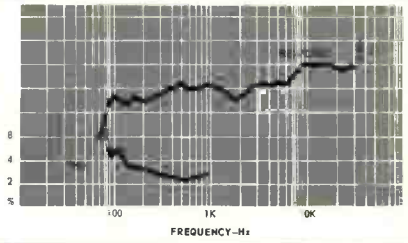
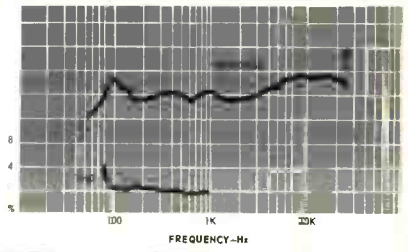
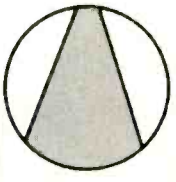
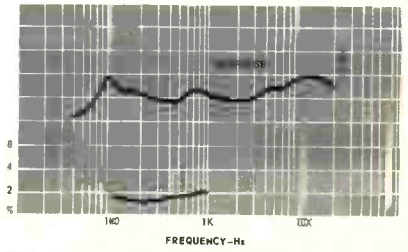
Distortion: This was measured with a 5-watt input signal and the low frequency limit was 80 Hz. Distortion at this point (mostly doubling) indicates to some extent what bass lift can be applied.

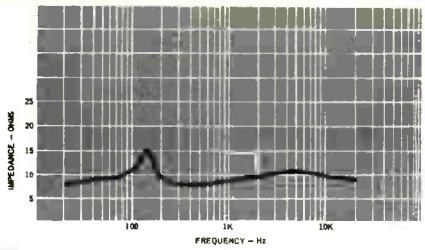
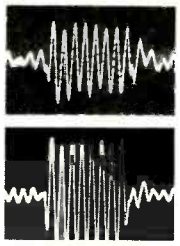
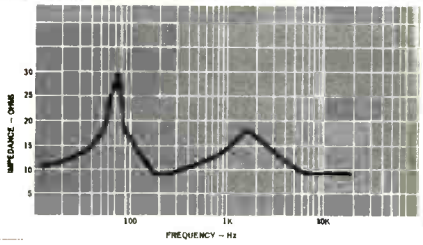
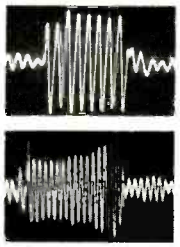
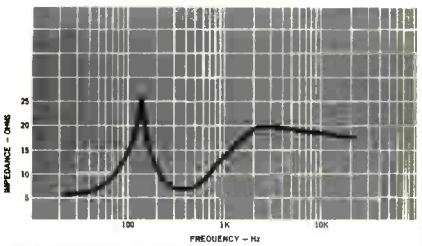
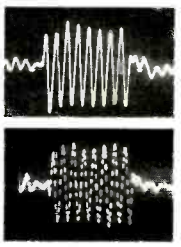
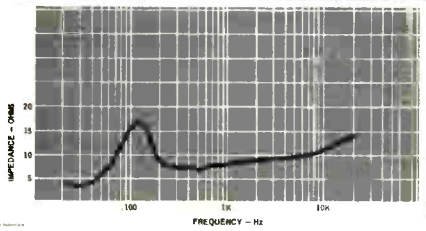
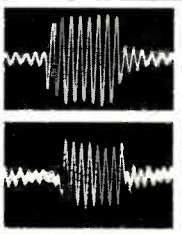
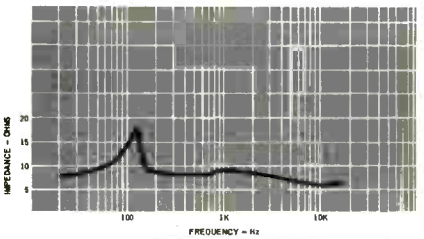
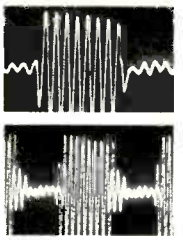
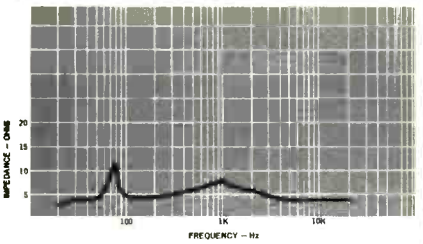
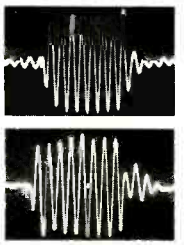
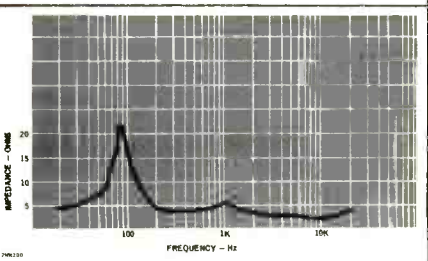
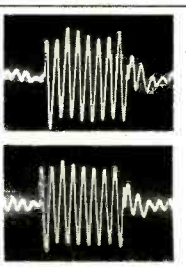
Tone-Bursts: These show the response when a signal is suddenly removed. A perfect speaker with a massless diaphgram having no inertia would respond immediately with no ringing or hangover. The two frequencies are A, 1 kHz, and B, 5 kHz.

Impedance: The impedance of a system may be a nominal 8 ohms at 1 kHz or 400 Hz but will vary throughout the band. Many amplifiers give trouble with loads lower than 4 ohms.

Manufacturer	Model	Units	System Resonance (Hz)	Sensitivity (dB)	Dispersion	Frequency Response & Harmonic Distortion
 ADC	404B	6-in. 2-in. cone	75	97		
 BSR	SS-2	6-in. 2-in. cone	130	98		
 Dynaco	A-10	6-in. 1½-in. dome	74	96		
 EPI	50	6-in. 2½-in. cone	54	96		
 E-V	8A	6-in. 2-in. cone	78	97		
 Frazier	Super Midget	4-in. cone	120 (49*)	98		
 Jensen	1	8-in. cone	120	97		

Impedance	Tone-Bursts	Dimensions (WxDxH)	Price	Remarks
	 1 kHz 5 kHz	8¾ x 7¾ x 11⅞	$45.00	Smooth, good dispersion.
	 5 kHz	8x7 x14	$70.00 pair	Slightly "forward."
	 1 kHz 5 kHz	8½x8 x15	$99.95 pair	Smooth, slightly "distant."
	 1 kHz 5 kHz	10x8 x13	$55.00	Smooth, excellent dispersion.
	 1 kHz 5 kHz	8½x6½ x15	$49.95	Smooth.
	 1 kHz 5 kHz	9½x7½ x 15⅞	$32.95	Some mid-range coloration, *port.
	 1 kHz 5 kHz	10x8½ x14½	$30.00	Forward.

Manufacturer	Model	Units	System Resonance (Hz)	Sensitivity (dB)	Dispersion	Frequency Response & Harmonic Distortion
 Lafayette	Criter. 25	8-in. 2½-in. cone	140	101		
 Martin	110	6-in. 3-in. cone	75	98		
 Maximus	1	5-in. 1½-in. dome	135	97		
 Quadraflex	11	6-in.	120	98		
 Radio Shack (Allied)	MC-500	5-in. 2½-in. cone	120	97		
 Video-Tone	132E	5-in. 4-in. cone	87	98		
 Video-Tone	DP202E	8-in. 4-in. cone	77	102		

Impedance	Tone-Bursts	Dimensions (WxDxH)	Price	Remarks
	 1 kHz 5 kHz	10¼x7 x12⅝	$20.45	Some mid-range coloration, very sensitive.
	 1 kHz 5 kHz	9x8¾ x11¾	$89.95 pair	Slightly forward, good dispersion, H.F. level contl.
	 1 kHz 5 kHz	7¼x5½ x10½	$69.95	Bass restricted, smallest system tested.
	 1 kHz 5 kHz	9x7⅞ x13⅞	$24.95	High frequency fall off, will accept treble lift.
	 1 kHz 5 kHz	9x5 x12	$30.00	Slight hard coloration.
	 1 kHz 5 kHz	8x6 x10	$86.00 pair	Smooth, slightly forward.
	 1 kHz 5 kHz	9x8 x15½	$130.00 pair	Most sensitive system tested, slightly "forward."

THE WORKBENCH

Fig. 1—Note the simplicity of the controls—only two rocker switches, one for power and the other for switching from Hz to KHz.

Heathkit Frequency Counter Model IB-101

MANUFACTURER'S SPECIFICATIONS

Frequency Range: 1Hz to greater than 15 MHz. **Accuracy**: ±1 count ± time base stability. **Gate Times**: 1 Millisecond or 1 second, with automatic reset. **Sensitivity**: 1 Hz to 1 MHz—less than 100 Mv, rms; 1 MHz to 15 MHz—less than 250 mV, rms after 30 minutes operation. **Trigger Level**: automatic. **Input Impedance**: 1 megohm shunted by less than 20 pF. **Time-Base Frequency**: 1 MHz, crystal controlled. **Readout**: 5 digits plus overrange indicator. **Dimensions**: 8¼" wide × 3⅜" high × 9" deep (exclusive of handle). **Weight**: 4½ lbs. **Price**: $199.95 (kit).

Most experimenters or practitioners in the audio field have little familiarity with digital techniques, but most of them will have often found a need for accurate measurement of frequency. Analog-type frequency meters have been around for a long time, but their accuracy is usually limited to ±1 per cent of a meter scale, whereas a digital instrument has an accuracy of ±1 count—which at 1 MHz, for example, is an accuracy of one ten-thousandth of 1 per cent.

Anyone who builds oscillators, square-wave generators, or any similar equipment, needs some form of frequency measurement in order to calibrate the dial. Of course, one could use a scope and Lissajous figures against the 60-Hz power line frequency to get up to, perhaps, 1200 Hz, and with an intermediate generator set at 1200 Hz could continue upward to as much as 24,000 Hz, assuming a 20 to 1 Lissajous figure on the scope screen, but even then he would have to interpolate to prepare a useful scale over the entire audio spectrum. If one correctly calibrated oscillator is available, one can compare the new one with the old, again using a scope, or possibly a heterodyne method, but any of these methods is primitive and time consuming.

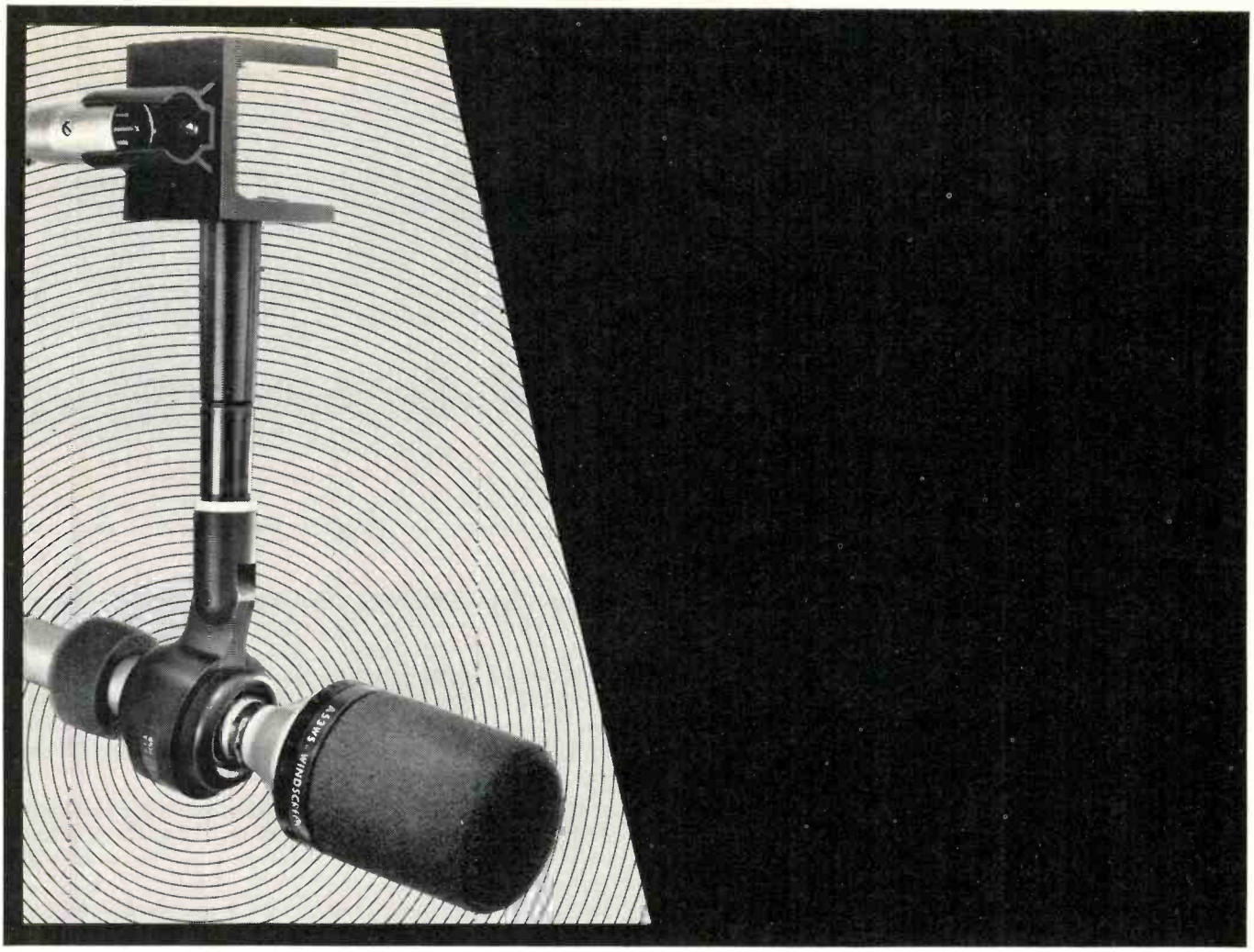
The frequency counter is the elegant answer to the problem of calibrating an instrument and has been for a number of years. But they have been expensive devices, usually above $500 for a five-digit model. Some counters are capable of measuring intervals of time as well as frequency, and prices can easily run up in the two- or three-thousand dollar range. This Heathkit measures frequency only, but is a most useful instrument for the audio lab.

We have used this unit to measure the frequency of the bias oscillator in tape recorders by simply attaching a small inductance to the input leads and placing in close proximity to the erase head. We use it continually to measure speed variations of turntables equipped with vernier controls, playing a 1000-Hz tone on a record and noting the frequency at the normal position, then varying the vernier to a maximum and minimum positions and noting the reproduced frequency. We have used it to calibrate square-wave generators, as well as to check other generators which may have been factory calibrated. We have found it a most useful device.

The Circuit

The IB-101 consists of 26 integrated circuits and 7 transistors, as well as a MOSFET (metal oxide semiconductor field effect transistor) and 6 diodes. Five display tubes provide the readout capability of eight digits in a simple operation. Suppose you are measuring a frequency of 11,245,987 Hz. You place the range switch in the kHz position, and the instrument indicates 11245; then you change the range switch over to the Hz position, and the indication is 45987 with the overrange light on, which shows that the frequency being measured is larger than the five-digits of the display. This is the result of the operation of any digital counter—the count starts with the units, is stepped to the tens, the hundreds, the thousands, and finally to the ten-thousands. After that, there are no more counters available so the overrange light goes on if the switch is in the Hz position. The accumulation of any count starts with the units first, of course. By combining the two indications 11245 and 45987, you end up with 11,245,987, a total of eight digits.

The input signal is fed to the input amplifier, a 40673 MOSFET which has integrated gate-protection circuits which protect against overload, and thence to a Schmidt trigger which shapes the input into a square wave. This is fed to a high-speed single flip-flop IC which counts the unit pulses. The output of this IC is fed to additional flip-flops making a total of five decade counters which feed buffer-storage IC's and their outputs are in turn fed to the five decoder-driver IC's which control the display tubes, converting the binary-coded information to decimal in the process. The gate circuit consists of a 1 MHz crystal followed by three decade counters, each of which divides the input frequency from the crystal by 10, with the result being tapped off to reset the input-frequency counters every millisecond for the kHz position of the switch, and again by three more decade counters which provide a reset signal every second for the Hz switch position. A regulated power supply provides 3.5 volts for all the counters and gate



Boom Boon.

We've taken our most versatile, best-performing unidirectional studio microphone, the *Shure SM53,* and made it even more versatile by developing a complete boom accessory system that equips the SM53 for every conceivable boom and "fish-pole" application! Shure design engineers started with a major breakthrough in design: a small, lightweight, extremely effective isolation mount. They developed a super-flexible isolation cable, a pair of highly-efficient front-and-rear windscreens, and a 20″ boom extension pipe. Finally, they developed a complete boom assembly that combines unusually small size with superb control and noise isolation. Result: an accessory lineup that makes every Shure SM53 studio microphone a complete microphone system! Write:

Shure Brothers Inc.,
222 Hartrey Ave., Evanston, Ill. 60204.

SHURE

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circuits, 36 volts for the MOSFET, and 170 volts for the anodes of the display tubes. The latter is the only non-regulated voltage from the power supply. The overrange circuit is actuated by an inverter transistor which triggers additional flip-flops every time the carry signal from the fifth counter is energized, and is a neon lamp which illuminates an "over" on the otherwise black panel. At the other end of the panel are two legends which are illuminated "Hz" or "kHz" depending on the position of the switch. The panel is a "smoky" black plastic sheet which occupies the upper half of the front panel. The lower half is an anodized aluminum panel which accommodates the power switch at the left, the Hz-kHz switch in the center, and a BNC input connector. This explanation of the operation is considerably simplified, but those interested in a more thorough description can read the information contained in the kit instruction book.

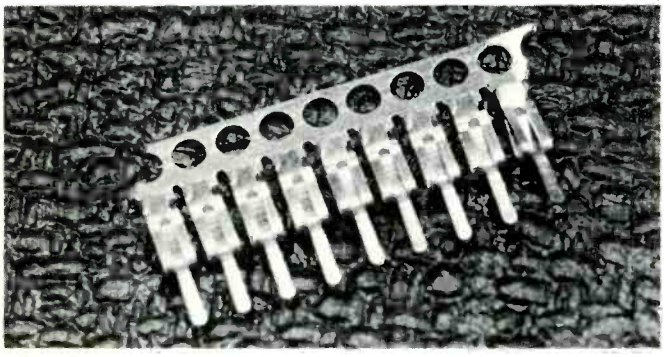

Fig. 2—Close-up of a section of the formed strip which serves as sockets for the 26 ICs. The bottom pins are inserted in predrilled holes in the circuit board and soldered in place. Then, with a furnished jig, the upper portion is broken off, forming seven (or eight) up-standing receptables for each row of pins.

Construction

Construction of this instrument follows the usual Heathkit procedure—the printed-circuit board is assembled first. With the 26 IC's used—some with 14 pins and others with 16, there are 384 separate pins to be accommodated. Mindful of the difficulty the average constructor would have in soldering these in place, and the further difficulty if any one of the IC's had to be replaced, Heath furnishes a strip of pin receptacles such as those shown in Fig. 2. These are cut into lengths of either seven or eight and inserted in holes in the circuit board and soldered—actually not a particularly difficult job if instructions are followed carefully. Then when these are all in place, a "jig"-like tool is used to break off the solid part of the strip just above the receptacles, leaving the latter standing up from the circuit board ready to receive the IC's. When these are all in place, the completed circuit board is as shown in Fig. 3. One caution—don't lose or discard any of these receptacles on the strip. We used the 384 required and had only the nine shown in Fig. 2 remaining.

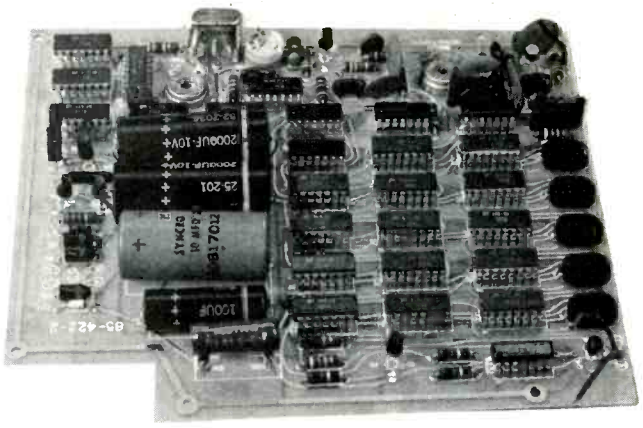

Fig. 3—View of the chassis before installing the case. The five ovals at the right are sockets for the numerical display tubes.

On the whole, this project, which should take about six hours to complete, is a thoroughly worthwhile one, and the satisfaction of having an accurate counter available makes future work with any frequency-generating device more interesting and more accurate. We have found it to be an extremely useful addition to our stable of instruments.

For those who want a still higher frequency limit, there is another kit which will provide accurate scaling to 175 MHz. This unit, IB-102, divides the incoming frequency by 10 or 100 to increase the upper limit. A 1:1 switch position provides a straight-through path for the input signal for measurements over the range of the counter. For those working in the radio frequency ranges of FM stations, this is also a useful addition to the lab equipment. *C. G. McProud*

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Speaker of the House

The idea of radiating r.f. power through the house power wiring is not new—in fact we have had intercom units using this principle for many years. But Concepts Plus, a Los Angeles—based company, has gone a stage further in designing stereo extension speakers to work this way. The transmitter operates in the 3MHz band and is housed in a small "black box" which is connected to the extension speaker terminals of your amplifier or receiver. The frequencies used are 2.30 MHz and 3.12 MHz—so they are spaced far enough apart to avoid crosstalk. Figure 1 shows the inside of a transmitter unit. The two resistors are 8 ohm loads for the amplifier. Figure 2 shows the inside of the top section of the speaker unit which houses the receiver and amplifier. The speakers fitted are a 6-in. bass unit and a 3-in. tweeter. Output measured just over 6 watts from 100 Hz to 10,000 Hz falling off slightly to 5 watts at 40 and 15 kHz. Distortion was 1.5% at 6 watts. Both bass and treble controls are fitted and they had a range of 20 dB at 60 and 10 kHz respectively.

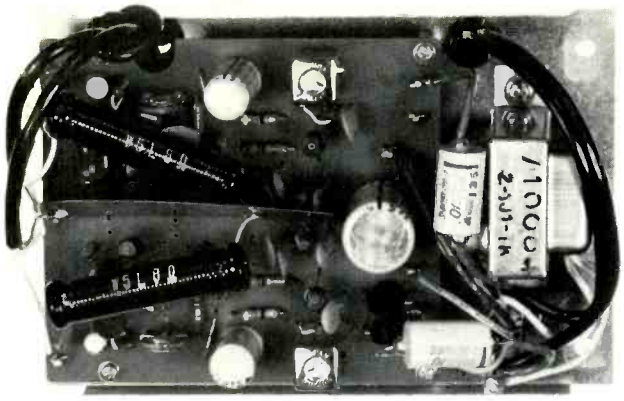

Fig. 1—Inside of the transmitter unit.

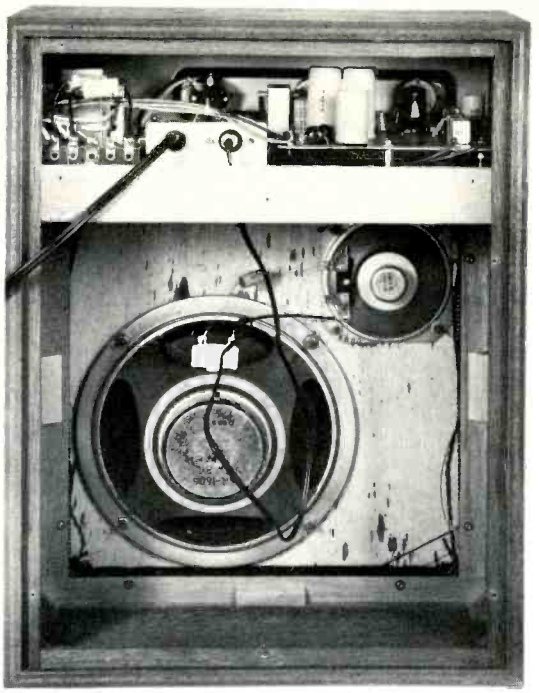

Fig. 2—Inside of the speaker unit.

In my tests, an amplifier power of 5 watts was more than sufficient to put a signal anywhere in the house with excellent signal/noise. A lot depends on the characteristics of the power wiring, the self-capacity and so on, but a receiver with 10 watts output should produce a good signal under the worst possible conditions—unless, of course, there is more than one wiring circuit. The overall sound was surprisingly pleasant and well-balanced although some frequency doubling occured below about 100 Hz. As a matter of interest, I disconnected the two load resistors mentioned above and then connected the transmitter to a tape recorder which gave an output of just over 1 volt rms. It worked very nicely, although the received signals had some background—as might be expected. The extension units are very attractively styled in walnut with a black facia panel with chrome and blue trim and knobs to match. Though the Concept Plus units cannot be considered hi-fi in the strict sense of the term, they would be good for use in a sick room, a kitchen, out on the patio—or indeed anywhere within striking distance of an a.c. outlet. The price of a transmitter and a pair of extension units is $129.95, which is very reasonable, and I need hardly mention that any number of units can be used with a single transmitter. Makers are Concept Plus. *T.A.*

Check No. 106 on Reader Service Card

The First *Meyerbeer* Opera on Records

Richard Freed

THERE HAS ALWAYS been a strong, if not overwhelmingly large, Meyerbeer faction among the ranks of opera buffs, and from time to time during the last decade or two there has been talk of a full-scale Meyerbeer revival. A few years ago there was even an announcement of a production of *L'Africaine*, with Richard Tucker, in Rochester, but (like so much announced from the same source) it never materialized. What has materialized now is the first recording of a complete opera by Meyerbeer, and it is one of his "grandest" (a term not to be confused, by any means, with "greatest"), *Les Huguenots,* offered with only the tiniest excisions in a four-disc London set (OSA-1437, $23.92), conducted by Richard Bonynge.

One would like to exclaim, "At last!" and run on to all sorts of enthusiastic effusions, but what this much-awaited—and, in many ways, very welcome—recording makes most dismayingly clear is that, although Meyerbeer was a splendid composer for the theatre, his music does not stand up very well on its own (that is, without the visual element and all the trappings that go into making grand opera "grand," or, in a word, "spectacle"). *Les Huguenots* is really pretty thin stuff, but it cannot be dismissed with a wave, and neither can this important first recording of it.

Meyerbeer in his own time was enormously respected. His operas dealt only with grand and profound subjects, subjects which lent themselves to the epic proportions of his endeavors. In certain very serious musical circles, in the second quarter of the 19th century, he was esteemed above Mozart and Beethoven, and the greatest praise a critic could bestow on Verdi's *Don Carlo*, a little over a hundred years ago, was to comment that it might *almost* be compared with Meyerbeer. Undoubtedly, both Verdi and Wagner owed much to him, but undoubtedly, too, their debt was paid a hundred times over in the form of music which, while it might not have been written at all without Meyerbeer's example, so far surpassed him in terms of quality and imagination as to render comparison ludicrous.

Joan Sutherland

Martina Arroyo

Meyerbeer, one feels, is best ingested in small doses—the still enchanting "O Paradis" from *L'Africaine,* a coloratura showpiece from *L'Etoile du nord,* the sparkling ballet *Les Patineurs* whose music Constant Lambert concocted from various Meyerbeer tunes. But there has been a sustained yearning for a complete Meyerbeer opera on records, and here we have one, so. . . ?

As suggested above, there is nothing small-scaled about Meyerbeer's operas, and the large cast of *Les Huguenots* calls for seven singers of "star" quality in principal roles. In the London recording, which ought to have been a glorious excuse for congregating seven of the most brilliant vocal artists available, there is only one among the seven who really makes the most of his opportunity: Gabriel Bacquier, the distinguished French baritone, whose presence in any undertaking may be taken as assurance of exceptional aural pleasure, is superb as the Comte de Saint-Bris. What a sense of style Bacquier invariably brings with him! The "Blessing of the Daggers" is one of the more convincing scenes in this work, and Bacquier makes it a memorable one.

The other six principals here are Joan Sutherland as Marguerite de Valois, Martina Arroya as Valentine, tenor Anastasios Vrenios as Raoul de Nangis, basso Nicolai Ghiuselev as Marcel, mezzo Huguette Tourangeau as Urbain, and baritone Dominic Cossa as the Comte de Nevers. Of these, the reliable Martina Arroyo gives the best account of herself; as always, hers is a very full characterization, both musically and dramatically, but one wonders if this was an ideal piece of casting for Meyerbeer, which demands more in the way of sheer, hard glitter. The justly admired Ghiuselev, too, seems conspicuously uncomfortable in this work. Vrenios is a stylish singer, and one cannot but admire the ease with which he attains—and holds on to—that high E at the

end of the Septet, but his voice is just not BIG enough for this huge-scaled spectacle. Cossa and Tourangeau simply lack the star quality to make their contributions convincing. That leaves Joan Sutherland, and even she is not on her best form, although the role of Marguerite is less critical than those sung by Arroyo, Vrenios and Ghiuselev.

So, as a bouquet of glorious vocal display, this package is far less impressive than it might have been had the casting of the other six stellar roles been undertaken as thoughtfully as that of Saint-Bris. Richard Bonynge, of course, is *the* current authority on music of this sort, and there is no faulting his leadership, the playing of the New Philharmonia Orchestra, or the singing of the Ambrosian Opera Chorus. The Decca/London engineers, though, have given a bit less than their characteristic best on this occasion, with noticeably less clarity and definition than we have come to expect from them; the voices have an echoish quality in many sections which becomes a cumulative irritant.

Well, we must be grateful to London for making this recording, even if the casting could have been improved. Some, I know, will regret that the first complete Meyerbeer opera on records was not *L'Africaine* or *Robert le Diable*, but it must be acknowledged that *Les Huguenots* is the big one. It is *Les Huguenots* which embodies all the Meyerbeer traits—the grandiosity, the color, the striving for a nobility this composer never quite achieved—on his most ambitious level. Now we have an opportunity to hear it in full. Unfortunately, though *Les Huguenots* is a *long* opera (three hours and 40 minutes for the five acts), there just isn't that much to hear.

Undoubtedly many opera-fanciers will feel differently about this, and, since Decca/London has gone to such expenses to produce the set, I only hope the vociferous Meyerbeer faction will respond in such a way as to justify the undertaking. One wonders, though, if even the most eager members of that enthusiastic group will not find the poverty of the composer's inspiration in the first and last acts almost embarrassing. Having heard it all now (more than once), I would look forward to a single disc of highlights, on which I could enjoy Bacquier in the "Blessing of the Daggers," hear again the duet "Beauté divine" with Sutherland and Vrenios, also the "Conjuration and Benediction"from Act IV and some of the other ensemble numbers.

Classical Record Reviews

Edward Tatnall Canby

Carl Nielsen: Symphony No. 5. L'Orchestre de la Suisse Romande, Kletzki. **London CS 6699**, stereo, $5.98.

Periodically, I come back to Nielsen to see whether I can realize in my own perceptions the qualities of greatness which Nielsen enthusiasts point out. He has a hefty following, no question about that, if enthusiasm is heft. The liner notes on this record are full of words like "genius," "colossal," "no post-Beethoven symphony has surpassed (its) dramatic power" and so on. Either you are a dedicated Nielsenite or you aren't.

I'm not. So turn to another magazine if you are, and no offense, I hope. Each to his own. To use the familiar youth phrase, I simply am not turned on by Nielsen, however dramatic he may be. He leaves me with a feeling of utter objectivity. Yes, a very fine orchestral sound, excellent melodic sweep, skillful, professional layout, an enormous canvas and much evidence of vast cosmos, some enormous spiritual ethos, which is very obviously being projected by the music. Par for the course in Nielsen's day, as of Mahler, Scriabine, et al. But in Nielsen it pushes too hard. I find the musical effects overblown for their content of musical language, repetitious to a degree I can't take, overextended, and most of all, somehow stylistically fuzzy (though of course it is "all Nielsen," I will be answered). One minute it's Impressionist, the next cautiously, rather selfconsciously, dissonant, then straight back to Brahms. Oh, well. Why say more?

(Play me 10 seconds of old Franz Berwald, another Scandinavian, and I'll swoon with joy, though he was no Beethoven. Play me an hour of Mahler, or two hours, and I'll listen, nor will my attention wander. Play me the same by Bruckner and I'll sleep. I even love Sibelius, now that I'm grown up. I used to think he was old fashioned.)

For all of that, I think I can state that this is a good performance, as good as they come, in spite of a few minor string blemishes of ensemble under London's familiar close-sounding string microphoning. Full of strong feeling and good phrasing.

Performance: B- Sound: B-

Beethoven: The Late Quartets (Op. 127, 130, 131, 132, 133, 135). The Yale Quartet. **Vanguard Cardinal VCS 10101/4**, four stereo discs, $11.92.

A sad rumor from New Haven says that the Yale Quartet is no longer playing. If so, it is a crying shame, for this unpretentious local group, attached to Yale University, has put down some of the finest Beethoven on records anywhere. And this even though the personnel of the group is not entirely the same throughout the recordings.

This collection contains all the famed late Quartets, including the Grosse Fuge, the Great Fugue, originally the enormous—too enormous—last movement of Op. 130. Beethoven wisely detached it and wrote a smaller and more appropriate ending for the same spot. Never has the almost unplayable intensity of this Fugue-with-episodes been so accurately and smoothly performed, yet with all the expressivity it needs. (The work too often gets hopelessly scratchy and squawky, as the players try to encompass its incredible "drive" and play the notes right too.)

Note that the Yale Quartet recordings are also available separately, on single LP discs, to your choice.

Performances: A- Sound: B+

John Williams/Raphael Puyana—Music for Guitar and Harpsichord. (Jordi Savall, viola da gamba continuo). **Columbia M 31194,** stereo, $5.98.

Here's another of those discs that combine a classical guitar with something else (like, say, another classical guitar). The sound mix here is mellifluous and the music pleasant, but I found that the three Sonatas by one man, Rudolf Straube, born 1717, were just too much. His prettily tailored music is of the middle 18th century, early-Hayden sort, and after one Sonata you can guess the rest. Minimal content.

However, there's a nice semi-modern piece by the Mexican composer Ponce, brilliant neo-classic, and a really worthwhile Sonata, at length, by the annotator of this record. Stephen Dodgson. It is beautifully styled for the two instruments with a real sense of each of them and an impressive knowledge of both guitar and harpsichord history. This work might be called neo-classical, as of 1970; its roots are in the eclectic modern of the 1930's, all Baroque-ish and bouncy. It is played continuously but the shape is of a Baroque Sonata, slow/fast, the slow segments all florid ornament, free style (like a Bach Fantasia), the fast movements full of slightly acid counterpoint, very Baroque in texture. I like the way Dodgson can write real harpsichord music for the harpsichord, while writing equally guitar-ish music for that instrument, the two combining with the greatest of ease.

Buy this disc for the moderns, then, not for the classics. If you get tired of modern, you can always fall back on old Straube.

Performance: A- Sound: B

Jesus Christ Super Star (Eight complete excerpts). First All American Cast Album. **Fleetwood FMS 4,** one 7-in. stereo disc, *available at some supermarkets.*

As per our recent editorial page, this is one of a new series of seven-inch discs that somehow cram a full 12-in. LP into an unprecedented closeness of lines and length of play on the little 7-in. platter. The records play on normal equipment.

I am not sure what a "First All American Cast" might be (is there a part-American cast?) nor will I expound on the now-familiar music except to say that it strikes me as something less than sensational, considering the subject matter and the enduring popularity of the show. All that matters here is that there are four complete numbers on each side, eight in all, and three of these range from 4:00 to 5:12 in their timing. A lot of music in a small space.

Yes, it is a technical feat. The sound is reasonably good, and the crucial inner grooves aren't bad at all (though the sound mercifully fades out in slow motion at the ends, which undoubtedly helps!). A bit dull in the overall, and definitely a lot less loud and coarse than many a current short-type 45. Also, the residual noises, minor clicks and bumps, do show up a bit and some of them tossed my ultra-light pickup a few grooves. But definitely a passable disc, at least in the high-production pop area. However, I think the real implication here has been overlooked. It isn't that our jukes will now fill up with half-hour sides, all of a sudden.

Instead, as I read the message, Fleetwood is saying to us that there is a large amount of useful leeway *between* this disc and the present full-size standard LP. No—not for a renewed 10-in. size, though that is technically possible. Nobody wants the 10-in. back. Rather, for an RCA-type discrete full-

sized disc, quadraphonic, improved.

If Fleetwood can do this well with somewhat reduced levels and a drastically smaller size—then it seems reasonable to think that the compromises now necessary for the discrete quadraphonic disc may in the end be successfully minimized. Times change and so do technologies. as Invention, so to speak, continues to be the Son of Necessity. RCA's present difficulties with lowish levels and shortish playing time are of the sort, you must admit, that—given time—our industry has usually been able to solve. Fleetwood is a side-indication of what might be coming. So it seems to me.

Franz Berwald: Piano Concerto in D Major (1855); Theme and Variations in G Minor; Rondeau-Bagatelle in B Flat; Tempo di Marcia; Presto feroce. Greta Erikson, piano; Swedish Radio Orchestra, Westerberg. **Genesis GS 1011**, stereo, $5.98.

Lovely. Anything by Franz Berwald is worth a listen, though the old Swede, formerly unknown to musicians as well as listeners, tends to write the same sort of music in all his late works. It is so delightfully quirky, so good humoredly jittery, nervous, high-tension, yet as honest and unspoiled as Schubert—who was younger than Berwald but died many years earlier. He isn't a great, universal composer, but surely he is one of the finest of the in-betweens. His music "fits" our own nervous temperaments as thoroughly as it riled the people of the 1840's and 50's, who couldn't stand nervousness.

This is a good all-Swedish performance, nice in the piano, a bit less than accomplished in the orchestra but definitely in the right spirit. Those who have tried Berwald will enjoy it, without question.

The solo piano pieces are revealingly uninteresting. They all date from the composer's youth, 1819-20, except one, the Presto, which is again, characteristic mature Berwald. The young Berwald wrote salon music, let's face it. Pretty empty stuff, if well put together. The more remarkable that he grew so much, in almost total musical solitude, in the long years that followed before his death in 1868.

Performances: B Sound: B

Handel: Judas Maccabeus. Harper, Watts, Young, Shirley-Quirk; Amor Artis Chorale, Somary. **Vanguard Cardinal 10105/6/7**, 3 stereo discs, $8.94.

Judas Maccabeus is one of the three big, late-period oratorios that include *Messiah,* and you will hear many an

echo of that slightly earlier work in this one. But each of the Handel oratorios has its overall pace and mood—this one is relaxed and yet impressive, full of the drama of celebration. It was composed as a musical analogy to rejoice upon the defeat of "Bonnie Prince Charlie," the last of the serious Stuart pretenders and grandson of James II. (Remember? Then came William & Mary out of Holland, in the "glorious revolution" of 1688, if my mind is in the right gear. . . .) A political showpiece, a device which Handel could always use to perfection in support of the glorious Establishment.

The Vanguard recording is the only current offering of the work by Englanders, in English, but it can stand up on any grounds of comparison you wish to choose. Somary, I'd say, has at last proved that in Handel we can be "authentic" to 18th century perfomance standards without being dry, dogmatic and dusty. His Handel moves along in modern style, briskly, naturally, with all proper details like continuo with harpsichord, more or less the original instrumentation, plenty of added trills and cadenzas (taken for granted in Handel's time), and a smallish chorus. His tempi are easily right, if fast-paced, and he "gives" to his singers, allowing them the grace of their own best expression, rather than dragging them along unmercifully at the new faster tempi which replace the dirge-like "oratorio" style of the past.

Indeed, the only necessarily less-than-authentic element, here as elsewhere, is that of the vocal stars, who sing very much as of today and not necessarily in the manner of Handel's time. They adapt variously well, but all of Somary's are good and leaders in the British singing art. As usual, Heather Harper, the soprano, comes out best, her voice still pure, simple, and flexible. It takes singing of a sort still rare today to bring out the rapid-fire runs and trills and roulades which were merely normal in vocal art in the 1740's.

The chorus? It has a definitely familiar and very pro sound, replete with healthy vibrato and brimming with energy. "Amor Artis," I suspect, is now another name for that ever-available British professional vocal pool that appears in all sorts of recent recordings under names convenient to the moment. It's the same in New York, where all professional chorus work is turned out by virtually the same singers, no matter what the designation. In any case, this group is tireless and efficient, if perhaps not quite as spiritually dedicated as might be hoped for. What more can you do under expensive

recording circumstances? It's a job, but a job well done.

Since the parallel Vanguard recording of *Messiah* is out in SQ, you will probably find this one, eventually, in the quadraphonic offerings. If so, get it, even at a premium.

Performance: A- Sound: B+

Lewenthal Playing and Conducting Funeral March for a Papagallo and other Grotesqueries of Alkan. Columbia M 30234, stereo, $5.98.

Pianist Raymond Lewenthal rediscovered Alkan, a French Jewish piano genius and recluse of the Wagner-Liszt-Verdi era who lived in Paris, played like a fiend but wouldn't play in public, composed voluminously, studied the Talmud—and was killed when the Talmud fell on him. An eccentric bird, of a sort not uncommon in France—note Erik Satie, many years later. Lewenthal has made himself the world's Alkan specialist. His first recording, *chez* RCA, brought out the heaviest Alkan piano armament; this one sheds light on the quirky side of the composer, and it does have its moments.

A lovely, bland little piece, for instance, jarred out of its complacency by sudden grotesque tone clusters, a century before Henry Cowell. A heinously difficult little Etude, one hand playing both a *legato* melody and a *staccato* broken-chord accompaniment—then both hands at once doing both things. A brace of assorted mood-pieces, apt to explode suddenly into the grotesque. Most interesting of all, a bigger item for voices and wind group, a mock-serious funeral march for a parrot on an endlessly repeated French equivalent of "Polly want a cracker?" —*A-tu déjeuné?*— and further, *Et de quoi?* (What did you eat?). It's done here by a batch of heavy-voiced Met singers for a vibrato-ridden sound of awesome vocal proportions, conducted by Lewenthal, who adds a croak of a bass for his own special grotesquerie!

I suppose I'm an unimaginative clod, but Mr. L.'s enthusiastic imagination makes these little pieces more important in his written descriptions than they seem to sound in the pianistic flesh. They are cute, well written, quirky, just as he says. But the texture and harmony is bland, a sort of mild Beethoven watered with semi-Chopin, not too exciting. In spots the writing is "virtuoso" all right, but more on the Beethoven model than say Liszt; incredible tangles of swift movement but without that showy brilliance which makes Liszt sound even more spectacular than it is.

As of the mid-century, I'll admit,

these works must have seemed pretty far-out, to the few who heard some of them. That would give Mr. L. his talking point. But they'll appeal mainly to modern ears who enjoy Satie and the like, the real esoterics.

Performances: A– Sound: B+

Percy Grainger plays Grieg. Klavier KS 101, stereo, $5.98. **Ignaz Friedman Concert II. Klavier KS 115,** stereo, $5.98.

These are via Duo-Art, the earlier American system, competing with Ampico in the latter days, before records and radio killed the whole type of reproduction. (The Welte system was the first, back at the turn of the century in Germany, and these three fought it out for artists and for quality right up to the end.)

The trouble—for our ears—with many of these old programs is that the music is now so insipid and old fashioned. Modern ears, even those that are totally untrained in "classical," nevertheless are attuned to dissonances of a kind unheard-of back then. The minor recital works, and many of the major works too, no longer have the musical punch they once had; we simply cannot hear them as they were then heard, except by a severe exercise of imagination.

Yet a potent performer, like Percy Grainger, can give you a pretty good idea as to the way *he* felt about them. Grieg's music nowadays seems all perfumed and over-juicy, with much drama about effects that seem to us pretty small potatoes in musical terms. But they were both modern and radical in their day, and this quality is brought out dramatically (if you can stand it) by Grainger's playing—he knew Grieg personally. Horse's mouth. Grainger was always a mannered, slightly foppish pianist even in his own day, and he still sounds so. His piano-only reduction of the familiar Piano Concerto (Side A) may amaze a few, but mostly it will pall, with all its tired effects. But the solo piano pieces of Grieg on Side B are much more interesting and truthful.

I found Ignaz Friedman's minor Tchaikovsky, his Weber, Paganini, pretty insipid and old fashioned, for all his rep as a piano giant. But Friedman's own works, mostly waltzes, are much more interesting—richly lush things, somewhere midway between Fritz Kreisler and Maurice Ravel, so full of notes you think of a music box, and—of course—very difficult to play. What else! A whole side of these, and very pleasing listening if you like good dessert music.

Performance: A Sound: B+

Sherwood L. Weingarten

ANGELA DAVIS is free, despite her being a black Communist; President Nixon has broken bread with the Communist leaders of China and Russia. My, my, but the times they *really* are a'changin'.

Things may also be a'changin' for another Black who has had his political troubles: singer *Paul Robeson,* who by choice decided to live in Russia a while because of the discrimination against Blacks he found prevalent in the U.S. When the Soviet Union turned out not to be Mecca after all, he returned stateside—but the damage to his career had been done.

Now, RCA gives us the opportunity to hear the kind of talent we harassed because of political blinders. *SONGS OF MY PEOPLE* (Red Seal, LM-3292) contains Robeson's legendary first recordings for the company, pressed—in mono, of course—on 78s between the years 1925 and 1929. Sound quality is something that must be overlooked, naturally, but the voice tone is so superb that that task is easy.

Backed on piano by his long-time accompanist, Lawrence Brown, who also sings on five of the 20 cuts, Robeson proves what many have said before—there's a lot of poor quality in today's music. For Robeson, who at 75 now lives quietly in southern New Jersey, clearly points out what a really fine voice is, and the contrast to much of today's pop-soul garbage is all too evident.

The songs Robeson performs on the disc, all Negro music and mostly spirituals, have a depth of feeling that can only be termed authenticity. Robeson obviously trembles with both the joys and sorrows of being Black, revels in the history of his race—despite the painful negative aspects of that history.

There are no highlights on the vinyl, for each melody is a gem unto itself. Starting with "Git on Board, Li'l Chillun" and ending with "I Got a Home in-a Dat Rock."

Old favorites are included, such as "Deep River," "Water Boy," "Swing Low, Sweet Chariot," "Ezekiel Saw de Wheel," "Nobody Knows de Trouble I've Seen," "Sometimes I Feel Like a Motherless Child," "Joshua Fit de Battle ob Jericho" and "Bye and Bye." Many of these, of course, have been revived by the new blues stars, both black and white, but none carry the urgent poignancy of Robeson's versions.

If a flaw exists, it is that some of the pieces are ultra-shortened, such as the 55-second "Dere's No Hidin' Place." All, in fact, are brief—a result of the time allotted to singles in that not-so-Roaring Twenties era; the longest selection

runs only one second past the three-minute mark.

Robeson's baritone-bass voice, given other political circumstances, might be remembered as comparable in his genre to Caruso in his. The problem is that the voice is hardly remembered at all. This disc may help correct that negligence. And the album can help do, by itself, what Robeson—who first had gained fame as an athlete and actor, and who since his retirement in 1958 has found only sadness and obscurity—always wanted to do, educate all people as to what the Black people are about. He said it himself, as the liner notes indicate, three decades ago:

"If I can re-create for an audience the great sadness of the Negro slave in 'Sometimes I Feel Like a Motherless Child'; or if I can make them know the strong, gallant convict of the chain gang, make them feel his thirst, understand his naive boasting about his strength in 'Water Boy'; or if I can explain to them the simple, divine faith in 'Weepin' Mary'—then I shall increase their knowledge and understanding of my people. That will be something to work for, something worth doing."

Amen.

NEW YORK (London "Phase 4 Stereo," SP44141) is a musical montage of Mayor Lindsay's playground as painted by *Frank Chacksfield* and his orchestra. All 10 cuts, which include a pair of medleys, are easy-listening—nothing spectacular, nothing bad. Best instrumentals are the 6:27 "West Side Story" medley "Something's Coming," "Tonight," "Maria," "America" and "Somewhere") and Rodgers and Hart's "Slaughter on 10th Avenue," still exciting and jazzy. Also worth a listen are "Harlem Nocturne," "Manhattan," "Take the 'A' Train," "Spanish Harlem" and the ever-bouncy "Give My Regards to Broadway."

ROY ORBISON SINGS (MGM, SE-4835) contains a variety of sounds, emphasizing, of course, the up-melodies and moralistic down-lyrics of country music. There are some surprises by the singer-guitarist, though, such as the French tossed in via "Beaujolais" and the sometimes schmaltzy arrangements featuring chorus and orchestra. If you don't mind Orbison's high-pitched, smooth voice, you'll like the LP.

MY STREET BEGINS AT MY HOUSE (Folkways, FC 7543) is a disc aimed at tots. Starring *Ella Jenkins,* whose soul-folk voice is self-accompanied by solo guitar, the recording keeps things simple, playful and directly to the point, a la the material on "Sesame Street." The singer-writer, who penned all the words and music on nine cuts (one a reprise of the title tune), is best on the lone narrative, the tongue-twisting wordplay-filled "World of Whickum-Whackum."

SIMON & GARFUNKEL'S GREATEST HITS (Columbia, KC31350) deserves the title. Among the 14 successes by the folk-rock duo are such modern evergreens as "Feelin' Groovy," "The Sound of Silence," "I Am a Rock," "Scarborough Fair/Canticle," "Homeward Bound," "Bridge Over Troubled Water" and "El Condor Pasa." A bargain at almost any price, especially packaged in one album.

SOLID BRASS (A&M, SP4341) is another bargain anthology, in effect a second volume of greatest hits by Herb Alpert & The Tijuana Brass. Among the 14 cuts, all re-releases, are "This Guy's in Love With You," "The Work Song," "Jerusalem," "A Banda," "Summertime" and "Wade in the Water." Alpert's horn is still golden, and the sound is unique.

(Continued)

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AU-9

I'D LIKE TO TEACH THE WORLD TO SING (Metromedia, KMD 1051) is the first album by The Hillside Singers, a nine-member group. Folky, in sing-a-long style, the group is best, naturally, on its chartbusting title tune. lifted from the Coke commercial. Also good are Pete Seeger's "One Man's Hands;" John Denver's "Take Me Home, Country Roads;" a bouncy version of the traditional, "Amen," and "We're Together," a redone version of the McDonald's hamburger theme. For those who prefer The New Seekers rendition of the title tune, however, **WE'D LIKE TO TEACH THE WORLD TO SING** (Elektra, EKS- 74115) also is available. This, though, is basically a one-song album, for the rest don't go anywhere (with the possible exception of a couple of down home-styled entries, "The Nickel Song" and "Good Old Fashioned Music").

VICTORIAN POETRY (Camden, TC 3004) will appeal to a limited audience, but the disc is fascinating because it shows the impact words can create. There are 55 cuts in all (on three discs), ranging from 32-second rendering of Robert Lewis Stevenson's "Requiem" to an 11:50 reading of Francis Thompson's "The Hound of Heaven." The vinyl features the voices of Max Adrain, Claire Bloom and Alan Howard.

ON THE GREEK SIDE OF MY MIND (MGM, SE-4818) spotlights Demis Roussos, whose squeaky voice is often grating to the ear, particularly when it becomes falsetto. The title cut is a poetic narrative, superimposed on an almost theological choral backdrop, and is fascinating. The rest, sort of electric-stringed Greek-rock, is uninspired.

SOFTLY WHISPERING I LOVE YOU (MGM, SE-4821) finds the once-innovative sound of The Mike Curb Congregation now a bore, filled with routine arrangements that are little more than sing-a-longs. The voices themselves have become muddled. Of the 10 cuts, worth hearing are "I'd Like to Teach the World to Sing," "United We Stand," and "Forty Days and Forty Nights." It's the second bummer in a row for the group, whose earlier **HITS FROM THE GLEN CAMPBELL SHOW** (SE-4804) also showed a lack of zest.

TIME TO WONDER WHY (RCA Victor, LSP-4638) spotlights George Kayatta on 10 cuts. The newcomer writes on the liner notes: "I sing of love, of terrestrial happiness, of the quiet pains and joys of solitude. . . ." He does, and he does it well.

SOMETIMES (United Artists, UAS-5529) is Allan Taylor's debut. The folksinger with a sometimes thin, sometimes deep, but always moving voice sticks to simple arrangements and an almost childlike concept. (In fact, nursery rhymes and other tot playthings are used.) The dozen cuts are heavily laced with Baroque and other classical themes. Most interesting is the lone instrumental, "Tudor Pop," which the flacks accurately describe as an "overdubbed violin in a mock Elizabethan piece that escalates into a jig."

ALREADY A HOUSEHOLD WORD (Rare Earth, R532L) showcases Repairs, a vocal sextet that delves into rock with folk overtones. It's a very pleasant sound when soft or arty, a good one when the stuff gets louder. And wonder of wonders, the voices actually blend and the solo portions fit neatly rather than standing out as an ego trip. Joni Mitchell's "Michael from Mountains" is the only cut not created by a member of the group, which stars Peter McCann's singing plus keyboard and guitar work. AE

(Continued from page 27)

restraint is needed. This is accomplished easily enough by putting a negative voltage, a small minus voltage, on the control grid (Fig. 8). This does not stop the movement of electrons from the cathode to the anode, but it does reduce their number to a controllable amount.

Cause and Effect

The physical closeness of the grid to the cathode makes it a most effective current control element, far superior to the anode working in the same capacity. It is entirely possible for 1 volt on the grid to be as effective as 50 or more volts on the anode. As the control grid is made more negative, current flow is reduced. Conversely, as it is made less negative, current flow to the anode rises. In the example just given, making the control grid more negative by 1 volt would reduce the current to such an extent that it could take an increase (in the positive direction) of 50 anode volts to restore the current to its original quantity. This ratio of anode voltage change to grid voltage change is called the amplification factor of the tube.

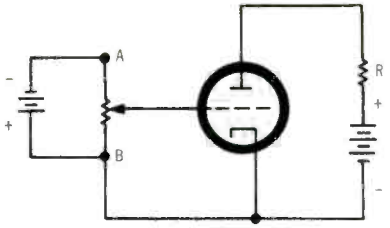


Fig. 8.—As the wiper arm of the variable resistor moves toward point A, the voltage on the control grid is made more negative. Current flow from cathode to anode is reduced. Current flow is increased by moving the wiper arm in the opposite direction.

The Plate Cloud

An a.c. voltage—possibly the signal voltage from a sound source such as record player or tape unit—can be inserted in series between the bias voltage and the cathode of the triode. The effect of this a.c. voltage is that it increases and decreases the bias. At times the signal voltage adds to the bias; at other times it opposes it. As a consequence, the current flowing through the tube, the anode current, varies in step with the signal voltage input. To convert this changing current flow into terms of voltage, it is permitted to flow through a load resistor, as in Fig. 9. The voltage developed across the load will be a reasonably good replica of the signal voltage, but with an exception. It will be much stronger. Note that it is not the original signal voltage, but just a magnified version of it.

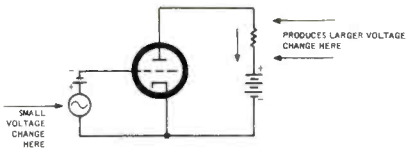


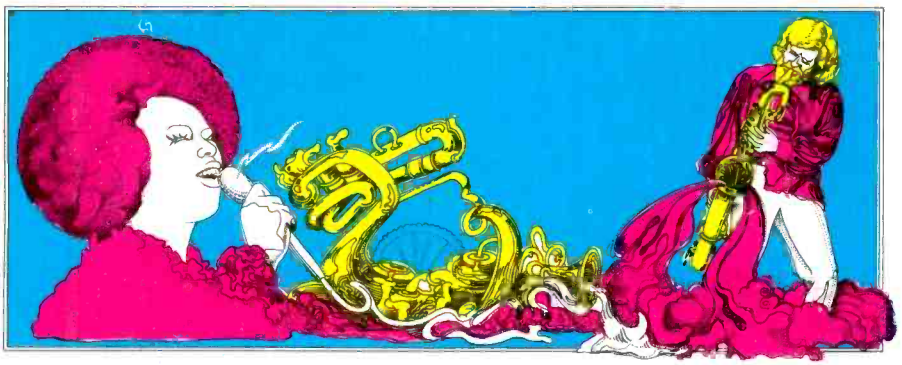
Fig. 9.—The a.c. voltage, in series with the bias battery, compels the current through the tube to keep in step with it. This varying current flows through the load resistor.

This amplified form of the signal can now be led into still another triode for further strengthening. The signal, by the repetitive process of amplification, can be made so strong that the footsteps of a fly walking across a microphone could be made to sound like the roll of distant thunder.

(To Be Continued)

Jazz & Blues

Martha Sanders Gilmore



Sam McGee: ***Grand Dad of the Country Guitar Pickers.***

Musicians: Sam McGee, vocals, guitar, banjo, and banjo-guitar; Clifton McGee, second guitar, and Goldie Stewart, bass.

Songs: *Sam McGee Stomp; Fuller Blues; Burglar Bold; Dew Drop; Jesse James; Ching Chong; Blackberry Blossom; Wheels; How Great Thou Art; When the Wagon Was New; Franklin Blues; Penitentiary Blues; Pig Ankle Rag; Railroad Blues, and Buckdancer's Choice.*

Arhoolie 5012, $5.98.

That Sam McGee began his guitar picking on a farm in Tennessee under the tutelage of Uncle Dave Macon at the age of twelve won't surprise you at all when you hear this record. Country music fans may be familiar with his style and technical ease from his appearances on Grand Ole Opry—at 78 he's the oldest member of the "company" and still charming audiences vocally as well as on guitar, banjo, and banjo-guitar.

Sam McGee has been a tremendous popularizer of the guitar since the early 1900's, bringing it up from rural origins to the more sophisticated complexities of modern times in a successful musical marriage of the two eras. McGee was the first guitarist to broadcast—over WSM—and to record—on Vocalion in 1926.

This pleasant and rustic cross-section of McGee's art contains examples of popular songs, blues, ballads, fiddle tunes, waltzes, hot guitar pieces, humorous songs, a hymm, a rag, and parlor guitar tunes in a generous survey f the guitar genre which would be an excellent study vehicle for the student. But don't get me wrong: it's not didactically dry.

McGee's execution is lucid and deft, his notes clean, well-defined, and separate. Take "Dew Drop" for example, a waltz tune out of the parlor tradition. Here McGee's linear excursions are precisely delineated as he employs staccato and rubato in a period piece that evokes images of ladies wearing wide skirts and perhaps even bustles. Unaccompanied "Franklin Blues" sounds like a Czerny exercise while "Sam McGee's Stomp" has a composed quality in its bright, intricate arrangement that scoots right along without strain. McGee plays five-string banjo on "Jesse James," taken at a canter and the reproduction here is so sensitive that you can hear him squeak to accomplish the changes!

In "Ching Chong," McGee introduces the banjo-guitar which has a more mellow timbre than its brother banjo and perhaps fewer overtones, as though tempered by felts. You can just imagine a square dance in "Blackberry Blossom" which I seem to recall is the name of a train and it does indeed have a choo-choo drone. McGee manages strenuous leaps and projects a minor feeling by playing adjacent notes together as does he also in "Railroad Blues," the most inventive cut of the fifteen. There he employs slide guitar, achieving the great barreling forward motion of a train and "we hear that whistle as we go through Franklin." Now singing, now percussive, it's great picking that rests comfortably on the plump bass line of Goldie Stewart. "Pig Ankle Rag" and "Buckdancer's Choice" also deserve mention. Clifton McGee supplies supplemental guitar throughout but McGee's sidemen are just as it says, strictly off to the side.

McGee's vocals parallel his instrumentals: facile and fluid, not much on dynamics. This music is not exciting in the spontaneous sense but well practiced, cheerful, and thoroughly accomplished. Recorded on equipment loaned by the Newport Folk Foundation, the fidelity is excellent. So rusticate if you will with Sam McGee!

Sound: A Performance: A–

The Olympia Brass Band of New Orleans

Musicians: Harold A. Dejan, leader and alto saxophone; Emanuel Paul, tenor saxophone; Milton Bastiste, trumpet; Kid Sheik Cola, trumpet; Andy "Jug" Anderson, trumpet; Homer Eugene; trombone; Henry Glass, bass drum; Andrew Jefferson, snare drum; William "Coby" Brown, sousaphone, and Paul Crawford, trombone.

Songs: Explanation Of A Funeral Procession; Just A Little While To Stay Here; Dirge; Free As A Bird; Nearer My God To Thee; Pleyel's Hymn; Just A Closer Walk With Thee; Telephone To Glory; Oh, Didn't He Ramble; Weary Blues; Panama; Yes, Sir, That's My Baby, and Willie, The Weeper.

Audiophile AP 108, stereo, $5.95.

One of the last remaining vestiges of the rich folklore of New Orleans lies in its shiny brass bands which offer their musical services for 'most any occasion, be it happy or sad. Music as catharsis somehow has the power to transform and elevate sorrow into joyful acceptance as vividly illustrated in this spirited music of New Orleans played by the Olympia Brass Band.

This band was actually formed in 1960 under the aegis of Harold Dejan who further inspires it with contributions on alto saxophone, particularly in "Yes, Sir, That's My Baby" and "Panama." In the latter, Dejan plays arpeggios in counterpoint to the collective ensemble and adventures high above his 10 musical teammates whose ages range from 30-80.

After an explanation of the funeral procession by Dejan in his soft, pleasing tones—for instance, "dirge" he pronounces "dodge"—they're off and running to the cadence of a snare and bass drum in the hymn "Just A Little While To Stay Here." Dynamics are employed in the best of taste and the sonorities of the brass choir are lovely with lots of Sidney Bechet vibrato. After all, New Orleans was his stomping ground. But one wonders whether vibrato is instantly achieved while marching!

The Dirge portion of the parade contains the familiar "Nearer My God To Thee" with attractive tenor saxophone work by Emanuel Paul in "Pleyel's Hymn." Another well-known hymn, "Just A Closer Walk With Thee," taken at a frisky gait, is punctuated by the ubiquitous sound of the sousaphone which acts as the very pulse of it all.

The music gets jazzier and jazzier until it is flying high with unison passages interspersed by soloing instrumentalists who break away from the fold in the true jazz tradition, playing popular songs to ready the deceased to meet the Master. Needless to say, the group isn't much on sadness and gets increasingly jocular as it marches along while the parade followers raise and lower their brightly colored parasols in rhythm, shuffling, strutting, prancing, and high-stepping.

"Weary Blues" is irrestible with wails and whines disseminated by the brasses who render banana peel slides and donkey brays underlaid by a growling muted trumpet. "Panama" is highly developed, sporting a great drum sequence by Henry Glass which brings it all home.

Unfortunately, the individual soloists do not come through over the ensemble too well and at times, as in "Willie the Weeper," the group sounds slightly out of tune.

If your dealer doesn't stock Audiophile Records and you want to get the spirit, this may be ordered from Audiophile Records, Inc., P.O. Box 66, San Antonio, Texas 78291.

Sound: B+ Performance: A-

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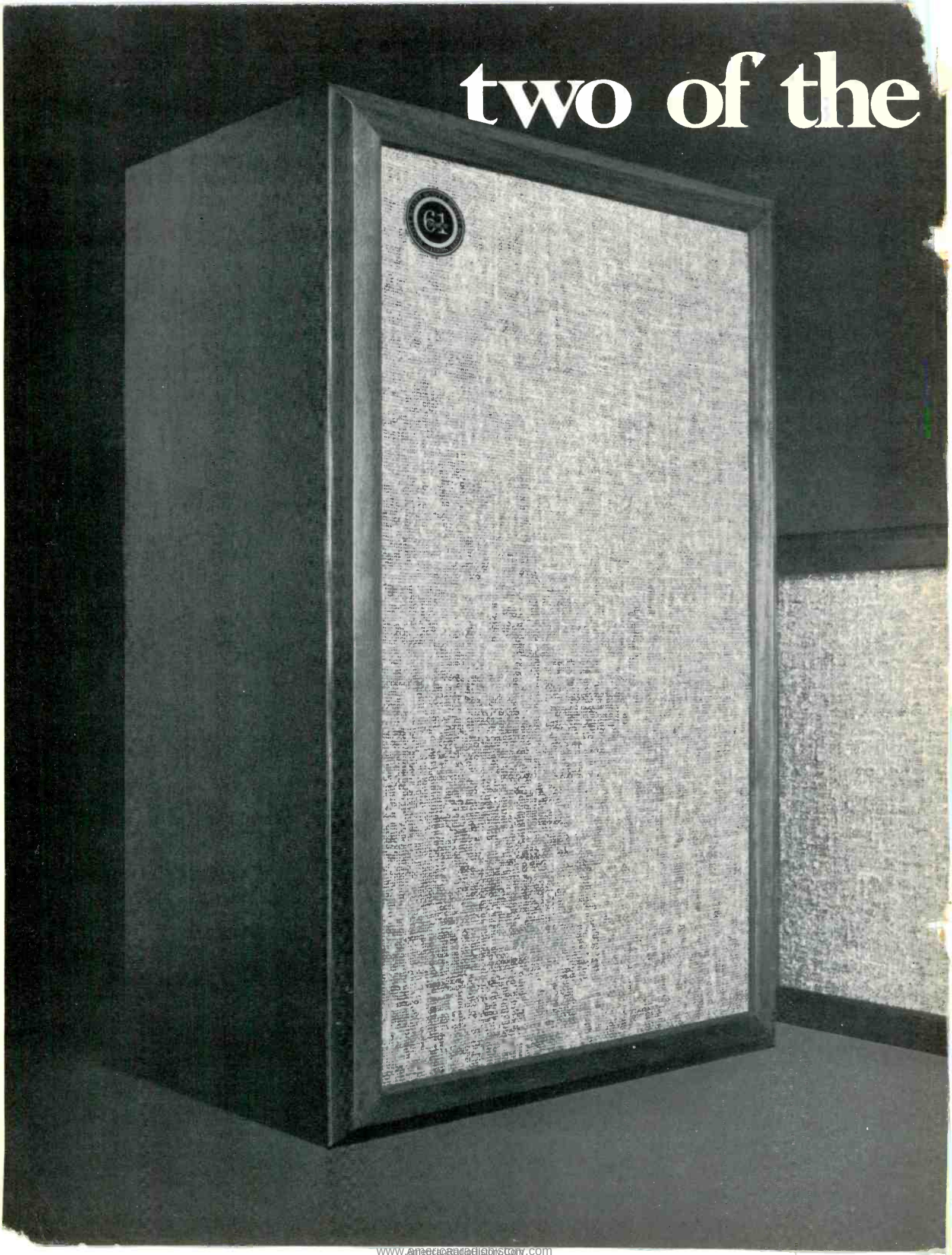

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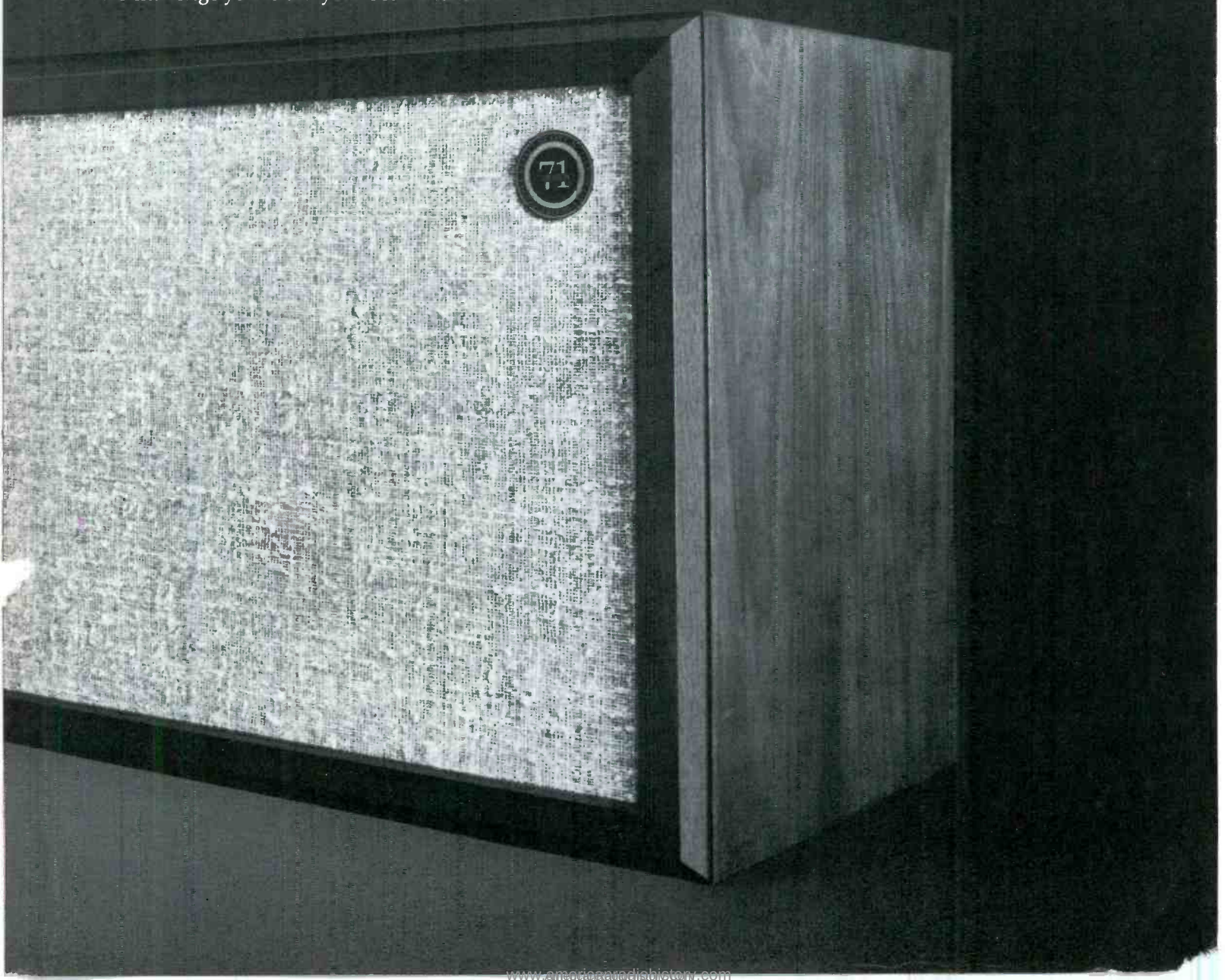

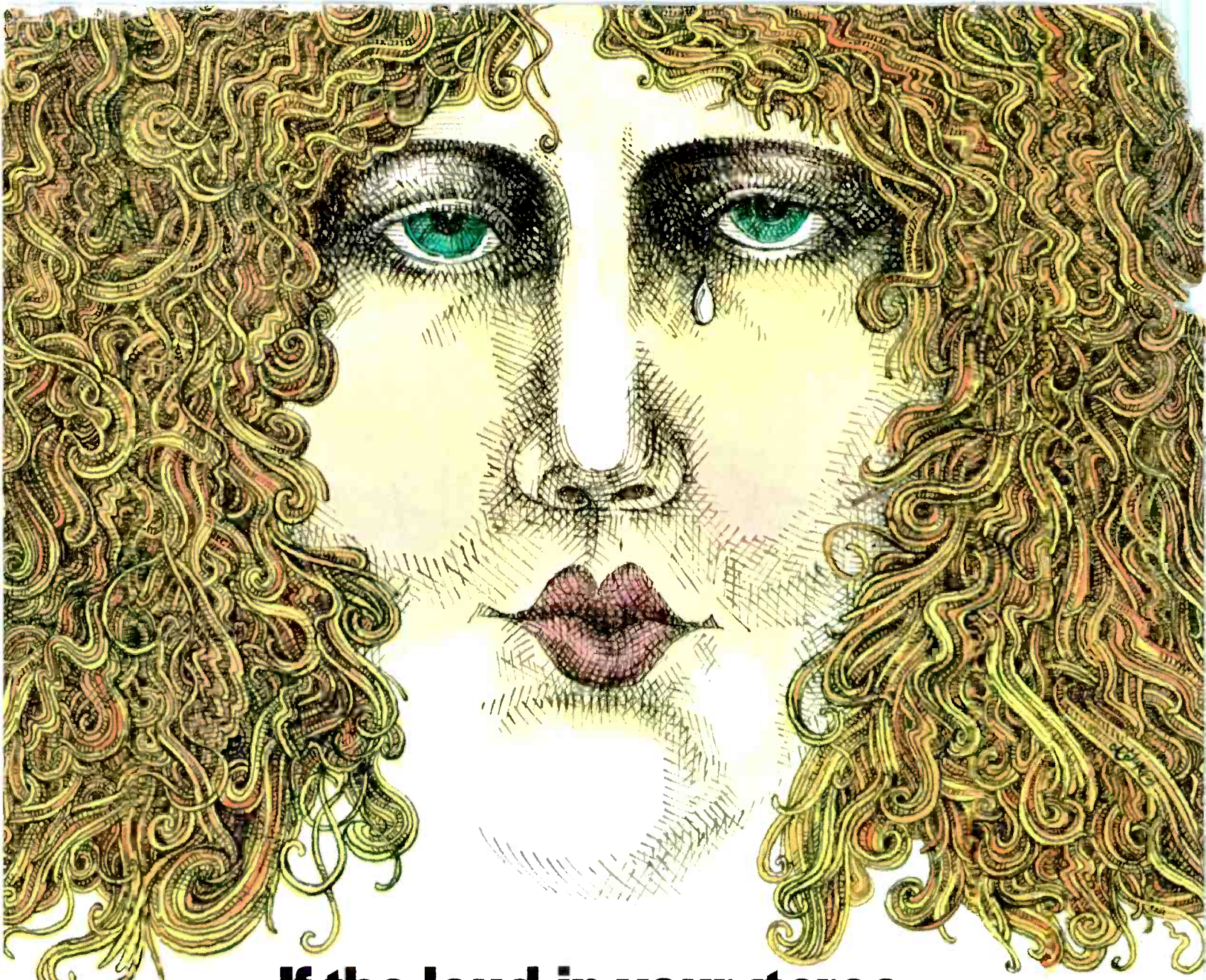

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It's not that she's got super-duper sensitive hearing (like that spotted beagle two doors down), it's because most women hear better than men, so when she screams turn down the sound what she really means is turn down the damn distortion because the distortion is driving her bananas.

Not so with Marantz stereo. Take the Marantz 2270 stereo AM/FM receiver for $549.95. It delivers a walloping 140 watts RMS power at less than 0.3% distortion...which means virtually NO DISTORTION. And because Marantz measures distortion at continuous full power through the whole listening range—it won't bring tears to her eyes or a pain to her head. NO MATTER HOW LOUD. Other companies measure power and distortion only in middle listening range. So they quote their highest power and lowest distortion only in the middle. But on the low and high sides their power is down and their distortion is up. So if you pay for 140 watts be sure you get 140 watts at both ends and in the middle.

With Marantz you get exactly what you pay for. If all you need is 30 watts, take our model 2215 for $249.95. Want twice as much power? Our model 2230 gives you 60 watts RMS for $349.95. And our model 2245 at $449.95 delivers 90 watts RMS. ALL FULL RANGE CONTINUOUS POWER.

No matter which model you choose, remember this. You're getting Marantz quality. The same quality that goes into the magnificent Model 19 FM stereo receiver (shown) that costs $1200. YES. That's right, a cool $1200! But it is the absolute, ultimate, very best there is.

Visit your Marantz dealer. And take your wife along. (Or that spotted beagle two doors down.)

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We sound better.

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