How To Build an Equalizer

ANNUAL STEREO DIRECTORY

AUDIO'S 1973 STEREO PREVIEW DIRECTORY
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 more...

SX-727 AM-FM STEREO RECEIVER — 185 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."
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.

<table>
<thead>
<tr>
<th>Model</th>
<th>IHF Music Power</th>
<th>RMS @ 8 ohms Both channels driven @ 1KHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>SX-828</td>
<td>270 watts</td>
<td>60+60 watts</td>
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<tr>
<td>SX-727</td>
<td>185 watts</td>
<td>40+40 watts</td>
</tr>
<tr>
<td>SX-626</td>
<td>110 watts</td>
<td>27+27 watts</td>
</tr>
<tr>
<td>SX-525</td>
<td>72 watts</td>
<td>17+17 watts</td>
</tr>
</tbody>
</table>

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.

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

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.

<table>
<thead>
<tr>
<th></th>
<th>SX-828</th>
<th>SX-727</th>
<th>SX-626</th>
<th>SX-525</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Response</td>
<td>+75dB</td>
<td>+70dB</td>
<td>+70dB</td>
<td>+45dB</td>
</tr>
<tr>
<td>Capture Ratio</td>
<td>1.5dB</td>
<td>2.0dB</td>
<td>2.5dB</td>
<td>3.0dB</td>
</tr>
</tbody>
</table>

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.

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

Pioneer
when you want something better
SEPTEMBER 1972

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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. 112, Westbury, N.Y. 11590.

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The only automatic turntable with Zero Tracking Error.
Mfg. by Plessey Ltd. Dist. by British Industries Company
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, rotatable 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 check-up, especially if it is still within the warranty period.

If your antenna is rotatable, 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 voltage 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 those 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 63,000 Hz.

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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.

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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 likely 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 “howling” 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-emblished 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.
We’re giving away 100 pairs of Fairfax Speakers if you’re willing to listen

It pays to listen
One Hundred Lucky Winners will receive this pair of FAIRFAX FX-100A Speakers
List Price $159.90 per pair.

If you’re willing to listen we know we can convince you that dollar for dollar, model for model, you get more high-fidelity performance with Supersound by Fairfax.

In fact, we’re giving away about $16,000 worth of speakers to audio enthusiasts who visit their Fairfax Dealer for a Sound Comparison. Listen to any Fairfax System from our compact, inexpensive bookshelf model to our incredible 12 speaker (4-way system) Wall of Sound. Ask your dealer to match them against competitive speakers. Then fill out a Fairfax Entry Card. You can be one of the 100 lucky winners of a pair of supersounding Fairfax FX-100A Speakers.

These 5-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.
Behind The Scenes

Bert Whyte

In 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 participatory 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 - possibly 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 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 licensees 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 quadrophonic 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 following "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 Wilson.
The Magnificent Seven

We've been hearing unsolicited rave reviews from soundmen across the country concerning our seven ingeniously versatile problem-solving audio control components (1) M68 Microphone Mixer, vanguard of the low-cost, high-performance portable mixers; (2) M68-RM Mixer, with built-in reverb for vocalists and special effects; (3) M67 Mixer, the trail-blazing low-cost professional mixer; (4) M63 Audio Control Center, that gives you variable response shaping; (5) M62V Level-Loc, the audio level controller that automatically limits output level; (6) M688 Stereo Mixer, made to order for stereo recording and audio-visual work; and finally, (7) M675 Broadcast Production Master, that teams up with our M67 to give a complete broadcast production console (with cuing) for under $325. Write for the new Shure Circuitry catalog that shows them all:

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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 stimulate 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 Aubert, 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

---

They sound better.

The TDC line of loudspeakers was designed to provide good sound at reasonable prices. The Transducer Development Company believes that specifications fall short of determining how good a speaker sounds, and TDC believes that sound is what counts. However, one specification that most people are concerned with is price. So TDC set out to design speakers that above all sound good and are moderately priced. Listening audiences were equipped with electronic equalizers and asked to modify the original designs to make them sound better. When a consensus was reached, the desired equalization was built into the speaker by mechanical and electrical design changes. By repeating this process, significantly improved speakers were obtained - at reasonable prices. And by improved, TDC means they sound better.

To prove our point, we ask only that you listen to TDC speakers in A vs. B listening tests with comparably priced speaker systems. All TDC speakers are covered by a 5-year parts and labor warranty and exchange at the dealer of units found defective within 90 days of purchase.

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<tr>
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<th>Model IVA</th>
<th>Model VIA</th>
</tr>
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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 stricures and limitations of present day pop recording practices. 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 matrices 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 "looser" 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 quadrophonics 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. Tillet

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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 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 mélange 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 refurbish 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 7 1/2 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 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 Ruhi 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 Poree 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 Caballeros—who were in pretty good form, no doubt fortified by generous helping of tequila. 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.
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 ($47.50t). Next, the very popular Seventeen ($74.95t). Up front, the classic Six ($134.00t). And finally, the spectacular Five ($189.95t). 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.

For more information, visit your KLH dealer or write to KLH Research and Development, 30 Cross St., Cambridge, Mass. 02139.
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 recognized throughout the world as being absolutely 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 Ad- vent, 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 quadruphonic 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.

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...
The 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 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 asymmetrical. 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 milliampere 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. 3—Circuit diagram of supplementary filter.

Fig. 5—High- and low-pass filter.
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 circuited 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.
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.

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In the past, Thorens turntables were exclusively sought by those select few who demanded the ultimate and had the unlimited purse to indulge their tastes. Many others with similar discerning preferences, but with more moderate means, were obliged to compromise their critical standards.

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*High Fidelity Magazine*

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"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."

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."  

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

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

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www.americasradiatorhistory.com
INCE 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.

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.

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
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.

For complete information and specifications on Stanton cartridges, write Stanton Magnetics, Inc., Terminal Drive, Plainview, L.I., N.Y. 11803.

All Stanton cartridges are designed for use with all two and four-channel matrix derived compatible systems.
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.

![Diagram of filament and cathode](image)

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 anode circuit consisting of the cathode, anode and the anode voltage source, and the filament and its voltage source.

NEW from CROWN
AURALINEAR SPEAKERS

As a serious audiophile, you no doubt recognize that the weakest link in the sound reproduction system has long been the speaker. You would not tolerate an amplifier with 4.5% distortion or with response as poor as +4 dB or with a bandwidth of only 100-10,000 Hz. And yet, only a very few loudspeaker enthusiasts have any idea what a good loudspeaker sounds like. The experience of the Crown speaker design has been working for years to develop such a speaker design. But they felt that they would rather sell none at all than to ruin their reputation with a mediocre product that was "just another speaker".

At last, recent breakthroughs in electrostatic speaker design have made possible genuine accurate sound reproduction. Now Crown can offer you a line of four Auralinear Speaker Systems, which unite unique wideband electrostatic radiators with special long-throw woofers, each model worthy of the Crown name in every respect. They are the first and only speakers that radiate absolutely flat honest sound, as documented by numerous measurements detailed in Crown technical literature

What Makes Crown Speakers Unique?
1. Radically new wideband electrostatic radiators have thinner membranes for greater efficiency and greater acoustic output. Special long-throw low distortion acoustic suspension woofers exhibit absolutely flat response over the entire range. This means comfortable distortion-free listening at full realistic sound levels, even at low frequencies. Reliable electrostatic elements need no pampering.
2. Models ES-224 and ES-212 have bidirectional radiators emanating sound through front, back and sides of upper enclosure.
3. Multi-element arrays are set at precise angles to form a powerful "acoustic lens.
4. All speakers are two-way with seamless electrostatic response.

CROWN
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Check No. 28 on Reader Service Card
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.

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 mélange, 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).

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 hurt 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.

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 circuits, 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 some electron...
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  
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Compton, Calif. 90220

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

Astrocom  
Onouonta, 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

B&B McDonald  
Route 303  
Blauvelt, N.Y. 10913

B&W (see Linear Devices)  

Benjamin Electronic Sound  
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Farmingdale, N.Y. 11735

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

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

Braun/ADS  
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Huntsville, Ala. 35801

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South Service Road  
Westbury, N.Y. 11590

CCA Electronics  
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Gloucester City, N.J. 08030

Concord (See Benjamin)  

Crisman Speaker Co.  
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Boulder, Colo. 80302

Crown International  
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Elkhart, Ind. 46514

DWD  
3209 N. Marks  
Fresno, Calif. 93705

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

Delta-RET  
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Houston, Texas 77018

Design Acoustics  
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Palos Verdes, Calif. 90274

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Culver City, Calif. 90230

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1 Charles St.  
Newburyport, Mass. 01950

ESS, Inc.  
4503 Railroad  
Sacramento, Calif. 95826

Electromusic  
Bin 30, Arroyo Annex  
Pasadena, Calif. 91109

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

Elite Electronics  
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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

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

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

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

Ferrograph (See Elpa)  

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Long Island City, N.Y. 11101

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Dallas, Texas 75234

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Grado Laboratories, Inc.  
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Plainview, N.Y. 11803

Harmony House  
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New York, N.Y. 10021

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Heath Co.  
Hill Top Road  
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Hegeman Labs  
176 Linden Ave.  
Glen Ridge, N.J. 07028

Hi-Fi Laboratories  
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City, N.Y. 11101

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

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Amplifiers—Basic & Integrated

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<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>Type of 1-watt, W</th>
<th>Type of 1-watt, %</th>
<th>RF input, mV</th>
<th>Power supply voltage, V</th>
<th>Power output (2 ohms), W</th>
<th>Power output (4 ohms), W</th>
<th>No. of channels</th>
<th>Frequency response, Hz</th>
<th>Type of biasing</th>
<th>Weights, lb</th>
<th>Price</th>
<th>SPECIAL FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACOUTIC RESEARCH</td>
<td>AR</td>
<td>50</td>
<td>0.5</td>
<td>0.15</td>
<td>0.25</td>
<td>0.1</td>
<td>14.44</td>
<td>20-20kHz</td>
<td>100</td>
<td>0.2</td>
<td>8</td>
<td>40</td>
<td>15 khz x 10</td>
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<tr>
<td>VAIKA</td>
<td>AA-6100</td>
<td>12½</td>
<td>1.2</td>
<td>20-20kHz</td>
<td>3</td>
<td>70</td>
<td>3</td>
<td>150</td>
<td>0.15</td>
<td>8</td>
<td>160 x 9½</td>
<td>19</td>
<td>189.95 Discrete</td>
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<td>AUDIO RESEARCH</td>
<td>M60C (1/B)</td>
<td>50</td>
<td>0.5</td>
<td>0.1</td>
<td>0.25</td>
<td>15-30kHz</td>
<td>5-20kHz</td>
<td>4,8</td>
<td>10</td>
<td>9 x 8</td>
<td>6</td>
<td>54</td>
<td>695.00 Mono</td>
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<td>D51 (1/B)</td>
<td>50</td>
<td>0.5</td>
<td>0.1</td>
<td>0.25</td>
<td>15-30kHz</td>
<td>5-20kHz</td>
<td>4,8</td>
<td>15</td>
<td>19 x 12</td>
<td>3</td>
<td>59</td>
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<td>D75 (1/B)</td>
<td>75</td>
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<td>5-20kHz</td>
<td>4,8</td>
<td>16</td>
<td>15</td>
<td>19 x 12</td>
<td>3</td>
<td>65</td>
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<tr>
<td>BGM SYSTEMS</td>
<td>(B) 1000</td>
<td>225</td>
<td>0.5</td>
<td>0.1</td>
<td>1.5</td>
<td>0.1</td>
<td>5-20kHz</td>
<td>110</td>
<td>1.25</td>
<td>4,8</td>
<td>500</td>
<td>600</td>
<td>1200.00 SCR crow bar; no fuses; adj. power limiting; FET op amp, forced air cooling As above, but 4-channel.</td>
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<tr>
<td></td>
<td>(B) 1/20 4 channel</td>
<td>250</td>
<td>0.5</td>
<td>0.1</td>
<td>1.5</td>
<td>0.1</td>
<td>5-20kHz</td>
<td>110</td>
<td>1.25</td>
<td>4,8</td>
<td>500</td>
<td>600</td>
<td>1450.00 SCR crow bar; no fuses; adj. power limiting, FET op amp.</td>
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<tr>
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<td>(B) 1/25 4-channel</td>
<td>125</td>
<td>0.5</td>
<td>0.1</td>
<td>1.5</td>
<td>0.1</td>
<td>5-20kHz</td>
<td>110</td>
<td>1.25</td>
<td>4,8</td>
<td>500</td>
<td>600</td>
<td>950.00 SCR crow bar; no fuses; adj. power limiting, IC op放大器.</td>
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<td>(B) 500 4-channel</td>
<td>125</td>
<td>0.5</td>
<td>0.1</td>
<td>1.5</td>
<td>0.1</td>
<td>5-20kHz</td>
<td>110</td>
<td>1.25</td>
<td>4,8</td>
<td>500</td>
<td>600</td>
<td>500.00 SCR crow bar; no fuses; adj. power limiting, IC op amplifier.</td>
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<tr>
<td>CROWN</td>
<td>D-300 (B)</td>
<td>150</td>
<td>0.5</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>200</td>
<td>19 x 9½</td>
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<tr>
<td></td>
<td>D-150 (B)</td>
<td>75</td>
<td>0.5</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>229.95 Front panel phone jack. ** = 1 dB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D-60 (B)</td>
<td>30</td>
<td>0.5</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>299.95 Front panel phone jack. ** = 1 dB</td>
<td></td>
</tr>
<tr>
<td>DYNACO</td>
<td>Stereo 400 (B)</td>
<td>200</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>200</td>
<td>17 x 8½</td>
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<tr>
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<td>SCA 800 (B)</td>
<td>40</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>299.95 Regulated power supply</td>
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<tr>
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<td>Stereo 1200 (B)</td>
<td>60</td>
<td>0.5</td>
<td>0.1</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>500</td>
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<tr>
<td>ESS</td>
<td>500 (B)</td>
<td>250</td>
<td>0.3</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>45</td>
<td>199.95 Add-on amp with E-V Stereo-4 decoder for rear channels.</td>
</tr>
<tr>
<td>ELECTRO VOICE</td>
<td>124X4 4 channel</td>
<td>18</td>
<td>1.0</td>
<td>20-20kHz</td>
<td>20-30kHz</td>
<td>30</td>
<td>30</td>
<td>150</td>
<td>40</td>
<td>10</td>
<td>16</td>
<td>299.95 W 4-channel player, matrix decoder.</td>
<td></td>
</tr>
<tr>
<td>FISHER</td>
<td>TX-2000</td>
<td>50</td>
<td>0.5</td>
<td>0.2</td>
<td>0.8</td>
<td>0.2</td>
<td>22 kHz</td>
<td>20 kHz</td>
<td>10</td>
<td>15 x 12 kHz</td>
<td>24</td>
<td>394.95 W 4-channel player, matrix decoder.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TX-220 4-channel</td>
<td>15</td>
<td>0.5</td>
<td>0.2</td>
<td>0.8</td>
<td>0.3</td>
<td>30 kHz</td>
<td>20 kHz</td>
<td>40</td>
<td>10</td>
<td>16 x 11½ kHz 14%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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All in the family.

In the space of a few short years, the critically acclaimed Revox A77 has established itself as the tape recorder of choice for the knowledgeable enthusiast.

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But simply quoting a list of specifications, however fine, doesn’t begin to describe the capabilities of this remarkable instrument.

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Together or separately these remarkable components are a fitting addition to the Revox family and provide further proof of what we’ve said all along… Revox delivers what all the rest only promise.

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## Amplifiers—Basic & Integrated

| MANUFACTURER | MODEL | 4-chan. | 4-cha. | 6-cha. | 12-cha. | 4-chan | 4-cha. | 6-cha. | 12-cha. | SPEAKER | TUNER | PHONO | AUX | POWER | OUTPUT | OUTPUT | OUTPUT | OUTPUT | OUTPUT | OUTPUT | OUTPUT | OUTPUT | OUTPUT | OUTPUT | OUTPUT | OUTPUT |
|--------------|-------|--------|--------|--------|---------|--------|--------|--------|---------|---------|-------|-------|-----|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| HARMAN-       | Citation 12 | 60     | 0.05   | 0.01   | 0.08   | 0.01   | 8.4k   | 1.01k  | 1.25k   | 105     | 30    | 79.00 |     | Term. & mech. breakers. |
| KARDON       |        |        |        |        |         |        |        |        |          |         |      |       |     |       |        |        |        |        |        |        |        |        |        |        |
| Heathkit     | AA-15  | 50     | 0.5    | 0.2    | 0.5    | 0.2    | 6.3k   | 8.4k   | 1.8k    | 60      | 45    | 189.95 |     | 4 Chan. with built-in matrix decode. |
|              | AA-29  | 35     | 0.25   | 0.1    | 0.2    | 0.1    | 5.3k   | 7.6k   | 1.8k    | 65      | 50    | 159.95 |     |       |        |        |        |        |        |        |        |        |        |        |        |
|              | AA-2004 | 35    | 0.25   | 0.1    | 0.2    | 0.1    | 5.4k   | 7.5k   | 1.8k    | 65      | 100   | 379.95 |     |       |        |        |        |        |        |        |        |        |        |        |        |
|              | KA-1214| 15     | 0.5    | 0.25   | 0.5    | 0.2    | 5.3k   | 7.1k   | 1.8k    | 60      | 50    | 89.95  |     | With Cabinet |
| Hitachi      | IA-1200| 60     | 0.1    |        |        |        | 20-50k | 100    | 5.0     | 1.5     | 40    | 695.00 |     | Four main amps. |
|              | IA-1000| 55     | 0.1    |        |        |        | 20-50k | 100    | 5.0     | 1.5     | 50    | 359.95 |     | Two VU mtrs., radiation finn. |
|              | VA-600 | 32     | 0.1    |        |        |        | 20-20k | 68      | 2.5     | 0.25    | 50    | 249.95 |     | Radiation finn. |
| Integral     | B-1010 | 500    | 0.1    | 0.05   | 0.1    | 0.05   | 8.6k   | 100    | 5.0     | 1.5     | 150   | 1000.00|     | 2 or 4 indep. chan.; detect level display |
| Systems      |        |        |        |        |         |        |        |        |          |        |      |       |     |       |        |        |        |        |        |        |        |        |        |        |
| JVC          | AVN-70 | 16     | 0.5    | 0.2    | 0.8    | 0.3    | 10.3k  | 18.4k  | 1.4k    | 65      | 50    | 289.95 |     | 4-chan. integ. amp.; 1 VU mtrs. |
|              | AVN-900| 58     | 0.5    | 0.1    | 0.8    | 0.2    | 10.3k  | 18.4k  | 1.4k    | 65      | 50    | 289.95 |     | 4-chan. integ. amp.; 4 VU mtrs.; Dual SEA tone controls. |
|              | VN-700 | 40     | 0.25   | 0.05   | 0.4    | 0.1    | 25-20k | 20.5k  | 1.4k    | 65      | 22    | 289.95 |     | SEA tone control. |
|              | VN-900 | 60     | 0.25   | 0.05   | 0.4    | 0.1    | 20-20k | 20.5k  | 1.4k    | 65      | 28    | 349.95 |     | SEA tone control; pink noise tester. |
|              | (B) VB 10 | 60     | 0.07   | 0.05   | 0.1    | 0.05   | 10.7k  | 10.1k  | 1.4k    | 65      | 36    | 599.95 |     | Two VU mtrs. |
|              | (B) VB 100 | 50 | 0.07   | 0.05   | 0.1    | 0.05   | 18.4k  | 18.4k  | 1.4k    | 65      | 16   | 239.95 |     | Two VU mtrs.; var. damping. |
| Kenwood      | KA-7002 | 50     | 0.5    | 0.3    | 0.3    | 0.3    | 20-30k | 20-30k | 1.0     | 65      | 10    | 319.95 |     | Direct coupling; 2 each tape, phone, tuner, aux; 3 speaker sys. |
|              | KA-6004 | 40     | 0.5    | 0.05   | 0.3    | 0.05   | 10.5k  | 20.4k  | 1.0     | 68      | 32    | 279.95 |     | Direct coupled; pot. cir.; 2 each tape, phone, aux; A-B speaker sys. |
|              | KA-8004 | 18     | 0.5    | 0.05   | 0.5    | 0.08   | 10.5k  | 20.4k  | 1.0     | 65      | 32    | 189.95 |     | As above. |
|              | KA-2002 | 17     | 0.5    | 0.05   | 0.5    | 0.08   | 10.5k  | 20.4k  | 1.0     | 60      | 13    | 119.95 |     | 2 each phone, aux. tuner. |
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Amplifiers—Basic & Integrated

**Marantz 4060**

**Panasonic SU-3404**

**Phase Linear 700**

---

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<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>MIN. POWER (W RMS)</th>
<th>MAX. POWER (W RMS)</th>
<th>POWER OUTPUT (W RMS)</th>
<th>FREQUENCY RESPONSE (Hz)</th>
<th>NOISE LEVEL (dB)</th>
<th>PRICE</th>
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<tbody>
<tr>
<td><strong>LAFAYETTE</strong></td>
<td>LA-64 4-chan.</td>
<td>23</td>
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<td>0.07</td>
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<td>LA-222 4-chan.</td>
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<td>LA-150 4-chan.</td>
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<td><strong>MARANTZ</strong></td>
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<td>3-60k</td>
<td>2-10k</td>
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<td>5-45k</td>
<td>20-25k</td>
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<td>0.3</td>
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<td>13-50k</td>
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<td><strong>RIKOD</strong></td>
<td>KM-2000</td>
<td>45</td>
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<td>0.3</td>
<td>15-10</td>
<td>13-50k</td>
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<td><strong>OLSON</strong></td>
<td>AM-375 4-chan.</td>
<td>40</td>
<td>0.5</td>
<td>0.3</td>
<td>20-40</td>
<td>65</td>
<td>10</td>
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<tr>
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<td>AM-395 4-chan.</td>
<td>12</td>
<td>0.75</td>
<td>0.4</td>
<td>20-28</td>
<td>58</td>
<td>20</td>
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<td>AM-372 4-chan.</td>
<td>8</td>
<td>1.75</td>
<td>1.5</td>
<td>20-22</td>
<td>30</td>
<td>20</td>
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<td><strong>PANASONIC</strong></td>
<td>SU-3040 4-chan.</td>
<td>50</td>
<td>0.2</td>
<td>0.2</td>
<td>5-50k</td>
<td>73</td>
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<td>5-50k</td>
<td>73</td>
<td>10</td>
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<td><strong>PHASE LINEAR</strong></td>
<td>(B) 700 4-chan.</td>
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<td>0.1</td>
<td>0.4</td>
<td>65</td>
<td>10</td>
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<td>(B) 400 4-chan.</td>
<td>200</td>
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<td>0.1</td>
<td>0.4</td>
<td>65</td>
<td>10</td>
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<td><strong>PILOT</strong></td>
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<td>30</td>
<td>0.5</td>
<td>0.5</td>
<td>15-30k</td>
<td>65</td>
<td>10</td>
</tr>
</tbody>
</table>

SPECIAL FEATURES

- SQ, matrix decoder: max/min remote speaker swap.
- Split, remote speaker; swit. level controls.
- SQ, matrix decoder: can be operated as 2-2, 4-4, or 4-4.
- SQ decoder.
- Opt. 70-V line xmr. Model LT70; blk. assd. front panel.
- Synthesizes a 4-ch. sound from any stereo source.
- 2/4 channel, 60W; 2 SQ adaptable with plug-in module.
- Relay operated preset devices.
- 2/4 channel; 2 mic jacks; 2 speaker selector; tone control; time delay mute.
- Distortion indicators.
- Matrix decoder: direct coupling.
- Discrete, 2 matrix, preset.
- 2 mtrs.; turn on time delay.
- 2 mtrs.: turn on time delay.
- Discrete, SQ matrix; 60W stereo; 4 mtrs.; mic-mic; bal. signal.

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Audio • Our 25th Year • September 1972
## Amplifiers—Basic & Integrated

### Pioneer SA-1000
![Pioneer SA-1000]

### Revox A78
![Revox A78]

### Scott 499
![Scott 499]

### Sansui AU999
![Sansui AU999]

### Sherwood S9400
![Sherwood S9400]

### Table: Amplifiers Specifications

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>Max. Power Input, W &amp; B</th>
<th>Thru Volts at Rated Input, V</th>
<th>Power Bandwidth, Hz</th>
<th>THD At 1-Watt RMS</th>
<th>Main Amplifier</th>
<th>Phono Input</th>
<th>Phono Hi-Tension, Nm</th>
<th>Sold to 10,000-20,000</th>
<th>Sold to 20,000-40,000</th>
<th>Sold to 40,000-60,000</th>
<th>Made in</th>
<th>Weight, Lbs.</th>
<th>Price</th>
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<td>1.5</td>
<td>49</td>
<td>17 x 4</td>
<td>5%</td>
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<td>0.1</td>
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<td>3.1kHz</td>
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<td>17 x 4</td>
<td>5%</td>
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<td>0.1</td>
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<td>100</td>
<td>40</td>
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<td>49</td>
<td>17 x 4</td>
<td>5%</td>
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### Special Features

- Direct coupled, prof. circ., step tone contls., 2 monitors, cabinet.
- 4-ch. built-in decoder.
- 4-ch., built-in decoder.
- Mag. phono & 2 tape inputs.
- Mag. & cer. phono inputs.
- Step tone contls., sep. adj. inputs.
- Slde contls., mute, 2 spkr. sys., loudness swit.
- 2-spkr. sys. mag. & cer. phono inputs, loudness swit.
- Mag. & cer. phono inputs, phone jack.
## Amplifiers—Basic & Integrated

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<th></th>
<th></th>
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<td>0.4</td>
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<td>5.10/0k</td>
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<td>0.2, 4.8, 16</td>
<td>8.5/11/4</td>
<td>18/20/4</td>
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<td>Sep adj. inputs, mute, 3 tone contls. with turn-over select, bal. check. Add-on amp w. decoder.</td>
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<td>0.1, 8</td>
<td>5.1/11/3</td>
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<td>16/16/4</td>
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<td>65</td>
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<td>0.2, 4.8, 16</td>
<td>16/11/4</td>
<td>16/16/4</td>
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<td>11/15/4</td>
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AUDIO • OUR 25th YEAR • SEPTEMBER 1972
### Pre-amplifiers

- **Audio Research SP-3**
- **Crown IC 150**
- **Marantz 3300**
- **JVC VP-10**
- **SAE Mk 1**

#### Table: Pre-amplifiers Specifications

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<th>MODEL</th>
<th>Frequency response</th>
<th>Bandwidth, V</th>
<th>Tip or shield input</th>
<th>Gain, 6-K output, S</th>
<th>Phono sensitivity, mV</th>
<th>Tape input, mV</th>
<th>Tonband, 1, 13, 15</th>
<th>Weight, lb</th>
<th>Price</th>
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<td>400</td>
<td>0.1</td>
<td>10k</td>
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<td>BGM Systems</td>
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**SPECIAL FEATURES**

- 2 tape mon., inputs, & outputs.
- 4-channel.
- Front panel input & output; 3-pos. hi filter.
- 3-pos. blend swit.
- 2 tape con.; equalizer; spkr./phones swit.
- Step tone controls; muting sw.; phone jack.
- Stepped conuts; tape copy; equalizers.
- Remote controls; graphic conuts.
- Toroid filters; tape copy; equalizers.
- Mid-range conuts; graphic conuts.
- Stepped conuts; tape copy; equalizers.
- 2 Mtrs.; simil. rec. on 2 tape rec.
PROFESSIONAL STUDIO EQUIPMENT

RECORDERS & REPRODUCERS

SX711 Claimed by its pro audio owners to be the finest professional tape recorder value on the market today - price versus performance.
- Frequency response at 7 1/2 ips ±2dB 20Hz-20kHz, at 3 1/2 ips ±2dB 20Hz-10kHz. Wow & flutter at 7 1/2 ips 0.09%, at 3 1/2 ips 0.18%. S/N at 7 1/2 ips-60dB, at 3 1/2 ips-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. $1790 for full-track mono deck as shown, $295 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. $895 for full-track mono deck as shown, $995 for half-track stereo deck.

STUDIO MONITOR AMPLIFIERS

D60 Delivers 30 watts RMS per channel at 8Ω. Takes only 1/2" rack space, weighs 81/2 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 1/4" rack space, weighs 20 lbs. $429 rack mount.

CX822 Crown tape recorders and reproducers are available in 42 models with almost any head configuration, including 4 channels in line. Patented electro-magnetic brakes maintain ultra-light tape tension and never need adjusting. They are made by American craftsmen to professional quality standards, with industrial-grade construction for years of heavy use.

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

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

DC300 Delivers 150 watts RMS per channel at 8Ω. IM distortion less than 0.05% from 0.01w to 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

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>Freq. Sensitivity</th>
<th>Tuning Indicators</th>
<th>FM i.f. Sensitivity</th>
<th>AM i.f. Sensitivity</th>
<th>Tuning Range</th>
<th>AM Tuner</th>
<th>W/B</th>
<th>D/B</th>
<th>Price</th>
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### Heath AJ-1510

- SPECIAL FEATURES
- Built-in oscilloscope, Gyro touch tuning
- Gyro touch tuning, FET IC
- Dual gate FET, external; filters, plug-in modules, circuit boards
- FETs, noise filter, mute
- 4-pole MOS FET, xtal filters, ICs, 5 FM MPX adapter

---

**Manufacturer**

- Dynaco
- Harman/Kardon
- Heath
- Hitachi
- JVC
- Kenwood
- Lafayette
- Magnavox
- Marantz
- Matsui
- Nikko
- Olson
- Panasonic

**Model Numbers**

- AF-6
- FM-5
- Citation 34
- AI-1510
- VT-910
- VT-700
- KT-7001
- KT-4005
- KT-2001
- RP7310
- LT-725A
- SM-26
- SM-19
- SM-16
- SM-14
- 120
- 105
- 113
- FAM 14
- FAM 12
- RA-235
- RA-310
- ST-3600
- SR-3400

**Features**

- Tuning Indicators
- FM i.f. Sensitivity
- AM i.f. Sensitivity
- Tuning Range
- AM Tuner
- W/B
- D/B
- Price

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**Audio - Our 25th Year - September 1972**

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[www.americanradiohistory.com]
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*

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.

Heathkit Company, Dept. 41-9 Benton Harbor, Michigan 49022

Please send FREE Heathkit Catalog.

Enclosed is $ , plus shipping.

Please send model(s). 

Name: ____________________________

Address: ____________________________

City ... State ... Zip

Prices & specifications subject to change without notice.

Mail order prices, F.O.B. factory. HR-264

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.

Check No. 41 on Reader Service Card

www.americanradiohistory.com
## Tuners

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Tuning Method</th>
<th>Intermediate</th>
<th>Tuning Selector</th>
<th>FET</th>
<th>Multiplier</th>
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<td><strong>TEAC AT-100</strong></td>
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<td>Digital readout; 3-in scope; 14 pole filter; 4-pole filter; FET front-end auto station selection.</td>
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<td>60</td>
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<td>AT100</td>
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<tr>
<td><strong>TOSHIBA</strong></td>
<td>ST500</td>
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<td>50</td>
<td>20 0.25</td>
<td>0.3</td>
<td>1.0</td>
<td>Yes</td>
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</table>

**Special Features:**
- Digital readout: quartz crystal freq. synch.; manual or auto station selection.
- Wall case; scope outs; 4-chan FM outs.
- Digital readout: scope outs; tape mon. & dubbing; headphones amp. & out.
- Multipath and audio outputs.
- Multipath output.
- Multipath output.
- Front panel tape input.
- Phase lock loop; pushbutton & remote select; vert cap tuning.
- FET front-end, wood case.
- Muting level cont.; muting swit.
- Muting swit.
- Muting swit.
- Muting swit.
- Muting swit.
- Muting swit.

All numbers solid-state except when model number is preceded by (T). 'K' indicates kit price, 'W' wired.
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**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>AM Range (kHz)</th>
<th>FM Range (kHz)</th>
<th>AM Sensitivity (µV/m)</th>
<th>FM Sensitivity (dB)</th>
<th>AF Output (mV)</th>
<th>Audio Power Out (W)</th>
<th>Special Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACOUSTIC RESEARCH</strong></td>
<td>AR 50</td>
<td>0.5</td>
<td>0.25</td>
<td>0.1</td>
<td>14-44 k</td>
<td>70-20 k</td>
<td>57</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>MATTI</strong></td>
<td>AV81000</td>
<td>4-ch</td>
<td>1.0</td>
<td>0.3</td>
<td>0.5</td>
<td>30-20 k</td>
<td>70-100 k</td>
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<tr>
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<td>0.5</td>
<td>20-20 k</td>
<td>0.1</td>
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<tr>
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<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>10-30 k</td>
<td>20-40 k</td>
<td>67</td>
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<tr>
<td><strong>B&amp;O-MAGNIFICENT</strong></td>
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<td>1.0</td>
<td>1.0</td>
<td>20-20 k</td>
<td>70-100 k</td>
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<td>22-45 k</td>
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<td>22-45 k</td>
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<td>0</td>
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<tr>
<td><strong>ELECTRO-VOICE</strong></td>
<td>EVF-4ER</td>
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<td>22-45 k</td>
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<tr>
<td><strong>FISHER</strong></td>
<td>800</td>
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<td>0.1</td>
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<td>115</td>
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<td>1.2</td>
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**Fisher 504**

<table>
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<th>Manufacturer</th>
<th>Model</th>
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<th>FM Range (kHz)</th>
<th>AM Sensitivity (µV/m)</th>
<th>FM Sensitivity (dB)</th>
<th>AF Output (mV)</th>
<th>Audio Power Out (W)</th>
<th>Special Features</th>
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<tr>
<td><strong>ACOUSTIC RESEARCH</strong></td>
<td>AR 50</td>
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<td>0.25</td>
<td>0.1</td>
<td>14-44 k</td>
<td>70-20 k</td>
<td>57</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>MATTI</strong></td>
<td>AV81000</td>
<td>4-ch</td>
<td>1.0</td>
<td>0.3</td>
<td>0.5</td>
<td>30-20 k</td>
<td>70-100 k</td>
<td>60</td>
</tr>
<tr>
<td><strong>ALTEG</strong></td>
<td>725A</td>
<td>5-8</td>
<td>0.3</td>
<td>0.3</td>
<td>0.5</td>
<td>20-20 k</td>
<td>0.1</td>
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<tr>
<td><strong>B&amp;O</strong></td>
<td>3000 Jarvis</td>
<td>0.6</td>
<td>0.6</td>
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<td>20-40 k</td>
<td>67</td>
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<tr>
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<td>1.1</td>
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<td>70-100 k</td>
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<td>RE5 50</td>
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<td>0.1</td>
<td>0</td>
<td>20-20 k</td>
<td>22-45 k</td>
<td>60</td>
<td>2.5</td>
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<tr>
<td><strong>CEMORD/MAGNIFICENT</strong></td>
<td>CR 250</td>
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<td>1.0</td>
<td>1.0</td>
<td>20-20 k</td>
<td>22-45 k</td>
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<td>2.5</td>
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<tr>
<td><strong>DOMORDER</strong></td>
<td>MS 8000 Jarvis</td>
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<td>0.5</td>
<td>0.5</td>
<td>10-70 k</td>
<td>0.1</td>
<td>0</td>
<td>1.8</td>
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<tr>
<td><strong>ELECTRO-VOICE</strong></td>
<td>EVF-4ER</td>
<td>1.0</td>
<td>0.1</td>
<td>0</td>
<td>20-20 k</td>
<td>22-45 k</td>
<td>60</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>FISHER</strong></td>
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<td>0.1</td>
<td>0</td>
<td>20-20 k</td>
<td>22-45 k</td>
<td>60</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>HANUMAN</strong></td>
<td>115</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>20-20 k</td>
<td>22-45 k</td>
<td>60</td>
<td>2.5</td>
</tr>
</tbody>
</table>
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.

Compatibility with today’s 4-channel systems? No problem. The SQR-6650 has everything you need: FM, AM, four power amplifiers, simplified controls including 4 VU meters for balancing your system, and two separate four-channel decoding circuits.

One is for SQ, and one is for all the other matrix systems on the market. Just plug in a turntable, connect four speakers, and you’re ready to enjoy four-channel sound from discs (or tape with an additional quadraphonic player deck). Or enjoy stereo or derived four-channel sound from stereo broadcasts and recordings.

Availability of records or tapes? Plenty! Schwann Catalog lists more than 100 four-channel records, 200 Quad 8 tapes and the list grows everyday. If FM is your favorite source of music, the hours devoted to 4-channel SQ and matrix broadcasting is growing.

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.

That leaves only cost as your excuse. And it’s a weak one. The SQR-6650 costs hardly more than stereo receivers of comparable facilities and specifications, $329.50.*

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

SONY® SQR 6650

Check No. 45 on Reader Service Card
## Receivers

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>Watt Power Output</th>
<th>Tuning Systems</th>
<th>Bass, Treble, Level, 6:1 Halo</th>
<th>AM Band (kHz)</th>
<th>FM Band (kHz)</th>
<th>Reception Indicator</th>
<th>SDM, MDS (kHz)</th>
<th>Shortwave Coverage</th>
<th>Frequency Modulation Coverage</th>
<th>Price</th>
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<td>180 40</td>
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<td>184 x 132</td>
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<td>SR-1100</td>
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<td>184 x 132</td>
<td>155 155</td>
<td>Yes</td>
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<tr>
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<td>155 155</td>
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<td>-3</td>
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<td>155 155</td>
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<td>KR-7200</td>
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<td>155 155</td>
<td>Yes</td>
<td>184 x 132</td>
<td>-3</td>
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<tr>
<td><strong>KIRKSEATER</strong></td>
<td>RFS-8000</td>
<td>140 0.5 0.5</td>
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<td>155 155</td>
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<tr>
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<td>155 155</td>
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<tr>
<td><strong>Kenwood KR-7200</strong></td>
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<td>1.2 1.8 1.5 0.3 0.5 0.3 0.5 0.5</td>
<td>184 x 132</td>
<td>155 155</td>
<td>Yes</td>
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<td>-3</td>
<td>1.2 1.0 1.5 0.3 0.5 0.3 0.5</td>
<td>249.95</td>
<td></td>
</tr>
</tbody>
</table>

**SPECIAL FEATURES**

- *Wood sides.*
- *4 channel, 2 SEA tone controls, Bull's eye tuning index, wood case.*
- *4 channel, SEA tone controls, Bull's eye tuning index.*
- *SEA tone controls, 2 mic inputs, VR-551, similar but 40 W, $390.*
- *SEA tone controls, Bull's eye tuning index, walnut case.*
- *SEA tone controls, Bull's eye tuning index, walnut case.*
- *4 channel, 2 SEA tone controls, Bull's eye tuning index.*
- *Diorlette, SQ, C74, poplar bat cont.*
- *Direct coupling, 2 tape inputs, 3 band controls, mic w/ level cont, 3 spkr. sys., 2 each phone, mic.*
- *As above, less mic mix & 1 phone.*
- *As above but 2 tone conts.*
- *Mic mix w/ level cont, 2 spkr. sys.*
- *Wave matching SQ, matrix discrete 50, matrix, main/remote spkr. switch.*

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**www.americanradiohistory.com**

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46 AUDIO • OUR 25th YEAR • SEPTEMBER 1972
The New KENWOOD Receivers are More Professional than Ever!

Three elegant new models give you a choice of power and sophistication—all with advanced new circuitry, tough new materials, and top professional features that make the choice difficult indeed!

**KR-5200...140-Watt (IHF) FM/AM Stereo Receiver**

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

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

Basic to all three new receivers is KENWOOD’s advanced engineering which gives you direct coupling for exceptionally flat response throughout the audio spectrum; exclusive dual protection circuit; new NPN and PNP silicon low-noise transistors for quiet performance; KENWOOD’s newly-developed DSD circuitry in the MPX stage for improved stereo separation; and a host of convenience features, such as the 2-system tape facility, provision for three sets of stereo speakers, and a new linear FM dial scale. That’s for starters! Check the specs, check the performance, and choose the new KENWOOD receiver with the professional features right for you!

### TUNER SECTION

<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>FM Sensitivity</td>
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<td>Capture</td>
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<tr>
<td>Ratio</td>
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<td>60 dB</td>
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<td>Stereo Sep. @ 1 kHz</td>
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<td>IC/3 Mech.</td>
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### AMPLIFIER SECTION

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<td>Both Channels</td>
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<td></td>
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<td>Driven @ 8 ohms</td>
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<tr>
<td>from 20-20k Hz</td>
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<td>THD &amp; IM (@ rated output)</td>
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<td>0.5%</td>
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<td>Power Bandwidth</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2 Phono, 2 Aux</td>
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</table>

For complete specifications, visit your nearest KENWOOD Dealer, or write...

KENWOOD

15777 So. Broadway, Gardena, Calif. 90249 • 72-02 Fifty-first Ave., Woodside, N.Y. 11377

In Canada: Magnasonic Canada Ltd., Toronto, Ontario; Montreal, Quebec; Vancouver, B.C.

Check No. 47 on Reader Service Card

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### Receivers

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MARANTZ</th>
<th>MASTERWORK</th>
<th>MAXIMUS</th>
<th>NIKKO</th>
<th>OLSON</th>
<th>ONKYO</th>
<th>PANASONIC</th>
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<td>RA777</td>
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Also with digital readout, FET, 1ICs. 1ICs.

2ICs.

Var. matrix; remote-card recepplace.

Var. touch tuning, main menu;

Joystick sw.

End; direct coupled.

90 decoder jack; 50 L & R decoder aux.; remote control.

SQ decoder.

SQ decoder; 8-track player.

6 FETs; 121 ICs, 1-tall filters; 2 mic inputs; 2 phone jacks; top vol. controls for rem. spks.

MOS FET, X-tall filter, w. wall cab.

MOS FET, X-tall filter, w. wall cab.

MOS FET, X-tall filter, w. wall cab.

2ICs.

2ICs.

FETs; 1ICs.

2ICs.

FETs.

FETs; 1ICs.

FETs; 1ICs.

8-track player, 4.5x4.5 cm.
...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.

But there's an important bonus. A built-in STEREO-4* universal decoder that automatically decodes any matrix FM, records, or tapes just as the record producer intended you to hear them ±2%. No switches to change. Simply play any encoded 4-channel material and the E-V STEREO-4 decoder does the rest. Perfectly.

This is the universal decoder the industry has been waiting for. It's the circuit we invented that ends the confusion in matrix sound. And it's also superb for enhancing your present library of 2-channel stereo records by revealing hidden environmental sounds.

Write us for complete technical specifications if you wish. But better still, hear the EVR-4X4 at your nearest Electro-Voice showroom. The sound you hear will make your day.
# Receivers

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<th>MANUFACTURER</th>
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**SPECIAL FEATURES**

- **PILOT:**
  - 4000K: 2 spkr. sys.
- **ROTEL:**
  - 1500K: 4500K, Noic, 2 spkr. sys.
  - 2500K: 2 spkr. sys.

**Specifications:**

- **SQ:**
  - 30W
  - 30W
  - 30W
  - 30W
- **Master:**
  - 30W
  - 30W
  - 30W
  - 30W
- **Speakers:**
  - 30W
  - 30W
  - 30W
  - 30W

**Pioneer SX-828**

**Sansui QR-6500**

---

Audio • Our 25th Year • September 1972

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www.americanradiohistory.com
Quick. Name the most powerful receiver under $300 . . .

- 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. But if you heard it, you’d know.

Ask your dealer. Or write:
Sherwood Model ST200.
Sherwood Electronic Laboratories, Inc.
4300 North California Avenue
Chicago, Illinois 60651

The Sherwood Experience
## Receivers

### Scott 443

<table>
<thead>
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<th>Power (W)</th>
<th>Number of Speakers</th>
<th>Controls</th>
<th>Display</th>
<th>Tuner Type</th>
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<td>6.5</td>
<td>5-60k</td>
<td>1.0</td>
<td>2.0</td>
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<tr>
<td>1.8</td>
<td>3</td>
<td>6.5</td>
<td>2</td>
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<td>5-60k</td>
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<td>6.5</td>
<td>2</td>
<td>6.5</td>
<td>5-60k</td>
<td>1.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

## Special Features

- 6-way speaker select.
- Toroidal PMF + filters: FET, high output.
- Dynadisc matrix, 4-channel swt., full-mode swt., tape dubbing.
- Front panel swt. for 4-channel adapter.
- Matrix, FET, 1G, ceramic filters, w. cab.
- Wood case, A/B speaker swt.
- 2/4 channel receiver.
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.

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**

---

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>Model</th>
<th>Channels</th>
<th>Bandwidth (Hz)</th>
<th>Range</th>
<th>Min. Deq.</th>
<th>Max. Deq.</th>
<th>Filter Type &amp; HP</th>
<th>Size</th>
<th>Weight</th>
<th>Price</th>
<th>Special Features</th>
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<tbody>
<tr>
<td>ADVENT</td>
<td>FBC</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>4.5</td>
<td>0.5</td>
<td>60</td>
<td>12 x 7 4 x 3/4</td>
<td>*</td>
<td>*</td>
<td>850.00</td>
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<tr>
<td>ALTEC</td>
<td>Acousta Voicette</td>
<td>2</td>
<td>24</td>
<td>1/2</td>
<td>4.5</td>
<td>0.5</td>
<td>80</td>
<td>10 x 8 x 2/4</td>
<td>13</td>
<td>450.00</td>
<td>Separate insert gain controls for each channel, 130 kHz octave filters.</td>
</tr>
<tr>
<td>FRAZIER</td>
<td>SEE-24</td>
<td>2</td>
<td>12</td>
<td>15</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>15 x 12 x 3/7</td>
<td>15</td>
<td>795.00</td>
<td>*Passive filters, no insertion loss at level positions.</td>
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<tr>
<td>METROTEC</td>
<td>FEW-1</td>
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<td>5</td>
<td>1.5</td>
<td>9.0</td>
<td>0.05</td>
<td>80</td>
<td>8 x 5/4 x 5/4</td>
<td>4</td>
<td>99.95</td>
<td>*Ganged controls. Kit price, $79.95.</td>
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<tr>
<td>SAE</td>
<td>Mk-7</td>
<td>2*</td>
<td>11</td>
<td>0.9</td>
<td>16</td>
<td>7.0</td>
<td>0.05</td>
<td>17 x 7 x 5/8</td>
<td>16</td>
<td>450.00</td>
<td>*Ganged controls. Switched 8 or 16 dB range.</td>
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<td>SOUNDCRAFTSMEN</td>
<td>20-12</td>
<td>2</td>
<td>10</td>
<td>24</td>
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<td>90</td>
<td>18 x 11 x 5/4</td>
<td>22</td>
<td>299.50</td>
<td>Professional model; input/output level metering.</td>
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<tr>
<td></td>
<td>RP10-12</td>
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<td>10</td>
<td>24</td>
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<td>0.01</td>
<td>95</td>
<td>18 x 11 x 5/4</td>
<td>22</td>
<td>349.50</td>
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Audio • Our 25th Year • September 1972

www.americanradiohistory.com
# Manual Turntables & Tonearms

## Manufacturers

<table>
<thead>
<tr>
<th>Turntables</th>
<th>Tonearms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Empire 598</strong></td>
<td><strong>Panasonic SP-10</strong></td>
</tr>
<tr>
<td><strong>JVC VL-8</strong></td>
<td><strong>Philips GA-212</strong></td>
</tr>
</tbody>
</table>

## Specifications

### Manufacturer: Acoustic Research
- **Model:** XA | **XLR:** 1/8" (5.4 mm) | **Input:** 1/8" (5.4 mm) | **Output:** 1/8" (5.4 mm) | **Cable Length:** 12" (30 cm) | **Power Supply:** 110 V, 50 Hz | **Weight:** 14 lbs (6.4 kg) | **Price:** $159.00

### Manufacturer: Audio Research
- **Model:** 1A | **XLR:** 1/8" (5.4 mm) | **Input:** 1/8" (5.4 mm) | **Output:** 1/8" (5.4 mm) | **Cable Length:** 12" (30 cm) | **Power Supply:** 110 V, 60 Hz | **Weight:** 12 lbs (5.4 kg) | **Price:** $199.00

### Manufacturer: Brisk
- **Model:** PS-600 | **XLR:** 1/8" (5.4 mm) | **Input:** 1/8" (5.4 mm) | **Output:** 1/8" (5.4 mm) | **Cable Length:** 12" (30 cm) | **Power Supply:** 110 V, 50 Hz | **Weight:** 13 lbs (5.9 kg) | **Price:** $175.00

### Manufacturer: Deca (Pauli)
- **Model:** 5/6 | **XLR:** 1/8" (5.4 mm) | **Input:** 1/8" (5.4 mm) | **Output:** 1/8" (5.4 mm) | **Cable Length:** 12" (30 cm) | **Power Supply:** 110 V, 60 Hz | **Weight:** 13 lbs (5.9 kg) | **Price:** $159.00

### Manufacturer: EMF (Gotham)
- **Model:** 5/6 | **XLR:** 1/8" (5.4 mm) | **Input:** 1/8" (5.4 mm) | **Output:** 1/8" (5.4 mm) | **Cable Length:** 12" (30 cm) | **Power Supply:** 110 V, 60 Hz | **Weight:** 13 lbs (5.9 kg) | **Price:** $179.00

### Manufacturer: Empire
- **Model:** 598 | **XLR:** 1/8" (5.4 mm) | **Input:** 1/8" (5.4 mm) | **Output:** 1/8" (5.4 mm) | **Cable Length:** 12" (30 cm) | **Power Supply:** 110 V, 60 Hz | **Weight:** 16 lbs (7.3 kg) | **Price:** $249.00

### Manufacturer: JVC
- **Model:** VL-8 | **XLR:** 1/8" (5.4 mm) | **Input:** 1/8" (5.4 mm) | **Output:** 1/8" (5.4 mm) | **Cable Length:** 12" (30 cm) | **Power Supply:** 110 V, 60 Hz | **Weight:** 16 lbs (7.3 kg) | **Price:** $249.00

### Manufacturer: Lenox
- **Model:** L-65 | **XLR:** 1/8" (5.4 mm) | **Input:** 1/8" (5.4 mm) | **Output:** 1/8" (5.4 mm) | **Cable Length:** 12" (30 cm) | **Power Supply:** 110 V, 60 Hz | **Weight:** 16 lbs (7.3 kg) | **Price:** $179.00

### Manufacturer: Panasonic
- **Model:** SP-10 | **XLR:** 1/8" (5.4 mm) | **Input:** 1/8" (5.4 mm) | **Output:** 1/8" (5.4 mm) | **Cable Length:** 12" (30 cm) | **Power Supply:** 110 V, 60 Hz | **Weight:** 16 lbs (7.3 kg) | **Price:** $299.00

### Manufacturer: Philips
- **Model:** GA212 | **XLR:** 1/8" (5.4 mm) | **Input:** 1/8" (5.4 mm) | **Output:** 1/8" (5.4 mm) | **Cable Length:** 12" (30 cm) | **Power Supply:** 110 V, 60 Hz | **Weight:** 16 lbs (7.3 kg) | **Price:** $199.00

### Manufacturer: Pioneer
- **Model:** PL-50 | **XLR:** 1/8" (5.4 mm) | **Input:** 1/8" (5.4 mm) | **Output:** 1/8" (5.4 mm) | **Cable Length:** 12" (30 cm) | **Power Supply:** 110 V, 60 Hz | **Weight:** 16 lbs (7.3 kg) | **Price:** $299.00

## Special Features
- With cover, base, stylus force gauge, oil, starting gauge, 1A 444 mm, similar but 120 or ZEO 5.0 or 69 Hz.
- Oil hydral, screw, intermid, shuck, slider, plastic, cover, base and cover.
- Includes pre-amps.
- Includes pre-amps.

## Prices
- **Empire (Gotham):** $399.00 with Empire (Gotham).
- **VACO (Benjamin):** $399.00 with VACO (Benjamin).
- **Panasonic SP-10:** $399.00 with Panasonic SP-10.
- **Philips GA212:** $399.00 with Philips GA212.
- **Pioneer PL-50:** $399.00 with Pioneer PL-50.
### Manual Turntables & Tonearms

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Price</th>
<th>Tone Arm</th>
<th>Record Size</th>
<th>Belt Mount</th>
<th>Weight</th>
<th>Special Features</th>
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<tbody>
<tr>
<td>Rabco ST-4</td>
<td></td>
<td></td>
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<td></td>
<td>Integ.</td>
<td>13</td>
<td></td>
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<tr>
<td>Sony 5520</td>
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<td></td>
<td></td>
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<td>Integ.</td>
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<td>Thorens TD-160</td>
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<td>Integ.</td>
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### Turntables

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<tr>
<th>Manufacturer</th>
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<th>Price</th>
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<th>Belt Mount</th>
<th>Weight</th>
<th>Special Features</th>
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<tr>
<td>Rabco ST-4</td>
<td></td>
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<td></td>
<td>Integ.</td>
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<tr>
<td>Sony 5520</td>
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<td>Integ.</td>
<td>13.6</td>
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<tr>
<td>Thorens TD-160</td>
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<td></td>
<td>Integ.</td>
<td>13</td>
<td></td>
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<tr>
<td>V-M 1579</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Integ.</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>
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 tone-arm 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.


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

Check No. 57 on Reader Service Card
### Automatic Turntables

#### BSR 810/X

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Design (inch-diameter)</th>
<th>Max. Weight (pounds)</th>
<th>Max. Weight (ounces)</th>
<th>Base Type</th>
<th>Cartr. Weight (ounces)</th>
<th>Cartr. Weight (ounces)</th>
<th>Overall W x D x H</th>
<th>Overall W x D x H</th>
<th>Weight</th>
<th>Price</th>
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<tbody>
<tr>
<td>B 100</td>
<td>B 12 0.06 55 0.5 8/5</td>
<td>Bal 0.4 7 6 16 4 14 3</td>
<td>17 14 19 32 6</td>
<td>12</td>
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<td>139.95</td>
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<tr>
<td>500A/X</td>
<td>A 11 0.12 40 0.75 7/6</td>
<td>Bal 0.6 16 8 7 3 14</td>
<td>15 4 14 7</td>
<td>17</td>
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<td>130.45</td>
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<tr>
<td>500A/X</td>
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<td>Bal 0.6 16 8 7 3 14</td>
<td>15 4 14 7</td>
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<td></td>
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<td></td>
<td>80.00</td>
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<tr>
<td>310A/X</td>
<td>A 11 0.15 38 1.0 7/6</td>
<td>Spd 0.9 20 7 7 3 14</td>
<td>15 4 14 7</td>
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<td></td>
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#### Garrard Zero 100

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<thead>
<tr>
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<th>Design (inch-diameter)</th>
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<th>Max. Weight (ounces)</th>
<th>Base Type</th>
<th>Cartr. Weight (ounces)</th>
<th>Cartr. Weight (ounces)</th>
<th>Overall W x D x H</th>
<th>Overall W x D x H</th>
<th>Weight</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS 600</td>
<td>A 12 0.06 55 0.5 8/5</td>
<td>Bal &amp; Spd 1.1</td>
<td>14 20 36 5</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>139.95</td>
</tr>
</tbody>
</table>

#### Dual 1229

- **Speeds**: A-33, 45, 78; B-33, 45; C-33 only; F-Cont. variable

#### Special Features
- **BSR MCDONALD**
  - With wall, base, cover, Shure M91ED cart., sync. mtr., visc. cueing.
  - With wall, base, cover, Shure M93E cart., sync. mtr., visc. cueing.
- **BRAUN**
  - As above, less strobe
- **DUAL**
  - Oililled, brushless d.c. motor, with base, cover.
- **FISHER**
  - As above
- **GARRARD**
  - Zero-base arm; all strobe; var. spd.; mag; anti-skat.; visc. damp. arm.
  - Visc. damp. arm; 2-pl. disc support; overshoe plate; anti-skat.; slide-in cart.
  - 4-channel demodulator built in; with base, cover, mag. cart.
- **JVC**
  - CD-4 channel demodulator built in; with base, cover.
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 (USA) Ltd. Blauvelt, N.Y. 10913
### Automatic Turntables

**Miracord 50H/II**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Speeds (rpm)</th>
<th>Tonearm</th>
<th>Cartridge</th>
<th>Special Features</th>
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</thead>
<tbody>
<tr>
<td>MCA</td>
<td>ST-10</td>
<td>45,78,100</td>
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<tr>
<td></td>
<td>ST-123</td>
<td>45,78,100</td>
<td>N/A</td>
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**V-M 1542**

<table>
<thead>
<tr>
<th>Speeds</th>
<th>SPECIAL FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-33, 45, 78</td>
<td>Sep., anti-skat. for con &amp; ellip.; sync. mtr.; pitch cont. adj.; anti-skat. marker.</td>
</tr>
<tr>
<td>D-16, 33, 45</td>
<td>Sep., anti-skat. for con &amp; ellip.; sync. mtr.; pitch cont. adj.; anti-skat. marker.</td>
</tr>
<tr>
<td>C-33 only</td>
<td>Sep., anti-skat. for con &amp; ellip.; sync. mtr.; pitch cont. adj.; anti-skat. marker.</td>
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</table>

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**Radio Shack 45**

<table>
<thead>
<tr>
<th>Speeds</th>
<th>SPECIAL FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-33, 45, 78</td>
<td>Tracks 4 to 6 gms., with base and cart.</td>
</tr>
<tr>
<td>D-16, 33, 45</td>
<td>Tracks 4 to 6 gms., with base and cart.</td>
</tr>
<tr>
<td>E-16, 33, 45</td>
<td>Tracks 4 to 6 gms., with base and cart.</td>
</tr>
<tr>
<td>C-33 only</td>
<td>Tracks 4 to 6 gms., with base and cart.</td>
</tr>
</tbody>
</table>

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**Sanyo 1P-505**

<table>
<thead>
<tr>
<th>Speeds</th>
<th>SPECIAL FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-33, 45, 78</td>
<td>Belt-drive synch. mtr.; with cart., wal. base, cover.</td>
</tr>
<tr>
<td>D-16, 33, 45</td>
<td>Belt-drive synch. mtr.; with cart., wal. base, cover.</td>
</tr>
<tr>
<td>E-16, 33, 45</td>
<td>Belt-drive synch. mtr.; with cart., wal. base, cover.</td>
</tr>
<tr>
<td>C-33 only</td>
<td>Belt-drive synch. mtr.; with cart., wal. base, cover.</td>
</tr>
</tbody>
</table>

---

**Pe 3012**

**V-M 1542**

<table>
<thead>
<tr>
<th>Speeds</th>
<th>SPECIAL FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-33, 45, 78</td>
<td>Sep., anti-skat. for con &amp; ellip.; sync. mtr.; pitch cont. adj.; anti-skat. marker.</td>
</tr>
<tr>
<td>D-16, 33, 45</td>
<td>Sep., anti-skat. for con &amp; ellip.; sync. mtr.; pitch cont. adj.; anti-skat. marker.</td>
</tr>
<tr>
<td>C-33 only</td>
<td>Sep., anti-skat. for con &amp; ellip.; sync. mtr.; pitch cont. adj.; anti-skat. marker.</td>
</tr>
</tbody>
</table>

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**Audio - Our 25th Year - September 1972**

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AmericanRadioHistory.Com
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 stop. 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.

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

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<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>Stylus Type</th>
<th>Special Features</th>
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<td>XLM</td>
<td>C</td>
<td>*</td>
</tr>
<tr>
<td>VLM</td>
<td>C</td>
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<tr>
<td>10EIV</td>
<td>C</td>
<td>*</td>
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<tr>
<td>20E</td>
<td>C</td>
<td>*</td>
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<tr>
<td>B&amp;D</td>
<td>SP12</td>
<td>E</td>
<td>*</td>
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<tr>
<td>SP10</td>
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<tr>
<td>SP14</td>
<td>E</td>
<td>*</td>
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<tr>
<td>DECCA (PAUL)</td>
<td>MAV</td>
<td>C</td>
<td>*</td>
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<tr>
<td>4IC</td>
<td>C</td>
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<tr>
<td>4AE</td>
<td>C</td>
<td>*</td>
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<tr>
<td>7BC</td>
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<td>*</td>
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<tr>
<td>EMPIRE</td>
<td>1000</td>
<td>C</td>
<td>*</td>
</tr>
<tr>
<td>Z1/X</td>
<td>C</td>
<td>*</td>
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<tr>
<td>999E/X</td>
<td>C</td>
<td>*</td>
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<tr>
<td>999SE/X</td>
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<tr>
<td>999E/X</td>
<td>C</td>
<td>*</td>
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<tr>
<td>909E/X</td>
<td>C</td>
<td>*</td>
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<td>909EE/X</td>
<td>C</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>GOLDRING (IMF)</td>
<td>800 Super</td>
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<td>*</td>
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<tr>
<td>800E Mk II</td>
<td>C</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>850</td>
<td>C</td>
<td>*</td>
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<tr>
<td>GRADO</td>
<td>F1</td>
<td>C</td>
<td>*</td>
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<tr>
<td>F1E</td>
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<tr>
<td>FCE</td>
<td>C</td>
<td>*</td>
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<tr>
<td>JV</td>
<td>4MD.20X</td>
<td>C</td>
<td>*</td>
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<tr>
<td>4MD.30X</td>
<td>C</td>
<td>*</td>
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<tr>
<td>OLSON</td>
<td>PC.195</td>
<td>C</td>
<td>*</td>
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<tr>
<td>PHILIPS</td>
<td>GP412</td>
<td>C</td>
<td>*</td>
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<tr>
<td>GP401</td>
<td>C</td>
<td>*</td>
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<tr>
<td>GP400</td>
<td>C</td>
<td>*</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Special Features</th>
<th>C : Conical</th>
<th>E : Elliptical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency curve and calibration certificate supplied.</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>*Twin tip stylus, F2 similar but with 0.3 x 0.6 elliptical stylus, $60.00.</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>*Shibata stylus, intended for use with 4chan disc.</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stylus Type</th>
<th>C : Conical</th>
<th>E : Elliptical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive scan no cantilever; 1 mg tip mass; hand polished.</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

*IM = 0.3% @ 14.2 cm/s.

With freq. resp. chart.

As above.

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 percent). **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.
## Phono Cartridges

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Force, oz.</th>
<th>Stylus, mil</th>
<th>Taper, mil</th>
<th>Frequency, k Hz</th>
<th>Output level, mV</th>
<th>Stylus Type</th>
<th>Point Type</th>
<th>Weight, oz.</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pickering</strong></td>
<td>XV-15</td>
<td>10-30</td>
<td>35</td>
<td>10-30</td>
<td>10-30</td>
<td>10-30</td>
<td>E</td>
<td>C</td>
<td>10-30</td>
<td>79.95</td>
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<tr>
<td></td>
<td>XV-15</td>
<td>20-20</td>
<td>35</td>
<td>20-20</td>
<td>20-20</td>
<td>20-20</td>
<td>E</td>
<td>C</td>
<td>20-20</td>
<td>49.95</td>
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<td>XV-15</td>
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<td>39.95</td>
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<td>XV-15</td>
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<td>20-20</td>
<td>E</td>
<td>C</td>
<td>20-20</td>
<td>29.95</td>
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<td><strong>Shure</strong></td>
<td>V-15</td>
<td>20-20</td>
<td>35</td>
<td>20-20</td>
<td>20-20</td>
<td>20-20</td>
<td>E</td>
<td>C</td>
<td>20-20</td>
<td>67.50</td>
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<td></td>
<td>V-15</td>
<td>20-20</td>
<td>35</td>
<td>20-20</td>
<td>20-20</td>
<td>20-20</td>
<td>E</td>
<td>C</td>
<td>20-20</td>
<td>54.95</td>
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<td>V-15</td>
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<td>V-15</td>
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<td>20-20</td>
<td>E</td>
<td>C</td>
<td>20-20</td>
<td>29.95</td>
</tr>
</tbody>
</table>

**Special Features**

- **Pickering XV-15**
  - Similar to 0015/10-30k
  - Stylus: Type C (Conical)
  - Output: 35 mV at 1000 Ω
  - Tracking Force: 1/2 - 1%
  - Weight: 47k Ohm
  - Price: 79.95

- **Shure V-15**
  - Similar to M75ED
  - Stylus: Type 2 (Elliptical)
  - Output: M75ED Type 2
  - Tracking Force: 0.7 mil conical stylus
  - Weight: 47k Ohm
  - Price: 66.00
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.

World Famous Long Playing Cartridges

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

Check No. 65 on Reader Service Card
# Speakers

**AR LST**

**ADC 303AX**

**Audio Research Magneplanar**

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>Diameter (in)</th>
<th>Frequency (Hz)</th>
<th>Impedance (Ω)</th>
<th>Price</th>
</tr>
</thead>
</table>
| ACoustics Research | LST | 12 42 | Acous. susp. | (4) ¾ Hem. done | 4 | 27.5 x 20 | 4.50 | 600.00 | Prof. applications; at selected dealers. **Complete data available from AR on request.**
| | AR-3 | 12 42 | Acous. susp. | ½ Hem. done | 4 | 25 x 11.5 | 3.89 | 250.00 | **Depends on various factors; data on request.** **Wal., ch., teak, mah., bir. unfin.**
| | AR-5 | 10 56 | Acous. susp. | ¾ Hem. done | 4 | 24 x 11 | 3.89 | 175.00 | **Wal., ch., teak, mah., bir. unfin.**
| | AR-2L | 10 56 | Acous. susp. | 4 Cone | 4 | 24 x 11 | 3.89 | 128.00 | **Wal., ch., teak, mah., bir. unfin.**
| | AR-6 | 8 56 | Acous. susp. | ¾ Cone | 4 | 15.9 | 3.89 | 81.00 | **Wal., ch., teak, mah., bir. unfin.**
| | AR-4L | 8 56 | Acous. susp. | 2¼ Cone | 4 | 15.9 | 3.89 | 63.00 | **Wal., ch., teak, mah., bir. unfin.**

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>Diameter (in)</th>
<th>Frequency (Hz)</th>
<th>Impedance (Ω)</th>
<th>Price</th>
</tr>
</thead>
</table>
| Advent | 10 43 | Acous. susp. | ¾ Dome | 30-20k / 4 | 15/20k | 1.0k | 120.00 | Also in walnut, vinyl cab. $105.00

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>Diameter (in)</th>
<th>Frequency (Hz)</th>
<th>Impedance (Ω)</th>
<th>Price</th>
</tr>
</thead>
</table>
| Altec | 840D | 15 | Bass reflex | 35-20k | 6 | 214 | 375.00 | 7.8 ft. "Voice of the Theater" home series.
| | 874A | 12 | Acous. susp. | 36-20k | 12 | 510 | 250.00 | Woofers has 3-in. voice coil, 12-lb. magnet.
| | 879A | 15 | Acous. susp. | 36-20k | 6 | 120 | 199.00 | 7.8 ft. "Voice of the Theater" home series.
| | 891A | 12 | Acous. susp. | 36-20k | 12 | 510 | 125.00 | 7.8 ft. "Voice of the Theater" home series.

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
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<th>Diameter (in)</th>
<th>Frequency (Hz)</th>
<th>Impedance (Ω)</th>
<th>Price</th>
</tr>
</thead>
</table>
| Audio Dynamics | 120 | 12 | Acous. susp. | 36-20k | 10 | 1412 | 250.00 | **Dispersion tweeters.**
| | 450A | 12 | Acous. susp. | 36-20k | 10 | 1412 | 135.00 | **Dispersion tweeters.**
| | 303A | 10 | Acous. susp. | 25-10k | 10 | 1412 | 90.00 | Mid & hi cors.
| | 404A | 6 | Acous. susp. | 36-20k | 10 | 1412 | 45.00 | **Dispersion tweeters.**

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<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>Diameter (in)</th>
<th>Frequency (Hz)</th>
<th>Impedance (Ω)</th>
<th>Price</th>
</tr>
</thead>
</table>
| Audiotechs Div. Hydrometals | T-10 | 30-20k | Magneplanar config., mylar diaphragms | 30-20k | 75 | 500 | 140 | 995.00 | "Fabric covered, 25 choices; ext. con. for hi amp.

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>Diameter (in)</th>
<th>Frequency (Hz)</th>
<th>Impedance (Ω)</th>
<th>Price</th>
</tr>
</thead>
</table>
| Aztec | 30-5106 | 8 | Acous. susp. | 30-20k | 30 | 11/2 | 18 | 995.00 | "Fabric covered, 25 choices; ext. con. for hi amp.

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**www.americanradiohistory.com**

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**AmericanRadioHistory.Com**

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*Note: The table includes information about various speaker models and their specifications, along with their prices and special features. The data is presented in a tabular format for easy reference.*
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, 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.

The Wharfedale 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

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.

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 W35
You're listening to the music, not the speakers.
Check No. 67 on Reader Service Card
<table>
<thead>
<tr>
<th>MODEL</th>
<th>MANUFACTURER</th>
<th>SPEAKER TYPE</th>
<th>ENCLOSURE</th>
<th>ENCLOSURE DIMENSIONS</th>
<th>W/ O H/M</th>
<th>WEIGHT</th>
<th>WOOD FINISH</th>
<th>SPECIAL FEATURES</th>
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<td>B&amp;W DM2A</td>
<td>Manufacturers</td>
<td>Tower</td>
<td>W/ O H/M</td>
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<td>W/ O H/M</td>
<td>W/ O H/M</td>
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<tr>
<td>Bose 901</td>
<td>Manufacturer</td>
<td>Tower</td>
<td>W/ O H/M</td>
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<td>W/ O H/M</td>
</tr>
</tbody>
</table>

**Audio - Our 25th Year - September 1972**
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 deep-throated as the roar of thunder in the summer sky.

Martin Speakers, for people who are attuned to the irresistible sounds of the audible universe.

MARTIN SPEAKERS SYSTEMS • A DIVISION OF EASTMAN SOUND MANUFACTURING CO., INC.
Harmony Road and Route 295
Mickleton, New Jersey 08056

Check No. 69 on Reader Service Card
## Speakers

### Dynaco A-35
- **Manufacturer:** Dynaco
- **Model:** A-35
- **Woofers:** 2 x 8" Cone, 3/4" Dome
- **Tweeters:** 2 x 3/4" Dome
- **Crossover:** 350 Hz
- **Impedance:** 8 ohms
- **Dimensions:** 20 x 20.4 x 11"
- **Price:** $183.00 per pair

### Design Acoustics D-12
- **Manufacturer:** Design Acoustics
- **Model:** D-12
- **Woofers:** 5 x 3" Cone
- **Mid-range:** 5 x 3" Cone
- **Tweeters:** 5 x 1" Dome
- **Crossover:** 1.5 kHz
- **Impedance:** 8 ohms
- **Dimensions:** 28.9 x 19 x 14.4"
- **Price:** $125.00 per pair

### E-V 7C
- **Manufacturer:** E-V
- **Model:** 7C
- **Woofers:** 3" Cone, 3/4" Dome
- **Tweeters:** 3/4" Dome, 3/4" Dome
- **Crossover:** 3 kHz
- **Impedance:** 8 ohms
- **Dimensions:** 20 x 16 x 14.4"
- **Price:** $200.00 per pair

### Special Features
- **Dynaco A-35:** Dual chamber, side radiating, matched pairs.
- **Design Acoustics D-12:** Balanced, matching tweeters, moving baffle, cut standing waves.
- **E-V 7C:** Tweeter level controllable.
- **Price variations:**
  - $183.00 per pair
  - $125.00 per pair
  - $200.00 per pair
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 121/4'' 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

Check No. 71 on Reader Service Card
### Speakers

**EPI 100**

Fairfax Wall of Sound

**Fisher 110S**

<table>
<thead>
<tr>
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<th>Diameter, in</th>
<th>Speaker in (except Hilo)</th>
<th>Enclosure Type</th>
<th>Type</th>
<th>Diameter, in</th>
<th>Woofers</th>
<th>Mid-Range</th>
<th>Tweeters</th>
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<tbody>
<tr>
<td><strong>EMPIRE</strong></td>
<td>9500 Mi 12</td>
<td>Horn load</td>
<td>(2) Cone</td>
<td>10 1/8</td>
<td>80</td>
<td>30 x 24</td>
<td>Wal.</td>
<td>319.95</td>
<td>S-driver sys. with parallel hook-up offers stereo; ply marble top, 529.95</td>
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<td></td>
<td>9000 M 15</td>
<td>Acous. susp.</td>
<td>5</td>
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<td>7100 MI 12 30</td>
<td>Bass reflect</td>
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<td>100</td>
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<td>6000 M 10 40</td>
<td>Bass reflect</td>
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<td>30</td>
<td>100</td>
<td>750</td>
<td>Wal.</td>
<td>None</td>
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</table>

| SPECIAL FEATURES | **FT2A** | Acous. susp. | 8 | 40 | Bass reflect | 3 | Dome | 35.25 | 8 | 25 | 5 | 8 | 12 x 9 | Wal. | 22 | 68.95 | Treble con
t | 1-in. board const |
| **FISHER** | 1105 12 | Acous. susp. | (2) Cone | 2 | Dome | 20.25 | 50 | 600 | Wal. | None | 75 | 349.95 |
|              | 1000 15 | Acous. susp. | 1/4 | Dome | 15 | 100 | 600 | Wal. | None | 56 | 249.95 |
|              | 900 12 | Acous. susp. | 1/4 | Dome | 15 | 100 | 600 | Wal. | None | 45 | 199.95 |
|              | 800 12 | Acous. susp. | 2 | Dome | 20 | 100 | 600 | Wal. | None | 37 | 199.95 |
|              | 7100 12 | Acous. susp. | (2) Cone | 2 | Dome | 20.25 | 15 | 40 | Wal. | None | 55 | 219.95 |
|              | 620 12 | Acous. susp. | 5/8 | Dome | 3 | Dome | 30 | 10 | 350 | Wal. | None | 40 | 189.95 | Lattice-work grille, XP-7B, similar, $115.95 |
|              | 640 12 | Acous. susp. | 5 | Dome | 3 | Dome | 30 | 10 | 350 | Wal. | None | 33 | 129.95 |
|              | 500 8 | Acous. susp. | 8 | 30 | Acous. susp. | 8 | 30 | 30 | Wal. | 20 | 75.95 |
WE SPEAK SOFTLY

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.

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SANSUI ELECTRONICS CORP.
Woodside, New York 11377 • Gardena, California 90247
Electronic Distributors (Canada), Vancouver 9, B.C.
SANSUI ELECTRIC CO., LTD., Tokyo, Japan • Sansui Audio Europe S. A., Antwerp, Belgium

Check No. 73 on Reader Service Card
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<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>BASS SPEAKER</th>
<th>MID-RANGE</th>
<th>TWEETER</th>
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<td><strong>Hitachi HS-500</strong></td>
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**Speakers**

| **FRAZIER** | Texan 12 x 25 | Fold horn | 3 | Horn | 30 | 15k | 4 | 10 | 50 | 600 | 8 | 24 x 24 | Util. | None | 162 | 430.00 | Front & rear loading. |
| **Mark VI** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 90 | 220.00 | Adjustable network. |
| **Mark V** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 50 | 100.00 | - |
| **Manhattan Deluxe** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 10 | 125.00 | - |
| **Wild Ones** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8 | 124.95 | Optional. |
| **Monte Carlo IV** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 10 | 32.95 | Hi control. |

| **HARTRANFORD** | Citation 13 | 12 x 25 | 1⁴ | Dome | 1 | Dome | 0.7 x 10 | 6 | 15 | 7 | 15 | 6 | 20 x 14 | 12 | 295.00 | - |

| **HERITAGE** | Concert master VI | 24 x 15 | Acoust. susp. | - | Dome | 30 x 30 | 12 | 29 | 18 | 30 | 60 | 14 x 24 | Cloth, black & gold | 135 | 605.00 | - |
| **Concert master Jr.** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 95 | 320.00 | Holton A, trad. cab., $300.00. Holton Jr., 15x12x31 cab., $250.00. |
| **Zodiac II** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 16 | 90.00 | Wood seats. |
| **Zodiac '72** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 50 | 120.00 | - |

| **HEATH** | AS-103 | 12 x 42 | Acoust. susp. | 1.5 | Dome | 6.75 | dome | 30 x 20 | 25 | 575 | 5k | 14 x 11 | 24 x 24 | Cloth, black & gold | 53 | 189.95 | Kit. All components. |
| **AS-101** | - | - | - | - | Horn | 35 x 20 | 8 | 800 | 50 | 27 x 24 | 27 x 24 | Fabric, black | 101 | 269.95 | Kit. All components. |
| **AS-104** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 89.95 | - |
| **AS-105** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 34 | 64.95 | Unfinished AS-105U. |

| **HESEMANN** | - | - | - | - | Dome | - | Dome | 28 x 23 | 20 | 25 | 5k | 11 x 8 x 26 | Teak, gr. bk. | 32 | 99.50 | Horn dispersion. |
| **HILL** | 850 | 10 x 50 | Acoust. susp. | - | Dome | 0.75 | Dome | 40 x 15 | 40 | 800 | 50 | 11 x 14 | 14 x 14 | Cloth, black & gold | 125.90 | Hi & lo fuses. |
| **750** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 105.00 | Hi & lo fuses. |
| **500B** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 79.50 | 4 or 8 avail., hi & lo fuses. |
| **HITACHI** | HS-500 | 8 x 50 | Reflex | - | - | Horn | 35 x 20 | 50 | 3000 | 8 | 14 x 13 x 24 | Maroon | 68 | 115.00 | - |
| **HS-350** | - | - | - | - | - | Horn | 40 x 20 | 50 | 3000 | 8 | 14 x 13 x 24 | Gray | 33 | 220.00 | Gathered edge, detachable grille. |
| **HS-420** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 160.00 | - |
| **HS-220** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 15.5 | 80.00 | - |

**Audio • Our 25th Year • September 1972**

[www.americanradiohistory.com](http://www.americanradiohistory.com)
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:

"...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.

You can hear the difference now.

BOSE®

NATICK, MA. 01760

Check No. 75 on Reader Service Card

Julian Hirsch STEREO REVIEW.

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

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

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.

You can hear the difference now.

BOSE®

NATICK, MA. 01760

Check No. 75 on Reader Service Card

Julian Hirsch STEREO REVIEW.

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

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<tr>
<th>Model</th>
<th>Manufacturer</th>
<th>Type</th>
<th>woofer</th>
<th>mid-range</th>
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**SPECIAL FEATURES**

- **IMF:**
  - Plastic laminate driver diaphragms.

- **INFINITY:**
  - 2 electrostatic screens, 6 bass amp & crossovers.
  - Electrostatic tweeters radiate from rear above 17k.

- **JBL:**
  - 3-way conv. kit, M 12, $69.00.

- **JENSEN:**
  - Mid & hi conts.
  - Hi cont.
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.

Sonora

11¾" x 20½" x 10" deep; walnut-grain vinyl.
8 Ohms; 12.5 to 60 Watts RMS.

Bozak, Darien, Connecticut 06820 / Overseas Export by Elpa Marketing Industries, Inc. / New Hyde Park, New York 11040, USA
### Speakers

#### KLH 32

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<th>Diameter</th>
<th>Manufacturer or Unit No.</th>
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### Special Features
- 2 pos. level contls.
- 3 pos. tweeter level contl.
- Acous. tweeter level contl.
- Flare tip tweeter level contl.
- Horn tweeter level contl.
- 3 pos. tweeter level contl.

www.americanradiohistory.com
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'S TOTAL ENERGY RESPONSE
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<th>MANUFACTURER</th>
<th>MODEL</th>
<th>Diameter</th>
<th>Woofer in (in. [mm])</th>
<th>Mid-range in (in. [mm])</th>
<th>Tweeter in (in. [mm])</th>
<th>User-manual for 6-12 Wm.</th>
<th>Consumer rating (1-5)</th>
<th>Importation status</th>
<th>Output in (Watts)</th>
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*Cons. V input: @ 200 Hz, step mid & hi contds.
*As above: duo omni.
*As above.
*As above.
the new component that is a "must" with any 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 accurate 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 opened 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 group 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

TOPOIDAL and ferrite-core inductors, ten octave bands per channel.

FREQUENCY response: ±5 db from 20 Hz to 20,000 Hz at zero setting.

HARMONIC DISTORTION: Less than 1% THD @ 2 V., Typ. 0.05% @ 1 V.

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 G10 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, 5½" x 18" x 11", or rack-mount.

WARRANTY: 2 year parts and labor.
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Flushing, Stereo Inc. 10-13 Graham Rd.
Jamaica, Lafayette Electronics. 1652 Liberty Ave.
Westfield, Lafayette Radio. 5058 Spring Ave.
Metairie, Superior Sound. 1801 Broad St.
Richmond, Hunt's Stereo. 171 S. Broad Ave.
Schneckley, Stereo Sound. 160 Jay St.
Springfield, Audio World. 2510 Evergreen Rd
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Portland, Hunters. 1690 SE 74th Ave.
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Chicago. hi-Fi Audio. E.Wickham & Moodburn
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Dayton, Stotts-Friedman. 158 N. Jefferson St.
Dayton, Allied Service. 3454 Vine Ave.
Lancaster, Commercial Music. 303 Cedar Hill Rd.
Minneapolis, Lafayette Radio. 15 S. Portland Ave.
Pittsburgh, Budd-electro. 5075 Ridge Rd.
Pittsburgh, Huppins. 6940 E. Forte St.
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Tennessee Valley, Lafayette Hi-Fi. 5784 Byrdwood
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www.americanradiohistory.com
Speakers

Olson S-82

(Continued from page 80)

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<tr>
<th>MANUFACTURER</th>
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<th>RESONANCE FREQUENCY</th>
<th>REVERBERATION TIME</th>
<th>SPEAKER</th>
<th>REVERBERATION FREQUENCY</th>
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| UNIKYO       | 36    | 12 45    | Acoustics  | 3 10 20 20k       | 15 70 500    | 8 16x15        | Wall    | 51 299.95               |
|              | 25    | 14 53    | Acoustics  | 2 Dome 1 30 20k    | 10 30 700    | 8 1x11         | Wall    | 54 249.95               |
|              | 20    | 12 60    | Acoustics  | 2 Dome 1 35 20k    | 10 25 700    | 8 13x11        | Wall    | 49 199.95               |
|              | 15    | 10 60    | Acoustics  | 1 Dome 1 10 70k    | 10 20 700    | 8 1x11         | Wall    | 33 149.95               |

| PANASONIC    | SB750 | 12 60    | Acoustics  | 6 Dome 1 20 20k    | 85 60 600    | 8 29x19        | Wall    | 55 239.95               |
|              | SB500 | 12 60    | Acoustics  | 6 Dome 1 30 20k    | 70 60 800    | 8 25x15        | Wall    | 41 199.95               |
|              | SB400 | 10 60    | Acoustics  | 8 Horn 6 35 20k    | 8 65 600    | 8 23x12        | Wall    | 26 149.5               |
|              | SB800 | 10 60    | Acoustics  | 5 Dome 3 30 20k    | 8 60 800    | 8 22x13        | Wall    | 22 199.5               |

| PIONEER      | CS-R700| 12 60 | Basic | (2)6 Dome 4 20 20k | 85 60 600 | 8 29x19 | Wall | 49 299.95 |
|              | CS-R500| 10 60 | Basic | 6 Dome 1 30 20k    | 70 60 800 | 8 25x15 | Wall | 41 199.95 |
|              | CS-R300| 10 60 | Basic | 5 Dome 3 35 20k    | 60 800 | 8 14x12 | Wall | 39 199.5 |
|              | CS-E400| 8 60  | Basic | 6 Dome 1 30 20k    | 60 800 | 8 23x12 | Wall | 26 199.5 |

| QUADRAFLEX   | 77    | 15 48   | Acoustics | (2)6 Dome 4 20 20k | 85 60 600 | 8 29x19 | Wall | 49 299.95 |
|              | 66    | 12 45   | Acoustics | 6 Dome 1 30 20k    | 70 60 800 | 8 25x15 | Wall | 41 199.95 |
|              | 64    | 10 60   | Acoustics | 3 Dome 1 30 20k    | 60 800 | 8 14x12 | Wall | 39 199.5 |
|              | 72    | 12 60   | Acoustics | 3 Dome 1 30 20k    | 60 800 | 8 14x12 | Wall | 39 199.5 |
|              | 11    | 8 60    | Acoustics | 3 Dome 1 30 20k    | 60 800 | 8 14x12 | Wall | 39 199.5 |

| MADFORD      | 360   | 12     | Trans.  | 4 Dome 1 30 20k    | 85 25 500 | 8 18x15 | Wall | 43 500.00 |
|              | Studio 270 | 12 | Trans.  | 3 Dome 1 30 20k    | 50 800 | 8 13x10 | Wall | 43 500.00 |
|              | Monitor 180 | 12 | Acoustics | 2 Dome 1 20 20k | 50 800 | 8 13x10 | Wall | 43 500.00 |
|              | Tri-Star 90 | 12 | Acoustics | 4 Dome 1 20 20k | 50 800 | 8 13x10 | Wall | 43 500.00 |

| PIONEER CS-A500 | 12 48 | Acoustics | 12 Horn 6 20 30k | 10 50 300 | 8 14x11 | Wall | 42 399.8 |

**SPECIAL FEATURES**
- *Front mid. level contls.
- 4-pos. level contls., multi-chan. swt.
- Two 4-pos. level contls.; multi-chan. swt.
- *30 w/1000 Hf3 vol. for 107 dB SPL.
- *30 w/1000 Hf3 vol. for 107 dB SPL.
- Equalizer avail.
- *20 w/1000 Hf3 vol. for 103 dB SPL.
- *12 w/1000 Hf3 vol. for 100 dB SPL.
- *6 w/1000 Hf3 vol. for 95 dB SPL.
- *6 w/1000 Hf3 vol. for 95 dB SPL.
- Level contl.; removable grille.
- *30 w/1000 Hf3 vol. for 107 dB SPL.
- *30 w/1000 Hf3 vol. for 107 dB SPL.
- Equalizer avail.
- *12 w/1000 Hf3 vol. for 100 dB SPL.
- *6 w/1000 Hf3 vol. for 95 dB SPL.
- *6 w/1000 Hf3 vol. for 95 dB SPL.
- Level contl.; removable grille.

**QUAD (HARMONY HOUSE)**
- 45 18k 30 60 | 34x13 | 10% | Wall | 34 400.00 |
- 45 18k 30 60 | 34x13 | 10% | Wall | 34 400.00 |

**QUADRAFLEX**
- 45 18k 30 60 | 34x13 | 10% | Wall | 34 400.00 |
- 45 18k 30 60 | 34x13 | 10% | Wall | 34 400.00 |

**MADFORD (AUDIONICS)**
- 45 18k 30 60 | 34x13 | 10% | Wall | 34 400.00 |
- 45 18k 30 60 | 34x13 | 10% | Wall | 34 400.00 |

**AUDIO • OUR 25th YEAR • SEPTEMBER 1972**
### Speakers

#### Rectilinear III Lowboy

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
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#### SAE Mk 12

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#### Scott Design 61

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<td>Design 41</td>
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<td>2 Dome</td>
<td>Opt. tweeter horn kit</td>
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### Audio - Our 25th Year - September 1972

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### Speakers

**Tandberg 5010**

**Soundcraftsmen SC-12ES**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Woofer</th>
<th>Mid-Range</th>
<th>Tweeter</th>
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<tbody>
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<td>SC-12ES</td>
<td>Acous. susp.</td>
<td>Acous. susp.</td>
<td>Horn</td>
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<tr>
<td></td>
<td></td>
<td>(2) 6 x 6</td>
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<td></td>
<td>Lancer</td>
<td>12</td>
<td>60 &amp; 15k</td>
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<td>15 &amp; 30k</td>
<td>12</td>
<td>15 &amp; 30k</td>
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<td>S-8/2</td>
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<td>60 &amp; 15k</td>
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<td>8 x 28</td>
<td>8</td>
<td>8 x 28</td>
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**Speakers**

- **Soundcraftsmen SC-12ES**
  - ** woofer type:** Acous. susp.
  - **mid-range type:** Acous. susp.
  - **tweeter type:** Horn

**Special Features**

- Midrange & tweeter conti.
- 4-way. cont. var. frq. conti.
- 3-way. *dual ducted port reflex, resist. loaded.
- 3-way. *dual ducted port reflex.

### Additional Information

- **Price:** $149.50
- **Dimensions:** 141/2 x 8 1/2 x 12"
## Speakers

### Speakers

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<tr>
<th>MANUFACTURER</th>
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<th>Minimum For 600 W</th>
<th>Diameter - in.</th>
<th>Type</th>
<th>Overlap freq. 600-1K Hz</th>
<th>1 K</th>
<th>Cross-Over Frequency 1 K Hz</th>
<th>Crossover Frequency 2 K Hz</th>
<th>Crossover Frequency 4 K Hz</th>
<th>Speaker Frequency (Hz)</th>
<th>Gun Metal-Unit</th>
<th>Cradle Type</th>
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<td>15 x 1 1/4</td>
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<td>1 1/2 x 1 1/2</td>
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<td>1 1/2 x 13</td>
<td>1 1/2 x 13</td>
<td>1 1/2 x 13</td>
<td>Wal.</td>
<td>Beige.</td>
<td>35</td>
<td>399.95</td>
</tr>
<tr>
<td><strong>WHARFEDALE (BIG)</strong></td>
<td>WH51E</td>
<td>15</td>
<td>Acous. susp.</td>
<td>1</td>
<td>Dome</td>
<td>25-20K</td>
<td>75</td>
<td>22 x 1 1/2</td>
<td>1 1/2 x 13</td>
<td>1 1/2 x 13</td>
<td>1 1/2 x 13</td>
<td>Wal.</td>
<td>Cloth.     &amp;</td>
<td>63</td>
<td>199.95</td>
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<tr>
<td></td>
<td>WH10E</td>
<td>12</td>
<td>Acous. susp.</td>
<td>1</td>
<td>Dome</td>
<td>30-20K</td>
<td>60</td>
<td>24 x 1 1/2</td>
<td>1 1/2 x 12</td>
<td>1 1/2 x 12</td>
<td>1 1/2 x 12</td>
<td>Wal.</td>
<td>Cloth.     &amp;</td>
<td>52</td>
<td>149.95</td>
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<td></td>
<td>W25</td>
<td>12</td>
<td>Acous. susp.</td>
<td>1</td>
<td>Dome</td>
<td>18-5K</td>
<td>40</td>
<td>15 x 1 1/2</td>
<td>1 1/2 x 8</td>
<td>1 1/2 x 8</td>
<td>1 1/2 x 8</td>
<td>Wal.</td>
<td>Cloth.     &amp;</td>
<td>21</td>
<td>79.95</td>
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<tr>
<td></td>
<td>W45</td>
<td>10</td>
<td>Acous. susp.</td>
<td>1</td>
<td>Dome</td>
<td>35-18.5K</td>
<td>40</td>
<td>10 x 1 1/2</td>
<td>1 1/2 x 8</td>
<td>1 1/2 x 8</td>
<td>1 1/2 x 8</td>
<td>Wal.</td>
<td>Cloth.     &amp;</td>
<td>16</td>
<td>54.95</td>
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</table>

### V-M 93

**Video-Tone DP-202E**

**Warfode W25**

## Special Features

- **ACOUSTIC LENS FOR TWEETER.**
- **12 DB/OCT. LC CROSSOVER NETWORK.**
- **DIRECT, REFLECTIVE.**
- **CONV. VAR. MID & HI CONTL.**
- **VERT. OR HORIZ. MTG.**
- **AS ABOVE.**
- **SPECIAL FEATURES**

*www.americanradiohistory.com*
### Open-Reel Tape Recorders

**Dokorder 7200**

**Crown SX824**

**AKAI GX-370D**

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>Speeds by letter code:</th>
<th>SPECIAL FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKAI</td>
<td>GX-370D</td>
<td>A BC D E F G H</td>
<td>Lo-noise tape swt.; auto rev. rec./PB; AGC; SOS; 5WS; auto stop-off</td>
</tr>
<tr>
<td></td>
<td>7200 SS 4-chan.</td>
<td>A BC D E F G H</td>
<td>&quot;2/4-chan. auto contl. rev. PB; lo-noise tape swt.; SOS recont contl</td>
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<tr>
<td></td>
<td>8800 SS 4-chan.</td>
<td>A BC D E F G H</td>
<td>7/4-chan.; lo-noise tape swt.; built-in 8-k.; auto stop pause</td>
</tr>
<tr>
<td></td>
<td>X-2000 50</td>
<td>A BC D E F G H</td>
<td>Built-in cas &amp; 8-k.; pause; auto off; transfer sus</td>
</tr>
<tr>
<td></td>
<td>GX-900D</td>
<td>A BC D E F G H</td>
<td>Built-in cas w. transfer; auto stop/off pause</td>
</tr>
<tr>
<td></td>
<td>X-1800D</td>
<td>A BC D E F G H</td>
<td>Built-in 8-k w. transfer; auto rev.; lo-noise tape swt. pause; auto stop/off &amp; contl PB</td>
</tr>
<tr>
<td></td>
<td>4000SS</td>
<td>A BC D E F G H</td>
<td>Lo-noise tape swt.; SOS; 5WS; auto off; pause</td>
</tr>
<tr>
<td>ASTROCON</td>
<td>40/7A 4-chan.</td>
<td>A BC D E F G H</td>
<td>Auto rev.</td>
</tr>
<tr>
<td></td>
<td>711 4-chan.</td>
<td>A BC D E F G H</td>
<td>Headphone amps. mixing,</td>
</tr>
<tr>
<td>BRAWN</td>
<td>TG-1000 4-chan.</td>
<td>A BC D E F G H</td>
<td>Elect. tape tension contl.; peak read mtrs; 4-chan PB; remote contl.; opt. auto rewind</td>
</tr>
<tr>
<td>CONCORD (BENJAMIN)</td>
<td>Mark VIII</td>
<td>A BC D E F G H</td>
<td>Has built-in 8-k. desk.</td>
</tr>
<tr>
<td></td>
<td>SK724</td>
<td>A BC D E F G H</td>
<td>Dual mic.; 1/4 in. GI mtr.; also in 1/4 track.</td>
</tr>
<tr>
<td></td>
<td>SX824</td>
<td>A BC D E F G H</td>
<td>Complete logic; Wal. cab.; counter opt.; also in 3/4 track.</td>
</tr>
<tr>
<td></td>
<td>SX824</td>
<td>A BC D E F G H</td>
<td>As above. Also in 1/2 track or 4-chan.</td>
</tr>
<tr>
<td></td>
<td>9100/1</td>
<td>A BC D E F G H</td>
<td>Bi-directional rec./PB; auto repeat</td>
</tr>
<tr>
<td></td>
<td>7200</td>
<td>A BC D E F G H</td>
<td>Auto PB repeat; auto off; adj. reel height; SOS; 5WS; echo; lock; pause contl.</td>
</tr>
<tr>
<td></td>
<td>6200</td>
<td>A BC D E F G H</td>
<td>Bi-directional rec./PB; auto repeat; auto off;</td>
</tr>
<tr>
<td></td>
<td>7500</td>
<td>A BC D E F G H</td>
<td>Bi-directional rec./PB; auto repeat; auto off;</td>
</tr>
</tbody>
</table>

**Audio: Our 25th Year • September 1972**

---

**Recorders**

- **B** = Belt
- **B** = Bead
- **B** = Belt
- **B** = Bead
- **B** = Belt
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- **B** = Belt
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- **B** = Belt
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- **B** = Bead
- **B** = Belt
- **B** = Bead
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, just 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-exursion, expanded scales. Now would you really expect a machine as strong as all this to be anything but silent?

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

*Dolby is a trademark of Dolby Laboratories, Inc.
## Open-Reel Tape Recorders

### Panasonic RS-740US

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>Model</th>
<th>Model No.</th>
<th>Heads</th>
<th>Channel(s)</th>
<th>Tapes</th>
<th>Motor Type</th>
<th>Hinge</th>
<th>Upper idler type</th>
<th>Arm tension</th>
<th>Lower idler type</th>
<th>Arm tension</th>
<th>Weight</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>JVC 4RD-1401</td>
<td>B No</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>Ind.</td>
<td>Idler</td>
<td>Idler</td>
<td>Idler</td>
<td>Idler</td>
<td>Idler</td>
<td>Idler</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 1/4k</td>
<td>0.1</td>
<td>45</td>
<td></td>
<td>180</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 1/4k</td>
<td>0.1</td>
<td>50</td>
<td></td>
<td>180</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

### Pioneer T-6600

#### Speeds by letter code:

- B: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- C: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- D: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- E: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- F: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- G: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- H: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- J: 2/4 channel, 8” x 8” x 8” x 8” x 8”

#### Special Features

- Auto reverse, remote control, tape select, SSS, remote pause/cont.

### Panasonic RS-740US

- B: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- D: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- E: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- F: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- G: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- H: 2/4 channel, 8” x 8” x 8” x 8” x 8”
- J: 2/4 channel, 8” x 8” x 8” x 8” x 8”

#### Special Features

- Auto reverse, remote control, tape select, SSS, remote pause/cont.

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90 | AUDIO | OUR 25th YEAR | SEPTEMBER 1972 | www.americanradiohistory.com
### Open-Reel Tape Recorders

**Revox A77 Dolby**

**Sansui SD7000**

**Sony 366-4**

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>SPEEDS</th>
<th>POWER</th>
<th>M.V.O</th>
<th>MAJOR FEATURES</th>
<th>SPECIAL FEATURES</th>
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</thead>
<tbody>
<tr>
<td><strong>RADIO SHACK</strong></td>
<td>494</td>
<td>A/2 4ch</td>
<td>3</td>
<td>Ind. Belt</td>
<td>50 Mtr.</td>
<td>249.95</td>
</tr>
<tr>
<td></td>
<td>999B</td>
<td>A/2 4ch</td>
<td>3</td>
<td>Ind. Belt</td>
<td>40 Mtr.</td>
<td>199.95</td>
</tr>
<tr>
<td></td>
<td>920B</td>
<td>A/2 4ch</td>
<td>3</td>
<td>Ind. Belt</td>
<td>50-18k</td>
<td>149.95</td>
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<tr>
<td><strong>REVOX</strong></td>
<td>A77</td>
<td>B Opt.</td>
<td>10</td>
<td>Servo Direct</td>
<td>30-20k</td>
<td>279.95</td>
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<tr>
<td></td>
<td>SD7000</td>
<td>B No</td>
<td>7</td>
<td>Mys</td>
<td>20-20k</td>
<td>199.95</td>
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<tr>
<td><strong>SONY/SUPRASCOPE</strong></td>
<td>TC-650</td>
<td>E No</td>
<td>10</td>
<td>Servo</td>
<td>30-20k</td>
<td>179.95</td>
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<td>TC-850</td>
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<td>Servo</td>
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<td>Mys</td>
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<td>TC-650</td>
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<td>Mys</td>
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<td>TC-800B</td>
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<td>TC-106A</td>
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<td>7</td>
<td>Ind.</td>
<td>40-18k</td>
<td>299.95</td>
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</table>

- Two or four channel.
- Built-in Mic-line mix; Photophone jack w/ vol. control.
- Two or four channel.
- Built-in Mic-line mix; Photophone jack w/ vol. control.
- Servo-conti. tension.
- Servo-conti. tension.
- Servo-conti. tension.
- Mic-line mix; auto off.
- Mic-line mix; auto off.
- Mic-line mix; auto off.
- Mic-line mix; a.c./d.c.
- Mic-line mix; a.c./d.c.
- Mic-line mix; auto off.
- Mic-line mix; auto off.
- Mic-line mix; auto off.
- Mic-line mix; auto off.
- Mic-line mix; auto off.
- Mic-line mix; auto off.
- Mic-line mix; a.c./d.c.
- Mic-line mix; auto off.
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- Mic-line mix; auto off.
- Mic-line mix; auto off.
- Mic-line mix; auto off.
- Mic-line mix; auto off.
- Mic-line mix; auto off.
- Mic-line mix; a.c./d.c.
## Open-Reel Tape Recorders

### Tandberg 9041X

<table>
<thead>
<tr>
<th>Manafacturer</th>
<th>Model</th>
<th>Power Supply voltage</th>
<th>First/Last Signal</th>
<th>Max. No. of Nights</th>
<th>Max. No. of Bands</th>
<th>Max. No. of Slots</th>
<th>Direct/Indirect</th>
<th>High/No 130V No.</th>
<th>No. 130V No.</th>
<th>Speeds</th>
<th>Weight of Reel</th>
<th>Weight of Case</th>
<th>Price</th>
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<tbody>
<tr>
<td>Tandberg</td>
<td>9041X</td>
<td>A</td>
<td>No</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>Asyn.</td>
<td>40-20k - 2</td>
<td>2 Mtrs.</td>
<td>15% x 12% x 6%</td>
<td>20</td>
<td>349.95</td>
<td>549.50</td>
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<tr>
<td></td>
<td></td>
<td>A</td>
<td>Yes</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>Asyn.</td>
<td>40-20k - 2</td>
<td>2 Mtrs.</td>
<td>15% x 12% x 6%</td>
<td>23</td>
<td>449.50</td>
<td>559.90</td>
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<tr>
<td></td>
<td></td>
<td>A</td>
<td>No</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>Asyn.</td>
<td>40-20k - 2</td>
<td>2 Mtrs.</td>
<td>15% x 12% x 6%</td>
<td>21</td>
<td>529.90</td>
<td>629.80</td>
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<tr>
<td></td>
<td></td>
<td>A</td>
<td>No</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>Asyn.</td>
<td>40-20k - 2</td>
<td>2 Mtrs.</td>
<td>15% x 12% x 6%</td>
<td>21</td>
<td>649.50</td>
<td>669.50</td>
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### Tapesonic 70A-TRSH

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Speeds</th>
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</thead>
<tbody>
<tr>
<td>Tapesonic</td>
<td>70A-TRSH</td>
<td></td>
</tr>
</tbody>
</table>

### TEAC 3340

#### Speeds by letter code:
- A: 15
- B: 1/2 x 15
- C: 3/4 x 15
- D: 1 x 15
- E: 1 1/2 x 15
- F: 2 x 15

#### Special Features
- With case: "**"less case; also in 1/4 tk., Model 70A-TRSH"
Imagine—to cradle in the palm of your hand as much as 180 minutes of the joy of music. What engineers all over the world have striven to achieve for years, TDK alone has done. The new C-180 LN is the first and only cassette that concentrates three full hours of life-like low-noise sound reproduction within the confines of a cassette. And it does so with the trouble-free reliability for which all TDK cassettes are famous.

Just lean back, relax and enjoy. For three full hours. The C-180 LN cassette by TDK.
# Cassette & Cartridge Recorders

**HITACHI TRQ.262**
- Heath Ad
- BRAUN
- AKAI CR80DSS
- 94 AUDIO
- 4.chan.
- TPQ-144
- TPQ.134
- GD
- HKI000
- CAD
- CP-100
- CD
- 4chan.
- Mark
- TCR 307
- 4
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- 110
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Of course!
Only AKAI combines exclusive Automatic Distortion Reduction System (ADRS) and GX Head with Dolby to achieve unparalleled Cassette recording quality...approaching that of the finest reel-to-reel recorders.

ADRS—a remarkable engineering breakthrough—is available only from AKAI. Eliminates almost all high frequency distortion above 8000Hz.

And only AKAI combines ADRS with Dolby. Add to that the extended frequency range of AKAI’s exclusive GX (glass and crystal ferrite) head and it all adds up to the most perfect cassette recording in the world today.

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What’s more, superbly engineered AKAI Cassette Recorders are now available at prices starting as low as $159.95*.

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*Model CS-35D

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Check No. 95 on Reader Service Card
### Cassette & Cartridge Recorders

![Cassette Recorder](image)

#### JVC CD-1668
- **Manufacturer**: JVC
- **Model**: CD-1668
- **Specs**: 30-16k, 0.13, 50 A.C.
- **Price**: $269.95
- **Features**: Noise reduction sys.; CR02 switch.; auto stop.

#### Kenwood KX-700
- **Manufacturer**: Kenwood
- **Model**: KX-700
- **Specs**: 12-15k, 0.15, 58 A.C.
- **Price**: $259.95
- **Features**: Double drive, hys.-sync. mtr.; turn x 4; 10 M/97.

#### Lafayette RK-D40
- **Manufacturer**: Lafayette
- **Model**: RK-D40
- **Specs**: 30-13k, 0.25, 49 A.C.
- **Price**: $179.95
- **Features**: Rec.; 2 mic & 2 line inputs; furn. x 4; Cr02 switch.; headphone amp only.

### Table: Cassette & Cartridge Recorders

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Country</th>
<th>Cassette/Cartridge</th>
<th>Tape Speed(s)</th>
<th>Microphone Inputs</th>
<th>Frequency Response (Hz)</th>
<th>Tone Controls</th>
<th>S/N Ratio</th>
<th>Special Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>JVC</td>
<td>CD-1668</td>
<td>X</td>
<td>No</td>
<td>S 30-16k</td>
<td>1.3 50 A.C.</td>
<td>17 x 11</td>
<td></td>
<td>16</td>
<td>149.95</td>
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<tr>
<td></td>
<td>CD-1666</td>
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<td>No</td>
<td>S 30-16k</td>
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<td>13</td>
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<td>CD-1667</td>
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<td>CD-1666</td>
<td>X</td>
<td>No</td>
<td>S 30-16k</td>
<td>1.3 50 A.C.</td>
<td>15 x 11</td>
<td></td>
<td>10</td>
<td>149.95</td>
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<tr>
<td>Kenwood</td>
<td>KX-700</td>
<td>X</td>
<td>No</td>
<td>S 12-15k</td>
<td>1.5 58 A.C.</td>
<td>15 x 11 x 11</td>
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<tr>
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<td>KX-700A</td>
<td>X</td>
<td>No</td>
<td>S 40-10k</td>
<td>1.2 45 A.C.</td>
<td>10 x 9</td>
<td></td>
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<td>159.95</td>
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<tr>
<td>Lafayette</td>
<td>RK-760B</td>
<td>X</td>
<td>&quot;</td>
<td>S 30-12k</td>
<td>1.25 48 A.C.</td>
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<td>RK-760C</td>
<td>X</td>
<td>&quot;</td>
<td>S 30-12k</td>
<td>1.25 49 A.C.</td>
<td>11 x 11 x 11</td>
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<td>17</td>
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<tr>
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<td>RK-890A</td>
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<td>1.25 49 A.C.</td>
<td>12 x 9 x 3</td>
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<td>12</td>
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<tr>
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<td>RK-890B</td>
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<td>S 30-12k</td>
<td>1.25 49 A.C.</td>
<td>9 x 6 x 6</td>
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<td>RK-890D</td>
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<td>10</td>
<td>97.95</td>
</tr>
<tr>
<td>MCA</td>
<td>SM-80</td>
<td>8</td>
<td>Yes</td>
<td>S 50-15k</td>
<td>1.3 60 A.C.</td>
<td>20 x 3 / 7 / 4</td>
<td></td>
<td>124</td>
<td>124.95</td>
</tr>
<tr>
<td></td>
<td>TC-32</td>
<td>8</td>
<td>Yes</td>
<td>M 150-10k</td>
<td>1.2 60 A.C.</td>
<td>11 x 7 / 4 / 2</td>
<td></td>
<td>5</td>
<td>49.95</td>
</tr>
<tr>
<td></td>
<td>TC-30</td>
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<td>Yes</td>
<td>M 100-6k</td>
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<td>12 x 7 / 4 / 2</td>
<td></td>
<td>5</td>
<td>49.88</td>
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<tr>
<td></td>
<td>TD-80</td>
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<td>S 50-10k</td>
<td>0.3 60 A.C.</td>
<td>8 x 10 / 9 / 3</td>
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<td>5</td>
<td>49.95</td>
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<td>Magnavox</td>
<td>JX-8844</td>
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<td>S 50-12k</td>
<td>1.5 40 A.C.</td>
<td>18 x 11 / 9 / 3</td>
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<td></td>
<td>Auto changer;</td>
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<td>JX-8843</td>
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<td>S 50-12k</td>
<td>1.5 40 A.C.</td>
<td>17 x 10 / 5 / 3</td>
<td></td>
<td></td>
<td>Auto rec.;</td>
</tr>
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<td>JX-8842</td>
<td>X</td>
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<td>S 50-12k</td>
<td>1.5 40 A.C.</td>
<td>15 x 10 / 5 / 4</td>
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<td></td>
<td>Auto noise reduc. sys.; CR02 switch; auto off/stop.</td>
</tr>
<tr>
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<td>JX-8871</td>
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<td>S 50-10k</td>
<td>1.5 40 A.C.</td>
<td>11 x 9 / 4 / 3</td>
<td></td>
<td></td>
<td>Auto stop/stop.</td>
</tr>
</tbody>
</table>
## Cassette & Cartridge Recorders

### Manufacturers & Models

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Cassette</th>
<th>Tape Width</th>
<th>Take-up Reel</th>
<th>Motor Drive</th>
<th>Motor Power</th>
<th>Motor Volts</th>
<th>Mic &amp; Line In</th>
<th>Speaker Volts</th>
<th>Frequency</th>
<th>WRMS</th>
<th>SPECIAL FEATURES</th>
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<tbody>
<tr>
<td>NIKKO</td>
<td>CR-301</td>
<td>B</td>
<td>H</td>
<td>Yes</td>
<td>25</td>
<td>40-12k 0.3</td>
<td>A.C.</td>
<td>Not turn</td>
<td>18 1/8 x 13 1/8</td>
<td>x 6</td>
<td>24</td>
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<tr>
<td>OLSON</td>
<td>RA-389</td>
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<td>A.C.</td>
<td>Ext</td>
<td>7 3/4 x 12 3/4</td>
<td>x 3 5/8</td>
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<td>94.98</td>
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<td>RA-589</td>
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<td>x 4 1/2</td>
<td>8</td>
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<tr>
<td>PANASONIC</td>
<td>RS277US</td>
<td>X</td>
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<td>No</td>
<td>S</td>
<td>30-19k 0.1</td>
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<td>16 1/4 x 12 1/4</td>
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<td>18</td>
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<td>RS266US</td>
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<td>S</td>
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<td>14 1/4 x 9 1/4</td>
<td>x 5</td>
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<td>RS277US</td>
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<td>20-14k 0.25</td>
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<td>S</td>
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<td>19</td>
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<td>PHILIPS</td>
<td>2100</td>
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<td>No</td>
<td>S</td>
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<td>S</td>
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<td>x 4/16</td>
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<td>T-3500</td>
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<td>x 4/16</td>
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<td>RADIO SHACK</td>
<td>SCT-6</td>
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<td>TR-296B 4 chan.</td>
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<td>H</td>
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### Audio - Our 25th Year - September 1972

97
### Cassette & Cartridge Recorders

#### Manufacturers

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<th>Model</th>
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<th>Manual 3, w/ Line Out</th>
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<th>VU meter</th>
<th>Tape Counter</th>
<th>Record lockout</th>
<th>Auto On/Off</th>
<th>Peak Limiter</th>
<th>Memory Swit.</th>
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### Stereo Headphones

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**Audio** - Our 25th Year - September 1972
## Stereo Headphones

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<th>MANUFACTURER</th>
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<th>TYPE</th>
<th>Frequency Response</th>
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SPECIAL FEATURES:
- Coil cord, mono/stereo swt.
- 4 channel, 2 spks. in each cap.
- Liquid-filled earcushions.
- Bassport design.
- Open-back earcup.
- 2 way, 2 level contls.; w. "Y" connector.
- Removable, washable earpads.
- Coiled cord, three conductor phone plug.
- Padded headband, three conductor phone plug.
- 2 way syst. w. L-C x-over, remote contl. w. vol. & tone contls, stereo/mono swt. Dynaphase 60, less remote contl., $59.95.
- 2 level contls.
- Dynaphase 40/600, similar but 600 ohms, w. built-in match. xformer, $47.95.
- Wooler tweeter; acous. susp., clothing clip, Hi-Z model avail.
- Self-actuated console included, spkr/phones swit., auto circuit prof.
- Semi-actuated cushions; clothing clip.
- Wooler tweeter; level & tweeter contls., clothing clip.
- Foam padded headband.
- Liquid-filled earcups, adj. headband.
- Slide vol. & tone contls. for each chan.; silicone ear cushions; padded headband, coiled cord. Studio II, less contls., $59.95.
- Vol. contls. for each chan.; padded headband. Model 100, less contls., $34.95.
- Vol. contls. for each chan.; padded headband. Model 100, less contls. with 8-ft. cord, $15.95.

100 AUDIO • OUR 25th YEAR • SEPTEMBER 1972

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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. 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 II 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 diaphragm 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.

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<tr>
<th>Manufacturer</th>
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<th>Units</th>
<th>System Resonance (Hz)</th>
<th>Sensitivity (dB)</th>
<th>Dispersion</th>
<th>Frequency Response &amp; Harmonic Distortion</th>
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<td>Price</td>
<td>Remarks</td>
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<td></td>
<td></td>
<td>8 3/4 x 7 3/4 x 11 3/8</td>
<td>$45.00</td>
<td>Smooth, good dispersion.</td>
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<td>$99.95</td>
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<td>10 x 8 x 13</td>
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<td>Smooth, excellent dispersion.</td>
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<tr>
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<td>9 1/2 x 7 1/2 x 15</td>
<td>$32.95</td>
<td>Some mid-range coloration. &quot;port.</td>
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<td>10 x 8 1/2 x 14 1/2</td>
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<td>1 kHz</td>
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<td>10 1/4 x 7 x 12 1/8</td>
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<td>9 x 8 1/4 x 11 3/4</td>
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<td>Slightly forward, good dispersion, H.F. level cont.</td>
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<td>7 1/4 x 5 1/2 x 10 1/2</td>
<td>$69.95</td>
<td>Bass restricted, smallest system tested.</td>
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<td>1 kHz</td>
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<td>9 x 7 1/2 x 13 1/2</td>
<td>$24.95</td>
<td>High frequency fall off, will accept treble lift.</td>
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<td>9 x 5 x 12</td>
<td>$30.00</td>
<td>Slight hard coloration.</td>
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<td>8 x 6</td>
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<td>9 x 8 x 15 1/2</td>
<td>$130.00</td>
<td>Most sensitive system tested, slightly &quot;forward.&quot;</td>
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**Notes:**
- Dimensions in inches.
- Prices in dollars.
- Remarks highlight key listening qualities.
Heathkit Frequency Counter
Model IB-101

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 gates.

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.

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

MANUFACTURER’S SPECIFICATIONS

Frequency Range: 1 Hz 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
Input Impedance: 1 megohm shunted by less than 20 pF
Time-Base Frequency: 1 MHz, crystal controlled
Readout: 5 digits plus overrange indicator
Dimensions: 8½” wide × 3¾” high × 9” deep (exclusive of handle)
Weight: 4½ lbs.
Price: $199.95 (kit)
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.

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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.

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 instruc-

![Fig. 2](image)

![Fig. 3](image)

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 receptacles for each row of pins.

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

Cautions 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.

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.
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 occurred 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.

SATCHMO, FATS, AND GIBBON.


Gibson Audio? Sure, Gibson Audio of New Orleans.

Maybe we aren't makers of music like Gibson Audio of NEW ORLEANS. The One Place in New Orleans to Buy:

"Satch" and "Fats", but the audio equipment we sell makes the most beautiful music you've ever heard.

If you're lucky enough to live in New Orleans, you can stop in and see us tomorrow. Or else see your travel agent. We're worth the trip.

Check No. 106 on Reader Service Card

T.A.
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 dismaying 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.

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 Arroyo 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 Ghuselev.

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 Bonygne, 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 Bacoquier 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.

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Classical Record Reviews

Edward Tatnall Canby

Blindfolded, you can still repair and splice recording tape the fastest, easiest, most precise way known.

Carl Nielsen: Symphony No. 5. L'Orchestre de la Suisse Romande, Klezni. 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 held. 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 Nielsene 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-


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+

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AUDIO • OUR 25th YEAR • SEPTEMBER 1972
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

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**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-

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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 humorously 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


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 performance standards without being dry, dogmatic and dusty. His Handel moves along in modern style, briskly, naturally, with all proper details like continuous 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
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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, blind 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 dejene?"—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 the 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 products 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—if 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 +
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'chasin'!

Things may also be a'chasin' 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 state-side—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 blunders. 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 convicts 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 'Weeping 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 instrumental is the 6:27 "West Side Story" medley "Something's Coming," "Tonight," "Maria," "America" and "Something Else") 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," "Home-ward 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," "Summer-time" and "Wade in the Water." Alpert's horn is still golden, and the sound is unique. (Continued)
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I'D LIKE TO TEACH THE WORLD TO SING (Metromedia, KMD 1051) is the first album by The Hillside Singers, a nine-member group. Folk-in-sing-a-long style, the group is best, naturally, on its charting 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-74113) is also 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 background, 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 album tracks accurately describe as an "overdubbed violin in a mock Elizabethan piece that escalates into a jig."

ALREADY A HOUSEHOLD WORD (Rare Earth, RS321) spotlights Re- pairs, 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.
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**

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**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)
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 Vocation 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 hymn, a rag, and parlor guitar in a generous survey of 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 "Pig Ankle" and "Dew Drop" and "Ching Chong" as 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 barrel roll 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 thoroughly but McGee's sidemen are just as it says, strictly off to the side.

McGee's vocals parallel his instrumental—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, trombone; 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.

Audophile 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 imparts 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's influence. 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 jazzer and jazzer 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 irresistible 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 Audophile Records and you want to get the spirit, this may be ordered from Audophile Records, Inc. P.O. Box 66, San Antonio, Texas 78291.

Sound: B+ Performance: A-
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