Stereo Review's

TAPE RECORDING & BUYING GUIDE 1982

THE COMPLETE CONSUMER'S DIRECTORY OF
CASSETTE DECKS • CAR STEREO • VIDEO RECORDERS
SIGNAL PROCESSORS • MICROPHONES • BLANK TAPES
INCLUDES FULL SPECIFICATIONS • FEATURES • PRICES

ALSO: Experts discuss how to choose and use Audio & Video equipment

PLUS: Hirsch/Houck Lab Tape Deck Test Reports
Anyone who records on tape knows what a pain it is to run out of tape before running out of music.

Pioneer has relieved this pain. Along with quite a few others inherent in the designs of practically all components being built today.

We've done it through a concept we call *High Fidelity for Humans*. A design and engineering idea so far reaching, that for the first time components are as pleasant to live with as they are to listen to.

For example, our new CT-9R cassette deck shows you a digital readout of the precise amount of recording time left on a tape.

Touch a button and find your favorite song. Because the CT-9R Index Scan breezes through your tape, automatically stopping to play the first five seconds of each piece of music.

If you want to hear a song over, you don't press REVERSE. STOP. PLAY. REVERSE. STOP. PLAY, until you find the beginning. Instead, you simply press the Music Repeat button. The deck does the rest.

The CT-9R even plays both sides of a cassette, automatically.

But don't get the idea that we've produced a cassette deck that is just a lot of fun to play with. It's also a lot of
fun to listen to.

Our signal-to-noise ratio and high frequency response set a standard in state of the art electronics due to the creation of totally unique record and play heads. They're called RIBBON SENDUST heads and they're only on Pioneer cassette decks.

We've also attained extraordinary record and playback accuracy. Because we've seen to it that the drive capstan and both the take up and supply spindles are driven directly by their own motors. We call it our 3 Direct Drive motor transport and it, too, is exclusively Pioneer's.

Plus, we have Dolby C. The latest in Dolby engineering, designed to once and for all rid you and your tape of hiss.

If you're the least bit skeptical that a cassette deck could do so much so well, we suggest you visit your nearest Pioneer dealer.

You can see the CT-9R for yourself, as well as an entire line of new Pioneer cassette decks.

But be forewarned. After seeing these, you'll begin to see cassette decks that just play music for exactly what they are.

Somewhat less than adequate.

PIONEER

We bring it back alive.

CIRCLE NO. 22 ON READER SERVICE CARD
WHY SPEND $200 MORE ON A BETTER TAPE DECK WHEN ALL YOU NEED IS $2 MORE FOR A BETTER TAPE.

No matter how much you spend on a tape deck, the sound that comes out of it can only be as good as the tape you put in it. So before you invest a few hundred dollars upgrading your tape deck, invest a few extra dollars in a new Maxell XLI-S or XLII-S cassette.

They're the newest and most advanced generation of oxide formulation tapes. By engineering smaller and more uniformly shaped oxide particles, we were able to pack more of these particles onto a given area of tape.

Now this might not sound exactly earth-shattering, but it can help your tape deck live up to its specifications by improving output, signal-to-noise ratio and frequency response.

Our new XLS cassettes also have an improved binder system, which helps keep the oxide particles exactly where they're supposed to be. On the tape's surface, not on your recording heads. As a result, you'll hear a lot more music and a lot less distortion.

There's more to our XLS tape than just great tape. We've also redesigned our cassette shells. Our new Quin-Lok™ Clamp/Hub Assembly holds the leader firmly in place and eliminates tape deformation. Which means you'll not only hear great music, but you'll also be able to enjoy it a lot longer.

So if you'd like to get better sound out of your tape system, you don't have to put more money into it. Just put in our new tape.

IT'S WORTH IT.
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1982 EDITION
At last there's a cassette transport that fully exploits the precision of quartz.

You expect precision from quartz-locked direct-drive. But with a wow and flutter specification of 0.019% WRMS, the JVC DD-9 goes beyond your wildest expectations.

Audibly, this means complete freedom from pitch waverinc. Plus uncanny clarity in the high frequencies thanks to almost total absence of flutter.

What else can you expect from a deck that's this accurate? Dolby C for one thing. It reduces noise by 20 dB (versus 10 dB with the previous Dolby system). And it operates much farther down into the midrange, giving 15 dB noise reduction even at 500 Hz.

Against this newfound background of silence you'll hear a greater resolution of musical details, especially with wide-range source material.

There's other JVC magic in the DD-9, too. Like our computer B.E.S.T. system that automatically measures every tape you use. Then sets bias, EQ and noise-reduction values to achieve ruler-flat response with lowest possible distortion. While JVC's heralded Sen-Alloy (SA) Heads give you supremely low distortion plus rugged durability, all in a three-head configuration.

There's also an electronic digital tape/time counter Peak/VU fluorescent level meters, Memory and Auto Rewind. And full-logic transport controls.

Is there a place in your system for a deck as accurate as the DD-9? Or the DD-7 or DD-5, both with wow and flutter at 0.021% WRMS? Why not visit a JVC dealer and find out.
By Ivan Berger

If the professionals make better-sounding tape recordings than you do, the credit doesn’t all belong to their recording gear. Today’s better cassette decks are as good in many respects as professional open-reel decks of a decade or so back—decks that are still in use in some studios. No, the real “professional” difference is technique, and many of the professional techniques are things you can do as readily even though you are usually dubbing whereas they are working with live material. And there are other tips as well, most of which don’t apply to professional recording, that can help you get better-sounding results.

Tape/Deck Matching

The first step toward getting good recordings is to match your recorder and your tape properly. Setting your deck’s bias and equalization switches to match the tape type is important, of course, but it’s not quite the whole story. Matching your deck to the precise tape formulation you are recording on will help you squeeze the last possible decibel of performance from it. Many of the newest decks can do this job automatically, but they’re among the most expensive models. More moderate-priced decks have metering or indicating circuits that show you when the bias is
BASF Chrome.
The world's quietest tape is like no tape at all.

Today only one high bias tape is able to combine outstanding sensitivity in the critical high frequency range with the lowest background noise of any oxide tape in the world. That tape is BASF's Professional II.

Professional II is like no other tape because it's made like no other tape. While ordinary high bias tapes are made from modified particles of ferric oxide, Professional II is made of pure chromium dioxide. These perfectly shaped and uniformly sized particles provide a magnetic medium that not only delivers an absolute minimum of background noise, but outstanding high frequencies as well.

Like all BASF tapes, Professional II comes encased in the new ultra-precision cassette shell for perfect alignment, smooth, even movement and consistent high fidelity reproduction. With Professional II, you'll hear all of the music and none of the tape. And isn't that what you want in a tape?

The difference in noise level between PRO II and ordinary high bias tape is greatest where the human ear is most sensitive (2-6 kHz).

For the best recordings you'll ever make.

BASF Systems, Crosby Drive, Bedford, Massachusetts 01730
CIRCLE NO. 5 ON READER SERVICE CARD
But, like all general statements, this has only held briefly during the loudest ones. Occasionally during the softest passages the general rule is to set the level so that the material you're taping. A good tape, from deck to deck, and according to how well you're performing will all have exactly the same characteristics. (Assuming this is possible) to make sure that your deck's bias is correctly set for the particular tape you're recording on.

But you can get a good match even without such aids. If your deck has a continuously variable bias control, try adjusting it slowly as you make a test tape of a record that is sonically as similar as possible to the kind of material you're planning to record (live, off the air, or whatever). Listen critically so you can find which bias setting gives the best balance among good high-frequency response, low distortion, and low noise. (Optimizing for one of these qualities alone is sure to worsen at least one of the others.) If the bias control on your deck is not continuously variable (or if there isn't any control at all), buy a selection of different brands and types of cassettes and try recording the same material on each of them to see which gives the best results. You won't be wasting money on the tapes that turn out to be less than the best, since the quality spread between the best and the worst on your machine is likely to be fairly narrow; cassettes from reputable manufacturers should all give you at least good results. But once you know which tape brand and type performs the very best on your machine, stick with it (and bear in mind that C-60 and C-90 cassettes that are nominally of the same formulation will have slightly different performance characteristics).

To be absolutely sure of maintaining the best possible tape/deck match, take two more tips from the pros. First, buy your preferred tape a dozen or so cassettes at a time so as to ensure that they will all have exactly the same characteristics. Manufacturers have been known to make unannounced improvements in tape formulations that change their performance characteristics; even when this isn't a factor, buying tapes in quantity will ensure that you won't run out at an awkward time—and you may get a larger discount. Second, before each critical recording, recheck and readjust (if necessary) your deck's bias (assuming this is possible) to make sure the internal settings haven't drifted.

**Level Setting**

Using a less than optimum tape can subtly "fog" a recording, but the wrong recording level can ruin it altogether. Unfortunately, what constitutes the right recording level varies from tape to tape, from deck to deck, and according to the material you're taping. A good general rule is to set the level so that the meter needle or level indicatorwitches occasionally during the softest passages and moves past 0 or into the red area only briefly during the loudest ones. But, like all general statements, this has to be qualified by the specific recording and by what is said in your recorder's instruction manual.

- **Meter Types:** The same signal will register higher on a peak-reading meter than on an average-reading one (such as a VU meter) since, after all, a signal's average value will always be less than its highest (peak) value. The difference can be anywhere from 3 to 8 dB, depending on the material being recorded, so don't try to convert mentally from one system to the other; just learn how to interpret the one your machine uses.

Some new machines have meters or bar-graph indicators with expanded scales, and these require a little different thinking too. Obviously, a signal level that barely causes the needle to twitch on a meter whose scale stops at 

"- 20 dB will provoke vigorous needle movement on one whose scale goes all the way down to, say, -45 dB. Moreover, different manufacturers may set their meters' 0-level points differently. Setting it low gives lots of headroom for undistorted recording above the 0 point, but it also increases the risk that soft passages will be recorded with too little gain and be excessively hissy on playback. Setting the 0 level high gives a better signal-to-noise ratio—but at an increased risk of overload distortion in loud passages.

- **Headroom and Saturation:** Tape decks—and, even more, tapes—differ in their ability to handle strong signals without overload distortion due to saturation of the head or the tape. This is especially true at the higher frequencies (above 8,000 Hz or so), but since these are usually overtones and are rolled off a bit by many microphones, much of what you record won't contain enough high-level, high-frequency sound to cause trouble. If your deck can record on pure-metal tape, that's the obvious type to use for critical recordings of treble-rich material; improved high-end headroom is the greatest benefit of metal tape.

- **Presetting Levels:** It's best, of course, if your recording level is set correctly from the moment you begin tapping. And it's usually possible to sample the source material beforehand to determine what the level should be. If you're recording from FM, it's easy—FM has a comparatively limited dynamic range that's easy to get on tape. One caution, however: you can't judge the level of a music program by the announcements between musical selections. Some stations deliberately cut back their volume during such announcements, feeling that it's unrealistic for an announcer to sound as loud as an orchestra or rock band. Others soup up the level of the commercials.

If you're dubbing from a disc or another tape, just play the loudest passages and set your levels so that they can be recorded without distortion. This is especially easy with records, since the loudest passages can often be spotted by eye; they are the areas where the disc surface appears roughest.

- **Riding Gain:** Unless you're taping material with a limited dynamic range on a recorder with a wide one, no single level setting will quite manage to keep the recorded signal both well above the noise in quiet passages and comfortably below the distortion point in loud ones, so you'll probably have to adjust the level settings during the recording—what the pros call "riding gain." This won't be as necessary in dubbing as in live recording, but you'll still have to do some of it, especially when you're dubbing from audiophile recordings with extra-wide dynamic range.

Too many amateurs don't "ride" gain, they chase it—dashing to the level knob to turn it down once a loud passage becomes distorted, then turning it up again when the signal becomes too soft and hence potentially hissy. Tapes made that way sound awful: passages no sooner build to a fortissimo than they're pulled back into an anticlimax; a delicate pianissimo is no sooner established than the level is pumped up again. And, of course, there's an audible increase in noise or distortion just before each delayed correction. The trick in riding gain is to anticipate where the music is heading and to achieve the proper level setting for each passage before the crucial moment. Reduce the gain slowly while a crescendo builds so the sense of its development is not destroyed, then raise it slowly as the music becomes more dynamic range that's easy to get on tape.

**Cleaning and Demagnetizing:** You should periodically clean and demagne-
RECORDING...

"...the art of live recording is the art of knowing where to place your microphones."

Taping Off the Air

So much for the basics; now for specific tips on different kinds of recording jobs. Let's start with the easiest, taping off the air. As I've mentioned, what makes it easy is the limited dynamic and frequency range of most broadcasts. And with FM you'll also find that a recording level that works for one station will almost always be good for any other as long as you're using the same tuner and don't change its output-level settings. Some stations regularly broadcast Dolby-level calibration tones at a 50 per cent modulation level (6 dB below maximum modulation), and if you catch one of these test tones you can use it to calibrate your recording as well as Dolby levels.

Speaking of Dolby, you'll find that most decks equipped with Dolby noise-reduction circuitry also have a switch position marked "MPX Filter" or the like. It's wise to switch in this filter whenever you tape a stereo FM program, for without it remnants of the FM-multiplex pilot tone leaking from your tuner or receiver may fool the Dolby circuits into acting as if there were more high-frequency audio in the signal than is actually there.

A recording from FM can be no better than the received signal, so make sure this is as good as possible. Tune in the station accurately and orient your antenna for the cleanest signal. Compare the signal quality in stereo, mono, and (if your tuner has it) "high-blend" mode (this is sometimes, confusingly, labeled "MPX Filter") to see which one gives the best-sounding results. Since reception conditions do change, make all these checks as close as you can to the airtime of the program you want to tape—but not so close that you'll be pressed for time to resolve any problems you encounter. With today's equipment there's rarely any need to warm it up beforehand, but there's no harm in this either.

Try to match the tape length to that of the music program you're taping if you know in advance what that will be. Broadcasts of classical music are usually listed in advance in station program guides or local FM magazines (some even give timings!). For specific pop selections you'll just have to be ready to go when what you want comes on, though programs featuring specific genres or artists are sometimes announced ahead of time. Planning your taping in advance ensures that you won't be frantically scrambling for a blank tape while something you want has already started. And keeping a blank tape cued up and the recording levels set whenever you listen to FM ensures that you'll be ready to tape when opportunity beckons.

Convenient as it is to use a timer to record programs aired when you're not around, it pays to be on hand if possible for taping off the air. That way you can use the deck's pause control to edit out commercials and unwanted announcements. If your machine (or car player) has an automatic music-finding system, be sure when you record to leave a few seconds of silence between selections (decks with "record-mute" switches do this semi-automatically). If you're taping a broadcast of a live concert, though, it isn't a good idea to cut the recording sharply when the music is over; fade out gradually during the applause—and try not to shear off the last few seconds of hall reverberation.

At each announcement break, check the amount of tape remaining and the expected length of the next selection. If you won't be able to get it all without an interruption, take advantage of the intermission to turn the cassette over or to switch to a new one. Finally, if you're in doubt about whether something is worth taping off the air, tape it anyway; you can always reuse the tape if you decide later that the program isn't worth preserving.

Dubbing

There are many reasons you might want to dub your own records or tapes: to preserve irreplaceable old records; to copy discs or open-reel tapes on cassettes for use in a car or with a portable player; to arrange an evening's worth of singles or album cuts for continuous play during a party; to make a tape anthology of your favorites from several sources; to duplicate your own demo tapes to send copies off to record companies... and so on.

If you're dubbing a record, be sure beforehand that the disc and stylus are clean and that the turntable is running at precisely the desired speed (which is not always the nominally correct speed, since you may sometimes want to alter the pitch and tempo slightly). Audition the record carefully beforehand to make sure your turntable has no trouble tracking it; you may need to use one that is better at handling warps. You'll certainly want to use your amplifier's
infrasonic filter, assuming there's one built in, to keep inaudible low-frequency signals from overloading the tape. (An external infrasonic filter is available for $73 in kit form, $93 factory wired, from Ace Audio, 532 Fifth Street, East Northport, N.Y. 11731.)

If you’re dubbing old discs, be sure to use the proper stylus—old mono LPs require 1-mil styli and old 78s 3-mil ones; stereo styli are considerably smaller. Some of the major cartridge manufacturers, such as Shure, Pickering, and Stanton, offer these older-type styli in plug-in form for at least some of their models.

You may also want to use an equalizer when you're taping old records, either to filter out noise or to correct for the differences between older and newer disc-recording curves. If your equalizer doesn’t process the signal it feeds to your tape deck, you can reconnect the deck to the outputs that ordinarily feed the equalized signal back to your system. The monitor outputs of your deck can then be connected to the former equalizer-input jacks.

If your system is at all prone to acoustic feedback, keep your monitoring level very low while dubbing discs.

When dubbing from other tapes, there are fewer points to keep in mind. First, make sure that the playback deck is also clean, demagnetized, and has its 70/120-μsec playback-equalization switch set to match the tape in use. If you are dubbing from one cassette to another, try both machines as the playback unit for the same source tape to see which works best (in general, the better deck should be used as the playback machine).

It is probably worth using Dolby (or whatever other noise-reduction system you have) even when you’re dubbing from a source that’s already noisy. True, Dolby circuitry can’t clean up pre-existing noise, but it will keep the noise from building up further. And if you’re recording from a Dolbyized tape, decode it in playback and then re-encode it while dubbing; even though this means the signal has to pass through extra Dolby circuits, it will help ensure that the Dolby circuits track properly when you play back the dub. (If the source you want to dub is very noisy, you may want to investigate a one-step noise-reduction accessory from such companies as KLH, Phase Linear, etc.)

RECOMMENDED READING

The following four books make up an extremely useful small reference library for the recordist. If you are unable to find them at your local bookstore, library, or audio shop, you can order directly from the publishers at the addresses given. Be sure to include applicable state and local sales taxes when ordering by mail.

- Handbook of Multichannel Recording, by Alton Everest. 322 pp., illus., $10.95 hardbound, $7.95 softbound (postpaid on prepaid orders). Tab Books, Blue Ridge Summit, Pa. 17214.
- Modern Recording Techniques, by Robert Runstein. 368 pp., illus., softbound, $9.95 plus 50¢ postage. Howard W. Sams & Co., Inc., 4300 W. 62nd St., Indianapolis, Ind. 46206.
- The Recording Studio Handbook, by John Woram. 496 pp., illus., hardbound, $37.50 postpaid. Sagamore Publishing Co., 1120 Old Country Road, Plainview, N.Y. 11803.

Live Recording

What the professionals do most—and amateurs least—is to make live recordings through microphones. This is enough of a challenge that whole books have been written on the subject (see the accompanying box), so I’ll just hit the high points.

Basically, the art of live recording is the art of knowing where to place your microphones. There’s no one “right” place: it varies with the acoustics of the room you’re taping in, the kind of music (or other material) you’re taping, and the kind of sound you want to get on the tape. Here are a few basic guidelines:

1. Distance matters most. Moving your mikes in closer doesn’t just make the sound they pick up louder—you could do much the same thing by merely turning up the gain. Microphone distance strongly affects the balance between the direct and the reflected sounds the mikes pick up. The closer the mike, the more sonic details it will get; the farther away the mike, the more full ambiance and sense of spaciousness its signal will have. Usually you’ll want some of each, but you’ll have to pick the balance between them for yourself; experiment to see what works. You’ll find that overly close miking brings in sonic details you might prefer not to hear, such as the slide of a musician’s fingers across strings; set your mike too far away, on the other hand, and the instrumental sound will be submerged in reverberation.

2. Stereo perspective is controllable. There are two basic stereo microphone setups that amateurs can easily use: a crossed pair of directional microphones facing forward in a V configuration on the same stand or a spaced pair of microphones (whether directional or not) on separate stands. Crossed pairs can give a more stable stereo image, but spaced pairs let you get closer pickup of more instruments and a wider stereo “stage.” Again, experiment to find which you prefer—and for what.

3. Too many mikes is madness. Not all pros agree with this—I’ve seen as many as twenty-eight microphones at a classical-music recording session—but more and more audio engineers are coming to realize that although a multiplicity of microphones may give more control over individual instruments and sections, it gives less control over the sound as a whole; moreover, excessive miking sometimes creates strange “comb-filter” effects that add an unnatural quality to the sound. In any case, it pays to learn basic recording techniques using only a couple of mikes, gradually adding more as you master those you already have.

A Final Note

Bear in mind that top-quality equipment is not necessarily required for top-quality results. In fact, a talented and knowledgeable recordist is likely to turn out better-sounding tapes with a mid-price cassette deck than a novice with a professional-quality open-reel machine. Time spent sharpening your recording skills will pay off in better performance from whatever level of equipment you are able to afford.
If you think "pads and rollers" are just a California craze, you're not ready for New Memorex.

Pads and rollers are key components of a cassette's tape transport system. This system guides the tape past your deck's tape head. It must do so with unerring accuracy. And no cassette does it more accurately than totally new Memorex.

The new Memorex tape transport system is precision engineered to exacting tolerances. Flanged, seamless rollers guide the tape effortlessly and exactly. An oversize pad hugs the tape to the tape head with critical pressure: firm enough for precise alignment, gentle enough to dramatically reduce wear.

Our unique ultra-low-friction polyolefin wafers help precision-molded hubs dispense and gather tape silently and uniformly, play after play. Even after 1,000 plays.

In fact, our new Memorex cassette will always deliver true sound reproduction, or we'll replace it. Free.

Of course, reproduction that true and that enduring owes a lot to Permapass™, our extraordinary new binding process. It even owes a little to our unique new fumble-free storage album.

But when you record on new Memorex, whether it's HIGH BIAS II, normal bias MRX I or METAL IV, don't forget the importance of those pads and rollers. Enjoy the music as the tape glides unerringly across the head.

And remember: getting it there is half the fun.

Now more than ever we ask: Is it live, or is it MEMOREX.

© 1981, Memorex Corporation, Santa Clara, California 95052, U.S.A.
The original cassette machine, the Norelco Carry-Corder from Philips, was a marvel of simplicity. There were no adjustments to make (other than in signal level), no choice of tape type or speed or noise-reduction system to confuse the user. It was the audio-tape equivalent of the Kodak Brownie box camera, which may not have made the greatest pictures but was certainly an easy device to use.

Today anyone shopping for a high-fidelity cassette deck must choose among hundreds of models with a broad range of features, capabilities, and prices. Capabilities and prices will interest the prospective buyer, but the features are what most clearly distinguish one cassette deck from another in the marketplace. And since features to a large extent determine cassette-deck performance and price, a shopper can arrive at some preliminary buying decisions once he understands what features are available and what they will do for him.

**Tape and Machines**

Any recorder's performance is intimately linked to that of the tape being used. Over the past couple of years metal tape (whose magnetic coating contains fine particles of metal alloy instead of metal oxides) has become so important to marketing in the audio industry that even inexpensive cassette decks are now "metal-compatible." Metal tape does have advantages, mainly in its high overload limits at high frequencies. It does, however, require higher bias and record levels than other tape types. In order to make machines metal-compatible, manufacturers have had to redesign their record and erase heads as well as bias and record-amplifier circuitry. It's safe to say that because of the necessary expense of such designs, the cheapest current metal-compatible models will not really get the most out of metal tape.

Getting the most out of a non-metal tape doesn't require redesign, but it does require careful adjustment of those deck characteristics to which a tape is most sensitive. Within each of the four major subcategories of tape (standard ferric, chrome and chrome-equivalent, ferrichrome, and metal) there is a wide variation in the optimum settings for bias, recording equalization, and sensitivity (standard recording level).

Many recent decks have been equipped with front-panel "bias-trim" or "equalization-trim" variable controls in addition to the bias and equalization switches used to set the deck for the general tape type. Proper use of these trim controls can improve high-frequency response for any particular tape, but some decks require that the adjustments be made by ear. This can be done easily only if your deck has separate record and playback heads so you can hear the effects—for better or worse—as you make the adjustments.

This year's decks have begun to take full advantage of affordable microprocessor technology by "computerizing" the adjustment not only of bias but of recording equalization and sensitivity. This full range of calibrations is rarely available without computer control because of the difficulty of adjusting all the interrelated settings at once by hand. A built-in microprocessor can optimize a deck's performance in a few seconds for almost any tape.

**More Headroom**

Recorder/tape adjustments can be critical in making a truly accurate recording of demanding musical material. But even the optimum settings are a compromise (though an acceptable one) between the conflicting demands of low noise, low distortion, and the ability to record loud high-frequency signals.

One way around the problem is double-speed recording, which increases high-frequency "headroom" by running the tape at 3¾ inches per second instead of the standard 1⅛ ips. Double-speed recording does, however, require twice as much tape for an equivalent playing time.

Another approach is the logical extension of all those automatic bias and equalization adjustments. Dolby HX (headroom extension), found on a few manufacturers' models this year, is a circuit that continuously varies bias and record equalization according to the demands of the music, producing the best moment-to-moment compromise. Dolby claims that use of this circuit effectively yields lower distortion at both high and low recording levels and in-
creases maximum potential output levels at high frequencies. Tandberg has a somewhat similar system of its own, called Dyneq (Dynamic Equalization), which adjusts only equalization to achieve a similar result. Both systems are active only during recording, and the resulting tapes will play normally on any deck.

**Level Setting**

In order to stay above a tape system's noise "floor" and below its distortion "ceiling" (that is, within the recording "window"), the recording levels must be set with care. The wider the dynamic range of the source material, the more critical this level-setting process is and the more important the level-metering system employed.

Most current cassette recorders, except for the least expensive models, have some sort of peak-indicating device to register short, high peaks in the music. This used to consist only of a light-emitting diode (LED) that would flash if the level exceeded a predetermined overload point; it was used in conjunction with standard average-reading mechanical meters. Nowadays, rows of LEDs (or other opto-electronic indicators) have replaced the meter movements entirely in many cassette-deck models.

Being electronic and without mechanical inertia, such metering devices can easily be designed to follow peaks or averages or to hold the highest peak value of the signal at the touch of a switch. Because of the discrete steps in which they work, however, they give only the illusion of precision, and frequently at the expense of usable accuracy. If the steps are too many decibels apart, the display loses much of its usefulness as a guide for setting recording levels.

To be most useful, any meter should have a scale reading from at least −30 dB to +5 dB. A good peak-reading mechanical meter will be easier to read in the critical area around 0 dB than a coarsely segmented display. Some of these meters have a switchable slow decay built into the drive circuit so that they can hold the highest peak value for some time.

Since microprocessors are so good at calibrating the machine for individual tape characteristics, the next step is to design them to set the recording level as well. Indeed, at least one manufacturer has announced a deck which does just that. Since levels in music are constantly varying, however, wide-dynamic-range source material may require some "gain riding" during recording, something that at the moment can be done well only by a human who knows the score—the musical score, that is.

**Noise Reduction**

Manual gain-riding during recording is one way of fitting the music into the dynamic-range limitations of a machine and tape, but the end product of such gain-riding is a recording with less dynamic range than the original. Noise-reduction systems can be considered a form of electronic gain-riding that employs frequency- and level-sensitive circuitry to reduce the dynamic range of the incoming signal in a predictable way that can be exactly reversed.

The Dolby-B noise-reduction system was the breakthrough that allowed cassettes to be taken seriously for recording music. Introduced in 1970, it has since become de facto the world-wide standard for cassette noise reduction, and it is available on virtually every cassette deck made. Dolby B acts only on high frequencies, where it produces an improvement in signal-to-noise ratio of slightly less than 10 dB.Encoded tapes can be played back without decoding (in cars, on portable equipment, and so forth) with reasonable quality. (JVC's ANRS noise-reduction system is generally compatible with Dolby B.)

All machines with Dolby-B circuits incorporate a filter for removing the 19-kHz pilot tone from stereo FM broadcasts before recording. This filter is necessary to avoid confusing the Dolby high-frequency level-sensing circuits while taping off the air. Some cassette decks can switch out the multiplex filter for widest frequency response in other recording applications, though such a switch is useful only if the deck has a usable response above 15 kHz or so.

Other manufacturers, in an effort to achieve greater noise reduction than Dolby B's 8 to 10 dB, have developed an assortment of compressor/expander (compander) systems. The longest-es-
established compander system for consumer use is the dbx II, which operates on all audio frequencies simultaneously. When recording through the dbx II system, the dynamic range of the incoming signal is cut in half as it is fed to the tape. This two-to-one (2:1) compression enables the signal to fit comfortably within the limitations of the recorder and tape. On playback the signal is re-expanded to the original dynamic range, effectively suppressing noise from the recording process by some 30 dB. While outboard (non-built-in) dbx II processors have been available for some years, the system has only recently been introduced into a few cassette decks. Some of these decks also include switching that makes possible decoding of dbx-encoded records as well as playing and recording tapes.

Recent years have seen the introduction of several new 2:1 compander systems intended to compete with dbx II. High-Com II and Super-D, both of which split the audio range into two frequency bands while operating, are incompatible with each other and with the single-band dbx. As yet, High-Com II and Super-D are available only as outboard devices that can be added to any manufacturer's cassette deck. ADRES (Automatic Dynamic Range Enhancement System) is another 2:1 compander system, but it is incompatible with dbx and is not yet available as an outboard unit. While all of these systems are intended to provide more noise reduction than Dolby B (some claim up to 30 dB more), they do not compete with it directly because no one of them has or is likely to achieve the same marketplace acceptance as Dolby B.

Dolby Laboratories itself has introduced a new noise-reduction circuit offering a 20-dB improvement in signal-to-noise ratio. Christened Dolby C, it has been offered to all present Dolby licensees at no additional fee, and at least fifteen companies have indicated their intention to put it in some new models. Dolby states that a C-encoded tape played back through a B-type decoder will sound much the same as a B-encoded tape played without a decoder—that is, fairly good. And every deck incorporating one of the Dolby-C systems will include a Dolby-B system as well, so it looks as though Dolby B will continue as the cassette noise-reduction standard.

"...one of the most welcome features in today's equipment is the provision for adjusting bias levels, recording equalization, and recording level ..."

Moving Parts
Up to this point we have not discussed the mechanical operation and functions of the cassette deck. Yet attention should be paid to the various features available with the latest cassette-deck mechanisms because mechanical stability and precision are vital with the slow speeds and narrow track widths used in cassette recording.

For example, dual-capstan drive is one good way to ensure smooth tape motion since it isolates the tape in the head region from frictions in the cassette shell. And several new decks in Japan include special "tensioning" arms for much the same purpose. Separate motors for capstan(s) and hubs simplify the mechanical operation of the transport for improved reliability and gentler tape handling. Direct drive (in which the capstan is an extension of the motor shaft) is an elegant approach to reducing wow and flutter since tape speed can be controlled by precise electronic circuitry.

Three-head decks permit playback of a recording while it is being made in addition to allowing separate optimization of head characteristics for the record and playback functions. In a few three-head decks the record and playback heads are in separate mountings and the effective relative angle (azimuth) between the heads is somewhat dependent on the physical characteristics of the particular tape and cassette housing. Head misalignment results in a loss of high-frequency response and a slight increase in noise. Correcting for such alignment variations has always been a cumbersome task at best, but now several high-price decks use their microprocessors to perform this azimuth adjustment quickly and automatically for each tape.

Another automatic function available on some decks is a search system. In an effort to give the cassette medium some of the instant accessibility inherent in disc recordings, auto-search systems look for and count silent pauses between musical selections. In a few machines specific tape-counter numbers or timings can be entered and located. With the most advanced of the automatic search units, selections designated by the operator can be programmed for playback in any desired sequence. One deck can even be operated by a home computer!

As another convenience feature, most decks can be set up to be started by a timer to make unattended recordings. Unfortunately, the maximum length of a program you can record this way is 60 minutes with a C-120 cassette. There is a way around this limitation—a half-speed cassette deck that runs at 13/8 inch per second. Several are available. Variable-speed playback is available on a few decks, a feature useful for matching the pitch of the recording to an instrument or for correcting a speed error made on another machine.

The Future
The latest features available on cassette decks point in several directions. On one hand, there is an array of incompatible noise-reduction systems, making life still more complicated for the average buyer. But then there are the various improvements in the man-machine connection, such as useful metering devices and computer controls that make it possible to get optimized results with little trouble.

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Understanding Tape Noise-Reduction Systems

By Craig Stark

If the serpent that tempted Eve in the Garden of Eden had hissed, the First Lady, like today's audiophiles, would instantly have known that something was wrong. The human ear can put up with a fair amount of distortion, and can easily tolerate less than state-of-the-art high-frequency response, but if tape hiss becomes audible the illusion on which high fidelity depends is immediately shattered.

Unfortunately, the slow speed (17½ ips) and narrow tracks (0.021 inch) of the cassette medium almost guarantee the audibility of tape hiss unless an effective noise-reduction system is used. For over a decade, one such system—Dolby B—has served as a kind of unofficial "standard" for cassette decks, but the constantly improving quality of taped music reproduction has led audiophiles to demand even greater amounts of hiss-suppression than the 8 to 10 dB that the original Dolby B can provide. Ingenious engineers have responded by producing a number of alternative noise-reduction devices, the very variety of which can be confusing to the audio newcomer.

The Basic Approach: Dolby B

To understand how these various noise-reduction systems work and help you decide which of them may be best for you, let's start with how and why Dolby B works. Hiss, as the name implies, is primarily a high-frequency phenomenon, so the simplest way to reduce its annoyance would be to turn down your treble control. While this would undoubtedly cut down the hiss, it also would equally eliminate the high frequencies in the music, giving you noise-free lo-fi.

Typical of the most popular tape noise-reduction systems on the market are the Nakamichi Dolby B-C system (above) and the dbx dynamic range enhancer/noise-reduction system (right).
back), for the low level insures against tape overload.

Dolby B works by analyzing the level and frequency content signal of the incoming music to produce a control signal that manipulates the amount of treble boost during recording and inversely manipulates the amount of treble cut during playback. The maximum manipulation—about 10 dB at the highest, softest frequencies—was set so that the variations themselves would not become audible, using circuitry available at the time of its introduction.

Without reawakening commercial alterations long past, it should be noted that the ANRS noise-reduction system used in many JVC tape decks is functionally almost indistinguishable from Dolby B. So successful has this basic approach been that Dolby B or ANRS is incorporated into almost every cassette deck that even claims high-fidelity quality.

New Approaches to Lower Noise

In this country, at least, the major competition to the Dolby system (both in consumer and professional applications) has come from dbx Corporation. Available built into some decks or as an add-on accessory, the dbx system represents a somewhat different approach. Consider the following data: live symphonic music has a maximum dynamic range (the ratio between the loudest sounds and the faintest reverberant echoes in the hall) of approximately 100 decibels. With no noise reduction, the signal to noise ratio of a good cassette deck is approximately 50 dB. If the 100 dB range were compressed into 50 dB during record, then expanded back again by the same 2:1 ratio during playback, the tape could hold the full dynamic range of the orchestra, keeping residual noise below the softest recorded sounds.

This is certainly a somewhat simplified picture of the dbx approach, but it emphasizes some of the differences from the traditional Dolby B. The latter strives for a maximum of 10 dB in noise reduction and works principally on frequencies above 1000 Hz. dbx and the somewhat similar (but different enough to be playback-incompatible) Sanyo Super-D system work primarily on an overall loud-to-soft ratio. As with any engineering solution to a problem, each side can point convincingly to the weaknesses of the other's "trade-offs".

From the dbx side it is to be noted that not only is Dolby B limited in its maximum effect, it is also somewhat "level dependent". (You've seen the "Dolby-level" markings on cassette deck meters.) If the sensitivity of a given tape varies markedly (more than ±2 dB) from the tape used in adjusting the deck at the factory, some decoding error in frequency response will be introduced during playback.

On the other hand, while the dbx system does not require a "reference level" adjustment, and unquestionably offers more noise reduction per se, any deviation in the recorder's overall record/playback frequency response will be magnified by the 2:1 compression/expansion ratio. Further, the more a signal is electronically manipulated, the more likely it is that, under some listening conditions, the manipulations, themselves will become available. "Noise modulation," "pumping," and "breathing" are the terms applied to noise-reduction systems to describe the situation in which the operation of the system itself becomes audible, offsetting its beneficial effects on tape noise. Not unnaturally, dbx has taken steps in its circuitry to avoid this kind of problem, but whether or not either Dolby or dbx can be "heard" to operate is a decision that must be left to the ears of the buyer.

Splitting Bands and Levels

One way to reduce the likelihood of audible "side effects" from a noise-reduction system is to split the frequency range to be covered into separate frequency bands. In this way, what happens at one end of the audible spectrum cannot affect ("modulate") what happens at the other end. The professional Dolby A and its chief European competitor, from Telefunken, both split the 20-to-20,000-Hz range into four separately-processed bands, but the cost of this kind of approach is prohibitive for consumer applications. The Nakamichi Hi Com II (designed in cooperation with Telefunken) is an excellent two-band design that doubles the 10-dB noise reduction of Dolby B, without audible side effects. As of this writing, however, it appears that most recorder manufacturers (even including Nakamichi) who do not choose to incorporate the dbx system, yet insist on more noise suppression than Dolby B can provide, are choosing the "split-level" approach of Dolby C.

A number of decks with the Dolby C-noise-reduction system are now beginning to reach the market, though it is expected that most of the initial offerings will be high-end models. The reason for this is not the cost of the circuitry itself (less than $10 at the manufacturing level), but the fact that the recorder's own circuits must be unusually noise-free to profit from the 20 dB of noise-reduction that Dolby C offers.

Oversimplifying again, Dolby C can be said to consist basically of two Dolby-B type processors, operating in tandem. When one is switched out, the deck operates as a normal Dolby-B machine. When the second processing circuit is switched in, activating the Dolby-C mode, the noise-reduction system operates on still lower-level signals, where Dolby B would already have contributed its maximum effect.

In addition to doubling the effective noise-reduction of the B-type unit, however, Dolby C extends the frequency range of the processing downwards by about two octaves, thus reducing middle as well as high-frequency hiss. Further, to eliminate the possibility of audible side-effects from very high-frequency variations (above 10 kHz), special anti-saturation and anti-skewing circuitry is included.

Which System for You?

For most audiophiles the original Dolby-B (or ANRS) systems offer sufficient noise-reduction, and they have the additional advantage that nearly all pre-recorded cassettes are Dolby-B encoded. Also, the noise-reduction encoding is sufficiently subtle that it is possible to play a Dolby-B tape without decoding it (in a car system, for example) and still have a listenable sound. In many automobile players, indeed, the slightly "bright" frequency response is desirable, since it compensates for deficiencies in the car unit's own response.

The greatest overall noise reduction is provided by the dbx (or Sanyo Super-D) system, and many of the dbx decoders also provide facilities for playing dbx-encoded records. While still limited in number, the catalog of these LP's is steadily increasing, and anyone who has ever heard one will agree that they are among the most sonically spectacular records ever produced. At the same time, dbx places the highest premium on the flatness of a recorder's overall frequency response. In some circumstances a number of listeners even claim they can hear the dbx system working.

Dolby C occupies the middle ground between Dolby-B and dbx systems. A C-encoded tape played on Dolby B has the same kind of "slightly bright" character that a B-encoded tape has when played on a non-Dolby machine; and a C-encoded tape played without any Dolby decoding is very decidedly bright. Played back on a deck with Dolby-C noise-reduction circuitry, these tapes are—for the really critical audiophile—an extraordinary improvement on Dolby B.

In the end, the best hi-fi advice is to listen and compare, for yours are the ears you must satisfy.
WHY ONLY SONY TAPE HEARS FULL COLOR SOUND.

There are some good and sound reasons Sony audio tape is second to none. Why Sony tape has such a sensitive, full frequency response all along the sound spectrum that it is actually capable of recording sounds that go beyond the range of human hearing. That incredible range, sensitivity and balance is what Full Color Sound is all about.

A history of milestones
When you get a Sony tape you get a lot more than tape. You get the entire history of tape recording.

Sony has been a pioneer in tape manufacturing since it began over 30 years ago. In fact, we made the first audio tape ever in Japan. Sony technology was front then... and it still is! (Who else could bring you the amazing Walkman?)

Besides a history of spirited determination to be the very first in technology, there's the knowledge that comes from also being pioneers in high fidelity audio equipment. (After all, you'd better know all there is to know about tape decks before you make a tape. Sony does.)

Another reason for Sony's unmatched excellence is our unmatched — almost fanatic — insistence on the highest quality material and manufacturing methods. Sometimes our standards are so high we can't find machinery that meets them, so we have to invent the machinery ourselves!

Then there's Sony's unique balance system. The fine-tuning of all the elements that go into making a tape, so that each complements the other, and together deliver the finest recording that is humanly and technically possible.

The new tape standard: State-of-the-Sony

Fact: Everyone uses magnetic particles for tape. But not everyone insists on buying super-fine grade particles, and then carefully examining and mixing each and every lot to be absolutely positive that the quality is consistently pure and homogenous. Sony does.

Fact: Sony has a unique formula for binding the particles to the tape. Binding determines the life of the tape and the heads. Because of the high standards we demand, Sony had to invent its own binder.

Fact: Another example of Sony high technology is in the coating process. The coating of magnetic particles must be absolutely, uniformly even all along the tape. Any variation at all, and the consistency and quality of the tape are compromised. Not only did Sony perfect the process for its regular tapes, but Sony outdid itself with its dual-coated tapes, where it was necessary to produce a top coating that was super-thin. We actually managed to create a perfect coating that's only 1 micronmeter thick! (Especially impressive when you realize some other tape makers have trouble producing an even coating 4-5 micrometers thick, much less 1 micronmeter thick!)

Hearing is believing

Sony tape comes by its extraordinary quality honestly. It has a heritage of breakthrough innovation. And a history of being famous throughout the world for leading technology, quality and dependability.

And that is why only Sony tape has Full Color Sound. But you don't have to take our word for it. Listen to Sony tape as fanatically as you wish. As they say, hearing is believing.

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Most serious recordists would probably agree that the greatest limitation of the cassette medium lies in its inability to handle high-level, high-frequency signals. If the record level is kept low enough—say, -20 dB—a flat frequency response can be made impressively flat throughout the audio-frequency spectrum. But recording at that low a signal level would provide an intolerably poor signal-to-noise ratio. Specifically, tape hiss would be so prominent that it would overwhelm the soft parts of the music and would be annoying even during loud passages. But when the record level is raised to a level at which the loud sections register 0 dB on the indicators, appreciable high-frequency content in the music is already there in any Dolby-equipped deck, which has an inherently higher storage capacity for high-level high frequencies. But a very interesting electronic approach to alleviating this problem is offered by Dolby Laboratories as the Dolby “HX” headroom-extension system, which requires no additional coding/decoding apparatus and can be used on any normal deck.

Readers familiar with the operation of the regular Dolby-B noise-reduction system are aware that it works by selectively boosting very low-level high-frequency signals during recording, thus raising the recorded level of the highs in comparison with the fixed residual hiss contributed by the tape. In playback, all treble frequencies (including the tape hiss) are reduced by precisely the same amount. The playback decoding thus simultaneously restores the original high-frequency levels of the music and lowers the residual tape hiss (which came in after the treble boost) by a maximum of 8 to 10 dB. The recorded high-frequency boost, and the boost also varies with frequency (the higher the frequency, the greater the amount of treatment). This kind of variable-level, variable-frequency control of the Dolby encode/decode operation calls for a detection system that responds quickly and accurately to the frequency content and level of the original musical signal.

That, in essence, is how the Dolby-B noise-reduction system operates. However, since the control signal is already there in any Dolby-equipped deck, could it not be used for a second purpose as well, in addition to its primary function of controlling Dolby encoding of the low-level high frequencies? This was the question that occurred to Kenneth Gundry, senior engineer at Dolby, and his answer is the Dolby HX headroom-extension system.

To understand the Dolby HX system requires one additional piece of information about the way tape behaves. When a tapedeck manufacturer adjusts the “proper” bias of his machine for a given tape, he normally does so on the basis of the maximum output level and/or minimum harmonic distortion obtained at a rather low frequency, such as 315 Hz. This bias level is somewhat greater than that which would produce maximum output at a high frequency such as 10,000 Hz. The result is that “normal” bias actually doesn’t take advantage of much of the high-frequency signal capacity of the tape. Reduce the bias a bit, and the treble sensitivity goes up, which is desirable under certain circumstances.

As you may have guessed, this is precisely what the Dolby HX headroom-extension system does. Working with the same control signal that operates the Dolby encoding process, the HX system lowers the bias at those instants when high-level high frequencies (which would normally cause tape saturation) are present and the Dolby system is, in effect, being bypassed. At the same time that the bias is lowered and treble sensitivity is increased, the normal record boost (equalization) is correspondingly reduced. So, a flat response is maintained, and more high frequencies can be “fitted” onto the tape.

Will everyone jump on the bandwagon, so that, at the cost of only a few dollars, the next generation of Dolby-processed cassette decks will be HX-equipped? Time will tell. There still remains some question as to whether, during those moments when the bias is lowered, low-frequency distortion will be sufficiently increased to become audible. Before we can answer that, we need HX-modified machines to measure and, above all, to listen to.
THOUGH metal-coated tapes have received most of the publicity during the past couple of years, the major tape manufacturers have been hard at work improving their oxide-based tapes. Judging from recent announcements from Fuji, Maxell, Memorex, and TDK, their development programs have been following basically parallel paths.

Some of the incentive for this activity may have resulted from a slight let-down in the general enthusiasm for metal tape following the fanfare of its introduction. Unquestionably, there has been considerable "oversell" of the new tape, and the lessening of enthusiasm has been aggravated by the inevitable time lag between the announcement and the availability of the tape itself, the initial variability in the tape's characteristics, the delayed appearance of hardware capable of exploiting its unique qualities—and the high cost of the tape.

Now that even the lowest-priced cassette decks are beginning to boast "metal compatibility," it is becoming apparent to anyone who has used this tape that metal, per se, is not the answer to everyone's cassette recording problems. On many decks, metal tape is hardly distinguishable from any good grade of ferric-oxide tape (except perhaps in those rare cases where one wishes to record live music that has a strong high-frequency content). Indeed, the most obvious difference between the two is usually price—metal tape costs roughly twice as much as premium oxide-coated tape.

Initially, there were production problems in the manufacture of metal tape, and the differences in magnetic properties between the tapes from different manufacturers sometimes made it difficult to realize their qualities to the fullest. If we can accept the latest statements from the tape manufacturers, most of these problems have been overcome, and the public can now choose among metal tapes from several manufacturers. It is a bit early to determine if there are substantive performance differences among them, but it is gratifying to see that the very high price of the early metal tapes has been shaved...
Simply overwhelming
At Aiwa, we believe the only thing about quality recording that should overwhelm you is the quality of the recording.

That’s why our engineers developed the Aiwa AD-M800. A microcomputerized cassette deck that’s so advanced, it’s simple.

The AD-M800’s specifications tell you it’s the last word in cassette deck technology. But its D.A.T.A. microcomputer system lets you know a new era of recording accuracy and simplicity is just beginning.

Instead of imprecise tape selector switches or confusing variable bias and eq switches, the AD-M800’s D.A.T.A. microcomputer system is as simple as it is accurate.

For “master” quality recordings with ruler-flat tape frequency response all you do is press “start”. D.A.T.A. does the rest.

It’s so smart, it automatically senses what type of tape you’ve chosen, then selects the best setting from over 250 million possible combinations to optimize bias, equalization and calibrate sensitivity. All in less than 30 seconds!

And thanks to its memory, next time you use the same tape it won’t take any time at all. D.A.T.A. can recall past analyses instantly.

But D.A.T.A. is just one of the AD-M800’s outstanding features. There are a lot more. Like Aiwa’s V-cut Sendust CVC 3-head system. Infrared remote control. Both VU and Peak LED metering. Double Dolby* NR. And Dual Motor Drive.

The Aiwa AD-M800. It’s that advanced. It’s that simple. That’s why it’s the top of our line.

* Dolby is a trademark of Dolby Laboratories.
considerably in some of the newer products on the market.

What about those "old-fashioned" oxide-coated tapes? Well, we now have new FX-1 and FX-2 formulations from Fuji, plus Fuji Metal and a lower-price "standard" tape, FL. According to Fuji, these tapes tend to have slightly higher output and lower noise than their similarly named predecessors, resulting in an overall dynamic-range improvement of 1.5 to 3 dB, depending on frequency. Maxell has added two new tapes, XL-I and XL II-S, plus MX metal tape, to its line, supplementing rather than replacing the well-established UD, UD XL-I, and UD XL-II. Here, too, the manufacturer claims that an improved process gives more uniform particle dispersion, greater bias latitude, lower noise, and less print-through, with an overall dynamic-range improvement of 1.5 to 2 dB.

Not all the tape development is taking place in Japan. Memorex has been busy as well, and the result of its labors is a pair of new tapes, MRX I (which replaces the MRX3), Memorex High Bias II (replacing the High Bias tape), and a new Metal IV tape. The numerical designations of the new Memorex tapes conform to the present international standards, which designate standard-bias, 120-microsecond-equalized tapes as Type I; high-bias, 70-microsecond-equalized tapes, including chromium dioxide and "chrome equivalents," as Type II; ferrichrome tapes, nearly extinct at this time, as Type III; and metal-coated tapes as Type IV. BASF has also upgraded various tapes in its line, mostly by enhancing the packing density of the oxide particles; in addition, the new shells have improved structural integrity, larger spring pads, redesigned roller guides, and so forth. And 3M also has improved the shell mechanics in its Scotch Master line.

Returning to Japan, we find TDK's new line featuring an improvement on the popular SA tape. The new SA-X tape is similar to SA in its bias requirements and frequency response, but SA-X (like the other new premium tapes we have mentioned) offers improved sensitivity and a higher output level at all frequencies, giving it a 1- to 2-dB advantage in signal-to-noise ratio.

The magnetic improvements in all these tapes are certainly worthwhile, though we would hardly expect any of them to be dramatically better-sounding than its predecessors (or even its competitors). The sonic improvements of a couple of decibels more dynamic range, plus a little better high-frequen-

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I am not going to attempt to draw any sweeping conclusions about the relative merits of the various tapes and cassette constructions. Although tape manufacturers, more than most, tend to publish full specifications of their products complete with details of their test conditions, there are enough differences between test standards that interbrand comparisons are not always feasible from printed specifications. Furthermore, most of these data do not have any unique relationship to the ultimate sound quality provided by the tape, merely to the recorder adjustments needed for optimum results with the tape. The very important question of how effective the mechanical improvements and features really are can be answered only by the manufacturers themselves, and there is no way for a consumer to judge relative merit except by personal experience.

It is my feeling that, although each of these many improvements may be rather minor, their combined effect is a substantially improved product compared with the best cassettes of even a few years ago. The gap between oxide and metal-coated tapes has been narrowed (and it was never as significantly large as many people claimed or believed). Metal-tape prices have dropped, while premium oxide tapes have become more expensive than ever, so a choice between them must be made on the basis of the specific tape recorder to be used. For the majority of low-price machines, metal offers no advantages commensurate with its cost, and in many cases even a high-bias (Type II) tape is not audibly better than a good Type I tape. The recordist with a good machine, preferably with three heads, who is a perfectionist or wishes to tape audiophile records or do live recording will probably find metal tape the answer to his needs—but the only way he can be sure is to try the different tapes for himself.
I've always been partial to the cassette medium, not for the way the cassette deck is commonly used (the ethically questionable practices of dubbing from broadcasts or friends' records), but as a means of providing, through the prerecorded cassette, music of high sonic quality at low cost. Cassettes, if properly recorded, can offer lower noise, fewer defects, longer playing life even on substandard equipment, and longer uninterrupted playing times than most long-playing discs. Prerecorded cassettes can even give better high-frequency performance.

Unfortunately, until recently there has been very little effort among manufacturers to realize the full capabilities of the medium. Advent, InSync, and CBS MasterSound have been among the few exceptions. To that list you can now add Vanguard, Mobile Fidelity, and JVC as companies that have chosen to apply audiophile criteria and techniques to the production of cassettes of high sonic quality.

Vanguard's releases in its SuperChrome cassette series are duplicated at fair low speed on chromium-dioxide tape stock and use Dolby-B encoding. While these characteristics sound very much like those of the CBS MasterSound cassettes, there is a major difference: price. Vanguard's "Two-Fers," containing the program equivalent of two LPs per cassette, sell for $10.98. Artists with such double-length cassettes include Joan Baez (CAT 41/42), Buffy Sainte-Marie (CAT 3/4), the Clancy Brothers (CAT 53/54), and P. D. Q. Bach (CAT 719/20). There is also a group of classical releases including music by Vivaldi (CA 470665), Stravinsky (CA 471177), and Mussorgsky (CA 471188). Handel's Messiah (CA 410090/2), and Bach's Brandenburg Concertos (CA 471208/9). How do they sound? Very good. The only major defect I found on the SuperChrome tapes I heard was some slight overmodulation distortion of the trumpet in the Bach Brandenburg Concerto No. 2. Wow and flutter were not a problem, nor was the noise level.

Audio Source (1185 Chess Dr., Foster City, Calif. 94404) is importing several cassettes that have been duplicated at low speed onto metal tape by JVC in Japan. Priced at $29.95 each, the first three releases featured Ikeda (MDS-4), Sadao Watanabe (MDS-1), and Dave Grusin (MDS-7). As can be expected from metal tape, the high-frequency performance of these recordings is very good, as is the noise level. The cleanest-sounding cassette, containing what to my ears is the most interesting music, is the Dave Grusin Mountain Dance tape, derived from a digital-master recording.

Mobile Fidelity, known for recording and pressing various LPs, has taken another unusual route with cassette releases. The Mobile Fidelity cassettes are said to be recorded at playing speed (1 7/8 inches per second) directly from the master tape. Even the Dolby-B unit employed is said to be improved, with reduced harmonic distortion and extended frequency response. These cassettes are probably the closest that consumers can get to master-tape sound, at least until digital playback enters the home. They cost $1 more than the equivalent Mobile Fidelity discs.

Regardless of how they were duplicated, the Mobile Fidelity cassettes sound superb. The tapes I heard (Steely Dan, C-033; Pink Floyd, C-017; Earl Klugh, C-025; and Zubin Mehta conducting excerpts from Star Wars and Close Encounters, C-008) all had very low noise levels, wide dynamic range, full-range frequency response, and no obtrusive distortion. At times I felt that I was missing some of the uppermost high-frequency octave (10,000 to 20,000 Hz), but this is probably because of a slight head alignment mismatch between Mobile Fidelity's duplicating machines and my playback unit. I also heard some slight modulation noise with certain selections, but this could just as easily stem from the original analog recordings as from the duplication process.

In short, these releases demonstrate that prerecorded cassettes can sound fully competitive with their disc counterparts and in some ways (noise, end-of-side distortion) superior. They also seem to show that prerecorded cassettes are reaching their final peak of development, barring another breakthrough in tape formulation or the use of more advanced noise-reduction systems.
A BASIC VOCABULARY OF TAPE RECORDING

By David Ranada

RECORDING tape and the machines that use it have evolved at a rate unmatched by any other component in our audio systems. The resulting expansion of capability, versatility, and features in a profusion of new products (particularly in the cassette area) has created a parallel expansion in the vocabulary used in component advertising, in test reports, and in technical articles.

For the ordinary consumer, this often bewildering thicket of new terms has further complicated the already challenging task of shopping, with the result that he needs buying guidance more than ever. Since knowing the lingo is at least half the battle, we have prepared the definitions in the basic tape-recording vocabulary that follows as much as possible in layman's language.

Alignment — The geometrical relationship between head gap, tape guides, and tape. The most important alignment is azimuth alignment, which requires that the head gap be perfectly perpendicular to the direction of tape travel. Aspects of performance which depend on azimuth alignment include high-frequency response, phase response, and compatibility with tapes recorded on other machines. All heads in a recorder must be aligned, especially the record and play heads in three-head machines. Some three-head cassette decks have their record and play heads installed side by side in the same housing, thus reducing the alignment problem.

ANRS — A complementary noise-reduction system, developed by JVC, which operates on low-level high-frequency signals as a Dolby B circuit does. There is some compatibility between ANRS and Dolby B. Super ANRS, in addition to the actions of an ANRS circuit, compresses high-level high-frequency signals during recording and expands them during playback to increase high-frequency dynamic range and decrease high-frequency distortion.

Back coated — Some tapes have the back side of the plastic base material (the side opposite the magnetically coated side) covered with a conductive compound. The surface texture of the compound improves the tape's traction through the recorder.

Bias — A large ultrasonic signal of constant frequency and level sent to the record head along with the audio signal. The bias signal is applied to the tape to reduce noise and distortion which would otherwise be generated by the recording process. The correct bias level is crucial to obtaining best performance with a given tape formulation: too high a bias level gives a rolled-off high-frequency response, and too little bias reduces the signal-to-noise ratio and increases distortion.

Capstan — The driven spindle or shaft in a recorder which rotates against the tape. In conjunction with the pinch-roller, it pulls the tape through the machine at constant speed. The capstan's rotational speed and diameter determine tape speed. Some advanced professional machines do not use a pinch-roller but instead use only a large-diameter, servo-controlled capstan and reel drive.

Chromium dioxide (chrome, Cr₂O₃, Crolym) — A high coercivity magnetic material, particles of which are used in magnetic tape. The high coercivity of chromium dioxide permits greater high-frequency output at slow tape speeds than that possible with "standard" ferric tapes. Chrome tapes are not more abrasive than other types and do not wear down heads faster than other tapes.

Closed-loop drive — A tape-transport system which drives both incoming and outgoing tape in order to control the portion of the tape contacting the heads and isolate it from the reels or cassette hubs. The tape drives in closed-loop geometries regularly used with open-reel recorders, but dual-capstan drive is the most popular for both open-reel and cassette tapes.

Cobalt doped — Tape utilizing a combination of "standard" gamma ferric oxide and cobalt as the magnetically active portion of the coating in order to improve maximum output level at low and high frequencies.

Coercivity — The magnetic field, measured in oersteds (Oe), required to reduce the magnetization of a saturated material to zero. Coercivity is proportional to the high-frequency capabilities of a tape as well as of the recording, bias, and erasure levels that it requires.

Compander — A type of noise-reduction system that compresses all or part of a signal during recording and expands it in a complementary way during playback. In general, such companders as ANRS, dbx, and Dolby B must be used during both recording and playback, otherwise the signal may be unlistenable or at least have boosted high anomalies in the record-playback process (invoking frequency-response irregularities or level changes) will cause some sort of mistracking between the input and the output halves of the companding process. The effects of this may or may not be audible.

dbx — Refers either to a series of dynamic-range enhancement devices, or to a complementary compander system, developed by dbx Inc. The companding system translates every 2-dB change in the overall input signal level to a 1-dB change fed to the recorder. During playback, the reverse process takes place: every 1-dB change is retranslated to a 2-dB change at the dbx output. The dbx system can provide up to 30-dB of noise reduction over the entire audio band.

Decibel (dB) — A ratio of quantities expressed in logarithmic terms. The number of decibels between voltage A and voltage B is twenty times the logarithm of A divided by B.

DIN (Deutsche Industrie Normenausschus) — A set of standards and specifications promulgated by German manufacturers and covering such audio-related matters as connectors, frequency weighting, measurement techniques, and specifications. Similar to the ASA (American Standards Association).

Dolby B — A complementary noise-reduction system designed to reduce tape (and FM) hiss. A Dolby-B circuit boosts low-level high-frequency signals during recording and reduces them, along with the tape's added noise, in a complementary fashion during playback. Noise can be reduced up to 10 dB above 5 kHz with the Dolby-B system. It is now in virtually universal use in cassette decks.

Drop-out — A momentary drop in signal level caused by a loss of the required close tape-to-head contact. Drop-out problems can be minimized by choosing a high-quality tape, cleaning the recorder regularly, and protecting the tape and recorder from mishandling, dust, dirt, and fingerprints.

Dual capstan — A tape-drive system in which the tape is pulled by two capstan/pinch-roller combinations, one on either side of the head assembly. This form of tape drive isolates the movement and tension of the tape over the heads from any motion irregularities at the feed or take-up reels.

Dynamic range — In a recording system, the range in decibels (dB) between the maximum undistorted output level and the noise level. Just how distorted the "undistorted output level" is depends on whose spec sheet is being read, and the interpretation of "maximum" output can range from...

(Continued on page 26)
Neither the heat of the desert, nor the cold of Alaska, nor the oven temperature of a closed car in the sun, nor falling on the floor can stop Loran from delivering incredibly clear, accurate and beautiful sound.

The Loran cassette has the only shell in the world made of Lexan® resin, the incredibly tough space age material used for bullet proof vests and bank teller windows. Unlike other cassettes it can stand up to extremes of heat and cold. It will not warp at 250° Fahrenheit or shatter at 60° below zero. That means you can leave Loran on an exposed dashboard all day long and still have trouble free performance.

Another unique Loran feature is the Safety Tab™ (patent pending). A ½ turn of the Safety Tab™ makes it virtually impossible to erase a recording. However, unlike all other cassettes, you can restore its erase and record capability by simply turning the Safety Tab™ back to its original position.

Loran's unique tape formulations offer performance that matches the advanced technology of the Loran shell and tape guide systems.

Our Chrome equivalent high bias tape is coated with separate layers of two different oxides. It offers extremely low residual noise levels (-56 dB, A weighted, relative 0 VU) and an MOL of +6 dB relative of 0 VU for 3 percent distortion. This tape provides magnificent low-end response, in addition to the high-end response normally found in other Chrome equivalent formulations.

Loran's Metal, Ferric Oxide and Ferrichrome tapes also deliver improved and outstanding performance associated with these formulations.

Loran...the most advanced audio cassette in the world. Destined to become a leader.

Share the excitement. Listen to Loran.

CIRCLE NO. 12 ON READER SERVICE CARD

Loran™ Audio Cassettes have been selected by the Consumer Electronic Show Design and Engineering Exhibition as "one of the most innovative consumer electronics products of 1981."
maximum operating level to saturation. Dynamic range varies with frequency. The dynamic range of a program is the range through which its volume changes. See noise, weighting, decibel.

Equalization (EQ)—The process of selective amplification or attenuation of certain frequencies or frequency bands in a recording system so as to give a flat overall frequency response, minimize noise, or create a special effect. Equalization is performed in tape recorders for the first two reasons. The better cassette recorders provide a choice of equalization in order to obtain the best performance from various tape formulations. Cassette playback equalizations (70-microsecond “chrome” and 120-microsecond “ferric”), along with open-reel playback EQs (NAB, CCIR), have been standardized to assure intermachine compatibility of recordings.

Feed reel—The reel (or cassette hub) from which tape is drawn during recording or playback. Also known as the supply reel.

Ferric—The original tape formulation, available today in many variations, based on magnetic particles of gamma ferric oxide (γ Fe₂O₃). See cobalt doped.

Ferrichrome—A tape formulation with a layer of “ferric” particles beneath a thin layer of chromium-dioxide particles. Benefits claimed for this tape include increased low- and high-frequency headroom over standard chromium-dioxide formulations.

Ferrite—A family of nonmetallic, ceramic-like materials usually made from ferric oxide in combination with other oxides. The magnetic properties of ferrites and their exceptional hardness make them suitable for magnetic heads.

Frequency response—An indication of a recorder’s ability to reproduce all the audio frequencies supplied to it without altering the original balance among them. A perfect frequency response would extend at least from 20 to 20,000 Hz (the traditional and numerically convenient limits to human hearing) with a ±0-Db deviation. The record-playback frequency response of a tape recorder varies with the recording level: as the overall recording level increases, high-frequency response decreases. When comparing record-play specification, make sure that the recording levels are equal.

Harmonic distortion—Distortion in which spurious harmonics (arithmetic multiples) of the original input frequencies appear at the output. Usually expressed as a percentage of the output signal and abbreviated HD or THD (total harmonic distortion). Harmonic distortion in tape recorders varies with bias and overall recording levels.

Head—A generally broken-ring-shaped electromagnet over which the tape is drawn. A head can: (a) erase a previous recording by producing a large, rapidly alternating magnetic field; (b) make a recording by converting an electrical signal to a varying magnetic field which is picked up and retained by the tape; or (c) play back a recording by sensing the varying magnetic patterns on a tape and converting them to electrical signals. The break in the “ring” of a head is called the gap the length and width of which help determine the frequency response and noise of the playback system.

Headroom—The range between a reference recording level and the maximum output level available at a specific frequency or band of frequencies. See noise, weighting, dynamic range, signal-to-noise ratio.

Flutter—Rapid, periodic variations in tape speed causing rapid changes in pitch and volume. Flutter and wow are sometimes specified in mutually uncomparable ways by different manufacturers. Differences in wow and flutter measurement methods (peak versus rms versus average) and frequency weighting should be noted. In its test reports, Hirsch-Houck Labs uses both a weighted-rms method popular in Japan and a DIN peak-weighted method.

Hiss—The most noticeable form of tape noise. The human ear is most sensitive to noise in the 2,000- to 8,000-Hz range—which is heard as hiss. In fact, it is this region of frequencies that gives wideband “white” noise (which contains all audible frequencies) its “hissy” quality.

Light-emitting diode (LED)—An electronic device which converts a current directly and instantaneously into light. This property makes the LED suitable for peak-reading or peak-indicating audio displays. At present only red, yellow, and green lights are commercially available.

Liquid-crystal display (LCD)—An alphanumeric display that uses liquid crystals which interact with an external source of polarized light. Originally used in watches, they are now found in calculators and various hi-fi readouts. LCDs require very little power, but the earlier types had very slow response and were temperature sensitive.

Logic controlled—A tape transport with its functions switched by digital-logic circuitry activated by front-panel switches or a remote control. Logic control theoretically does not permit an improper or potentially damaging series of commands to be executed by a tape deck, and it is likely to be found only in solenoid-operated machines.

Maximum operating level or maximum recording level (MOL)—The magnetization level of a tape which results in a specified level of distortion. The MOL varies with applied bias level and frequency; as the MOL at 1,000 Hz rises, the MRL at 10,000 Hz falls.

Maximum, output level (MOL)—The playback level produced by a tape after it has been saturated with a signal (typically 333 Hz). At other frequencies maximum output level is the point at which an increase in the recording level produces a decrease in the playback level (a result of a phenomenon known as self-erasure).

Metal tape—Tape in which the magnetically active portion of the coating is made up of particles of iron as opposed to particles of ferric oxide or chromium dioxide. Metal-particle tape has very high coercivity and remanence, leading to improved high-frequency performance. Special circuitry and heads are needed to record on metal tape.

Multiplex (MPX) filter—A filter designed to reduce or remove the 19-kHz stereo pilot tone present in all stereo FM broadcasts. This pilot tone, usually filtered out by tuners and receivers, must be removed when using a Dolby B circuit to record a stereo FM broadcast, for the Dolby circuit will otherwise mistake the tone for a high-frequency audio signal, leading to improper performance. Most good tuners and receivers have adequate 19-kHz filtering built in. For those that don’t, the use of the MPX filter on the cassette deck is necessary for successful taping off the air.

Noise—Unwanted electrical signals of mathematically random nature. There are many types of noise in tape recording, most of which sound like hiss. Noise is added to a tape when it passes through the bias and erase fields of the recorder and by the signal itself during the recording process (modulation noise). Tape noise can be minimized by the choice of tape, careful setting of bias and recording levels, regular cleaning and demagnetizing, etc.

*Some authorities use the abbreviation MOL to refer to maximum operating level; others use the same abbreviation to refer to maximum output level.
The First Discwasher Tape Accessory

The Perfect Path Difference:

- "Cleaning contact" is made along the total tape path including guides and heads, normally untouched by wiper cleaners.
- Perfect Path cleans without alcohol or freon. It will not extract and age pinch rollers.
- Perfect Path simultaneously cleans tape heads while removing debris from along the tape path.
- Perfect Path's cleaning fiber grid is non-abrasive. Even after hundreds of passes, it will not scratch heads.
- Perfect Path restores high frequency "air" and transient response of cassette recordings.

Special non-abrasive cleaning fibers are backed with an exclusive "capture surface" designed to trap tiny particles of tape residue, preventing them from contaminating tape mechanisms.

Playback accuracy of a calibrated test tape. Note that after only three hours' play, high frequency response is reduced by as much as 10 dB. One clearing with the Perfect Path Head Cleaner restores the highs to within 1 dB of the original response.
Noise-reduction system—An electronic circuit that attempts to achieve a reduction of noise level without changes in musical content. There are two basic types of noise-reduction systems: compander (complementary record-playback systems) and single-ended (playback only) systems. A compander is used for noise reduction during the record-playback cycle, while a single-ended system is used for removing noise from already recorded material.

Pressure pad—A small, feltlike pad designed to press the tape into intimate contact with a head. Although few modern open-reel machines have them, a pressure pad is built into every tape cassette, where it helps maintain high-frequency response. Pressure pads in open-reel machines should be kept clean and should be replaced when worn.

Print-through—The undesired transfer of recorded signals from one layer of tape to adjacent layers. At worst, print-through will cause distinct pre- and post-echoes. Print-through depends on a tape's thickness and its magnetic properties, on the recording level, and on tape-storage conditions. To minimize print-through, use thick tape, press the tape into intimate contact with a head and damping the vibrations.

Retentivity—The maximum possible magnetization that will remain after saturation of a magnetic material. Maximum low-frequency output level is directly proportional to reentativity. Measured in gaugs (Gs).

rms (root-mean-square)—A method of mathematically averaging an a.c. signal such as audio. As used in wow, flutter, noise, and amplifier power measurements, rms relates to the energy of the signal. An rms-reading meter will respond to a transient faster than an average-reading meter but slower than a peak-reading meter.

Saturation—Magnetic overload. In effect, a saturated material has been magnetized “as far as it can go,” and no increase of magnetizing force will produce an increase in the material's magnetic intensity. In analog audio recording, both heads and tape may saturate when handling high recording levels, with very high distortion resulting.

Scrape flutter—Vibration in a tautly stretched tape caused by the tape's friction against heads, pressure pads, tape guides, and other objects. Scrape flutter has audible characteristics similar to those of modulation noise; both impart a harsh quality to the sound. Many recorders have scrape-flutter “filters”; these usually consist of no more than a small roller touching the tape and damping the vibrations.

Sendust—An alloy of iron, aluminum, and silicon. Its great hardness and special magnetic properties make it especially suitable as a material for tape heads.

Servo controlled—A method of regulating capstan speed and/or reel tension. As the capstan rotates, it generates a voltage or frequency proportional to its speed. The voltage or frequency is compared with a reference voltage or frequency and the difference is used to shift the motor speed up or down. When the capstan-generated voltage or frequency matches the reference, the difference signal goes to zero and the motor speed is stabilized. The whole comparison-with-a-reference process is called a servo loop.

Signal-to-noise ratio (S/N, SNR)—The ratio, expressed in decibels, between (1) a signal at a specified reference frequency and output level and (2) the output noise. The signal-to-noise ratio varies with frequency and is subject to innumerable mutually incompatible methods of measurement. See noise, weighting, dynamic range, headroom, decibel.

Solenoid—An electromagnet with a movable core. When the coil is energized, the core moves, providing a mechanical action that is used to control a tape transport.

Source/tape monitoring—A feature on some tape recorders that permits listening to and switching between the signal being fed to the recorder and the signal just recorded on the tape (as provided by the playback-head amplifiers). Source/tape monitoring is possible only with three-head tape machines.

Three head—A recorder with separate erase, record, and play heads, as opposed to a two-head deck in which both the record and play functions are performed by a single record/play head. A properly designed three-head machine can have its record and play heads optimized for their individual duties. (In some cassette decks both heads are in a single housing.) In particular, playback frequency response is improved by the narrower gap possible in a play-only head (a record head requires a wider gap). A three-head recorder also offers the advantage of source/tape monitoring. See head alignment.

Three-motor transport—A transport similar to a two-motor transport but having a separate motor for each reel or hub. This makes for simpler mechanical design and permits better control of tape tension. See closed-loop, dual-capstan.

Transport—The mechanical portion of a tape recorder responsible for moving the tape across the heads with no variation in speed or alignment. Transport controls such as rewind, play, and fast forward are either mechanical or electronic (“logic controlled,” “feather touch”). In general, the savings in cost possible with a mechanically controlled transport are outweighed by the simpler mechanical design and higher reliability of one that is electronically or solenoid controlled.

Two-motor transport—A transport in which one motor drives the capstan(s) and another drives the feed and take-up reels. This arrangement is often used in cassette decks.

VU meter—A meter used to display audio signal levels in decibels relative to a fixed 0-dB reference level. A “true” VU meter, rarely found in consumer audio equipment, has standardized ballistic (mechanical) and electrical characteristics that allow professionals to judge signal levels regardless of the associated equipment. See decibel.

Weighting—The assignment of relative importance to certain measurement figures so as to take into account the ears' varying sensitivity with frequency, loudness, and energy distribution. For example, “A-weighting,” commonly used in signal-to-noise measurements, gives less prominence to low frequencies because of the ears’ low sensitivity to low-frequency noise.

Wow—A slow, periodic variation of tape speed resulting in slow changes of playback pitch. Wow can originate in the transport or from tape-related causes: uneven tension in the reels or hubs, friction against the reels or cassette shell, and low-quality, poorly manufactured, or damaged tape. Fast wow is called flutter.
1939...FIRST DIRECT-DRIVE TURNTABLE SYSTEM.
1951...FIRST MOVING-COIL CARTRIDGE.
1972...FIRST DIGITAL (PCM) RECORDING.

1981...THE DENON DR-330 AND DR-320 SERVO-TENSIONER THREE-HEAD CASSETTE DECKS.

Many manufacturers would lead you to believe that three heads alone can transform a cassette deck. Denon's experience with professional studio tape-recorders proved that lack of uniform tape-to-head contact and proper transport stability, can create serious phase problems—especially in the high frequencies—whether the recorder has three heads or two.

To solve this problem, Denon developed a unique Tape Tension Servo Sensor, a system that maintains uniform tape-to-head contact during record and playback. In addition, Denon originated the Non-Slip Reel Drive mechanism (without clutches) which provides the extremely stable tape movement and prolongs the deck's life.

Before the development of the DR-330 (Speed Control and fine Bias Adjustment), Denon built two-head decks, which many audiophiles prefer even to the most expensive conventional three-head units.

With the development of the Tape Tension Servo Sensor and Non-Slip Reel Drive, Denon has realized the full potential of the three-head configuration. The Denon DR-320 and DR-330. Two important contributions to better sound reproduction, from the company where innovation is a tradition.

CIRCLE NO. 6 ON READER SERVICE CARD (Remote control RC-55 optionally available.)

Denon was founded 71 years ago, making it among the oldest extant companies in the audio industry. Thirty years ago, Denon first entered the professional recording field, and today it is the prime supplier to organizations like the NHK, Japan's equivalent to the British BBC.

Denon's professional products range from blank tape to 24-track recording consoles to fully automated radio stations; their accomplishments include the development of PCM (digital recording), one of the most significant advancements in the history of recorded sound.

In the U.S. Denon is known primarily by those in the know. In Japan, the land where electronics is king, Denon is king of the land.

DENON
Imagine what we'll do next.
What do most owners of videocassette recorders (VCRs) use their machines for? All the surveys seem to agree: the current two million or so use their machines mostly for unattended automatic recording of TV programs. The next most popular uses are recording of one program while watching another, recording the program being watched for later re-viewing, and playing commercially prerecorded tapes. And, according to the surveys, the least popular use for VCRs up to now has been “home movies,” probably because one of today’s video color cameras costs about as much as the recorder itself.

Which Format?

As a preliminary to getting into the various VCR performance options and their significances, it would be best to take a close look at the advantages and disadvantages of each of the two major U.S. consumer-video formats: Beta, invented by Sony, and VHS (Video Home System) by JVC. After you weigh them, you may decide that the choice of most buyers—VHS—is not the one for you. However, the bottom line of my experience is that you won’t go wrong with either format.

As usual, it’s easier to understand differences if you understand similarities first. Both Beta and VHS machines use cassette that contain ¼-inch-wide magnetic tape which is extracted and wrapped halfway around a head drum so that only one of two rotating heads is sweeping the tape at any one moment. Further, both formats get more mileage from a foot of tape in the same way—by rotating the heads at an angle to the tape path. This “helical-scan” system creates more “writing area” (recording space) on the ¼-inch wide tape [see Figure 1(a)] than would otherwise be possible without using multiple heads or shifting them. All machines achieve the required 4-MHz or so video frequency response not by zipping the tape past a stationary head but by moving it slowly while a pair of alternating tape heads spin at high speed.

The two formats differ in the size of their cassettes and in the way the tape is extracted and wrapped around the head drum. These engineering differences have implications for the maximum record/play time as well as some of the features that can be offered. For example, in Beta’s “omega-wrap” system [Figure 1(b)] a single arm extracts the tape from the cassette and wraps it in a—y you guessed it—Greek-omega-shaped path halfway around the head drum and past the audio, control, and erase heads. This circuitous path minimizes tape twist as it moves past the heads. The VHS format uses two arms to remove and position the tape. Its system is dummmed “M-load” because the tape traces an M-shaped path past the several heads [Figure 1(c)].

When a cassette is loaded into a deck, the tape is totally enclosed within the plastic cassette case. Beta machines take longer to extract and thread the tape, but they leave the tape wrapped during fast forward and rewind. VHS machines, on the other hand, take a few seconds to unload the tape before each fast forward or rewind. Of course, there are arguments between the advocates of each format as to which procedure causes more tape and/or head wear. But what you’ll notice more than possible wear is that the VHS machine’s loading and unloading process often backspaces the tape two or three counter-digits’ worth. This makes it quite difficult to cue a tape precisely and may result in several seconds’ worth of action being taped over by a subsequent recording. (I have learned to dovetail segments by monitoring the playback of the recorded portion, pressing pause at its end and then pressing record.)

There are other engineering differences between the formats. Since they use a slightly larger head drum, Beta models can achieve a faster writing speed (690 cm/sec versus 580 cm/sec) for the same 1,800-rpm head speed. Many readers may already know that the size of the cassette and the maximum record/play time vary with the recorder’s format. Beta cassettes are slightly smaller, and their size is designated by the tape length in feet. As of this writing, Beta cassettes range from L-125 to L-820. Of course, since VCRs offer you a choice of operating speeds, the available play/record time depends both on the speed selected and on the tape length. The first Betamax had only one speed, dubbed Beta-I, which recorded for one hour with the tape running at 4 cm/sec. For those who wanted to tape TV movies, this left something to be desired—half a feature film, say—so the next machines slowed the tape to 2 cm/sec. This Beta-II (or X2) became the new standard speed. More recently, a third speed known as Beta-III (and also as X3 or LP) has appeared in most new machines. (Incidentally, current Sony can play Beta-I tapes, but no new consumer machine will record at that speed.)

VHS machines and tapes use a simpler, though sometimes misleading, nomenclature. Tapes are designated by “T” for time (instead of Beta’s “L” for length), followed by the number of record/play minutes available at standard playing (SP) speed. They range from T-30 to T-120. The first VHS machines (which offered only SP) transported the tape at 3.335 cm/sec. Later, some manufacturers added Long Play (LP), half the speed of SP, and/or a Super Long Play (SLP), also known as Extended Play (EP), running at one-third the SP speed. Thus, when product literature describes a unit as a 2/4-hour machine, the time is based on using a T-120 cassette.

How do tape length and operating speed affect performance? First, to fit a longer tape into a Beta cassette case, the tape itself had to be made thinner. Longer VHS tape lengths could be ac-
accommodated simply by changing the diameters of the supply and take-up reels. And, as with any type of tape recording, the slower the speed the more critical the head-gap size. The gap was 58 microns originally on both Beta-1 and VHS SP-only machines. To achieve reasonable response at slower speeds, the head gaps of both Beta and VHS machines were narrowed to 29 microns. The result has been a slight loss of recording quality at the fastest speed because, for technical reasons, the narrower head gaps cannot put as much video information on the tape. This is the reason that many manufacturers are now using separate sets of heads for the SP and SLP modes. This allows optimizing the gaps for two of the three speeds, and it is also probably responsible for a noticeable improvement of quality in the latest SLP machines.

You'll find if you test view the lineup on your VCR dealer's shelf that no machine's recording/playback picture quality will match that of the original broadcast, although SP and Beta-II tapes will come very close. There will be some deterioration in picture clarity as you step down from the fastest speed to Beta-III or LP/SLP. But I've found more variation in performance among the various VHS models I've checked (even those made by the same manufacturer) than between Beta and VHS machines per se.

That may seem like fence straddling, but it brings me back full circle to my original advice: I think you can be happy with either format.

Evaluate each machine and pick the one that offers the combination of features you want at a price that suits you. For example, Model X's performance is great at its fastest speed and much poorer at its slowest. But it offers the special effects you want (see "Features" below) only at the slowest playback speed. Meanwhile, two-speed Model Y performs about the same at both speeds, not as good as X at its faster speed, but noticeably better than at its slower one; furthermore, it comes with a remote control that permits special effects and fast searches at either speed. Which one should you choose? Either choose Model Y or keep looking.

A few last words about format: don't forget that Beta and VHS tapes are incompatible. You cannot play a friend's VHS tapes on your Betamax, although you can dub from one machine to another with no problem (unless, of course, you're breaking the law by trying to duplicate a copyrighted tape). If you choose VHS, you will probably be satisfied with a 2/6-hour machine, which offers the best compromise between optimum fidelity and economy. A 4-hour mode is really necessary only to play tapes recorded at that speed, and only a few commercially available ones are. If you're upgrading your VCR, it might help to know that although the new table models from Akai, JVC and Sansui can record only at SP EP, they can play LP tapes. (Incidentally, all new machines automatically adjust their playback to the speed at which the tape was recorded by reading the sync signal put on the tape during recording. This means you won't have to remember what recording speed you've used.)

Tuners and Timers

Taping television means that your VCR has to have a tuner section. Every console VCR has one built in, but for TV taping the portable battery-powered recorders must be paired with a separate tuner/timer/battery-charger module—except for Sharp's new all-in-one portable VCR. (Usually you'll need only the recorder module when you play roving cameraperson.) Antenna connections to either type of machine are simple and are usually well explained in the VCR manuals. The 75-ohm coaxial and/or 300-ohm flat cables leading from your normal TV antenna connect to the VHF and UHF inputs at the rear of the VCR (or tuner module). Other coaxial and flat cables lead from the VCR's outputs to the VHF and UHF antenna terminals of any television set (see Figure 2, page 00). All necessary cables and matching transformers are usually packaged with the VCR equipment.

In the latest-model VCRs, the old-fashioned rotary channel selectors have been replaced by twelve to fourteen electronic channel-selector pushbuttons. Each pushbutton (they can be pressed in any order) has an associated fine-tuning control hidden in a separate compartment, and you can tune the pushbuttons to correspond to any available VHF or UHF channel (see Figure 3, page 00). Every VCR has an automatic fine-tuning (AFT) circuit that locks the signal in after you've fine-tuned it (sometimes activated by closing the door of the tuning compartment).

The r.f. converter built into almost all VCRs is actually a very low-powered TV transmitter that "broadcasts" the video signal from the VCR via a coaxial cable to the antenna input of your TV set. The r.f. converter can be adjusted to work on TV channels 3 or 4, whichever is unused in your locality. A few new TV sets have inputs that will accept video and audio signals directly from the VCR; this eliminates the need for the converter and gives slightly improved performance. Incidentally, all recorders have a TV/VCR switch that allows either the normal antenna signal or the VCR's r.f. output signal to be fed to the TV set's antenna terminals.

Features, Plain and Fancy

All of the features you could possibly want in a VCR are available somewhere. Trouble is, they're not all to be had in one unit. You'll have to look for the machine that offers the most of what you want, whether it's a programmable timer, high-speed picture search, special effects during playback, full-function remote control, or get-up-and-go portability. Following is a rundown on what features are available together with my views (based on extensive home and field use) on their significance and usefulness.

| Timers | A year and a half ago, I was happy to have a machine that could record one show in my absence. But no more—not since multi-event programmable timers found their way into my home. Working in conjunction with the built-in digital clock display, they can be set to tape five to eight programs over a one- or two-week period. |
And most of them are easily programmed using the VCR's special set of timer-control buttons to enter the day (and week, if necessary), the start and stop times or just the start time, the recording time, and the channel for each program desired (see Figure 4). The deluxe timers will signal when two programs overlap, they have NiCad battery backs-ups to protect your settings in the event of a short power failure (or need to unplug the unit), and they let you lock the channel number or control panel so your settings can't be accidentally disturbed.

Before you get carried away by the possibilities, remember that you're still limited to (at least) one tape deck at a time -- unless you've got four cassettes. (Sony's BetaStack cassette changer holds four cassettes and attaches to the newer Betamaxes; it extends your unattended recording time to 20 hours.) It's been my experience that a simple one-day/one-event timer is not quite enough, but eight events over two weeks are more than I've ever needed. As of this writing I'm at least 20 hours behind in my video viewing, and at least 20 hours behind in my video viewing, and can respond to an electronic cue signal after every stop or pause. Like audio cassette decks, every VCR lets you use its digital counter to stop at 0000 in rewind and sometimes in fast forward.

Special Playback Effects. Special effects are receiving more than their fair share of attention these days. It's hard to find a unit without freeze-frame, perhaps frame-by-frame advance, and some slow-motion (slowmo in video jargon) capability. Some units even let you vary the slow motion from freeze to one-third of normal speed. (Freeze frame is not likely to be totally frozen; it may look more like Jell-O than ice.) These features may appeal to the user who wants to review his golf swing or the final skirmish in the Super Bowl, but I'm more interested in the possibilities of faster playback; JVC's HR-6700U, for example, lets me zip through a 2-hour tape in 1 hour with sound.

Remote Controls. There are remote controls and then there are remote controls. Some are limited to providing pauses—handy for interrupting recording during commercials or taking a phone call during playback. On the other hand, there are full-function remotes that permit the armchair viewer to do everything but load the cassette into the machine. Every machine with a picture search or special playback effects lets you command it from afar; in fact, you cannot operate these functions of the Sony SL-5800U and others from the machine itself. At least a half dozen of the newest machines offer a full-function infrared wireless remote, all remotes come with a thin 15- to 20-foot cable that plugs into the unit. Those remotes with channel-changing buttons (which sequence forward and perhaps in reverse) through the channels you've fine-tuned the VCR to receive will come in handy if you also want to use the VCR as a tuner for normal viewing. It does help if you can see the VCR's channel numbers from across the room (you can't with all of them) since you won't necessarily know by what's on the screen what channel you've tuned in.

Audio Features. Although there are many like it in Japan, Akai's ActiVideo unit (see VCR directory listings) is at the moment the only VCR in the U.S. with stereo-sound recording capability and Dolby noise reduction. As VCR fans know, most recorders permit subsequent audio dubbing of a narrative or music onto a previously recorded tape using a microphone or other program source. And most Beta machines are set up to work with a (very expensive) PCM digital-audio recording adaptor.

Auto-stop, Auto-rewind. Video tapes, like audio ones, should be disengaged (unwrapped from the head drum) during long pauses between recordings. For this reason, many new machines have an auto-stop provision which unloads the tape after any pause exceeding 5 minutes or so. Other machines revert (whether you like it or not) to the record or play mode, whichever they were in, after a long pause. And some, like the Mitsubishi, Panasonic, and Sony models, automatically rewind the tape when it reaches the end.

Locks. There's nothing as frustrating as coming home and finding that somebody has disturbed a recording you left in progress or, worse, defeated your carefully pro-

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The CATV Connection

As you probably know, cable television takes the TV broadcast signals (VHF, UHF) together with the cable-only channels and pipes them into Channel 3 or some other unused frequency. If you're a cable subscriber, you might be wondering how your cable service will be affected if you add a VCR to your system. It all depends on how you hook up the equipment. There will be no problem if the cable service does not include a converter box or descrambler, for in such cases the cable will be connected to the VCR just as a normal antenna would be. Here are the other possibilities:

In one setup, the CATV converter box is connected to the VHF antenna inputs of the VCR and the VCR-to-TV hookup is done in the usual manner. Both the TV and the VCR are then essentially monitors, receiving (over, say, Channel 3) whichever channel the box is tuned to. This arrangement precludes making untuned recordings on different channels as well as recording one channel while watching another.

Another option is to wire the cable through the VCR to the converter which connects to the television. While you can then watch any broadcast, selecting the TV channel at the box, your VCR will not record CATV stations since its tuner cannot be tuned to them. On the other hand, you can apply the timer capability to any combination of regular VHF or UHF broadcasts you want.

If the VCR is "cable-ready" (that is, if it can be tuned to mid-band or super-band CATV channels as well as to Channels 2 to 83), then the converter box can be eliminated and full advantage can be taken of the VCR's programmability. But unless your TV set is also cable-ready, the converter box must be connected to it if you want to watch one CATV channel while recording another.

If you get two converters and a switch box, you can view any channel while recording any other, but you must make your selections manually. Alternatively, there are accessories available to convert the cable's output frequencies to the UHF band: this not only permits you to use your TV's remote tuning control (if it has one) but, more important, maintains the VCR's programmability.

programmed timer. Several units therefore have channel locks or panel locks that help prevent this. (The Akai is the only one that has a key lock, perhaps just in case your kids are tempted to check out your off-limits tape library.)

*Memory Back-up.* A battery back-up will preserve the clock and any timer settings in the event of brief power outages.

*Transition Editing.* Owners of older VCRs are familiar with the annoying jitters and glitches that show up between recorded segments during playback. The latest machines, particularly the portables, now have circuits that back up the tape so as to dovetail the start of one passage with the end of the one before it, provided only that you pause—not stop—between them.

**Portables**

One manufacturer puts it nicely: "A portable can work at home, but a home deck isn't portable." Because today's portable recorders combine features of the 22- to 40-pound a.c.-powered stay-at-home models with the ability to record on-the-go, they are the (almost) perfect choice for consumers who aren't willing (or able) to buy two units. Until recently portables have lagged behind in offering some of the niceties common to home decks—such as two or three speeds, programmable timers, special effects, and picture searches—but they are catching up fast.

A portable system essentially consists of two basic pieces: a battery-operated recorder and a TV tuner/timer/power-supply/charger module (see Figure 5). There is also a separate a.c. adaptor available that can serve as a power supply/recharger if the tuner/timer function isn't also required. The recorder modules are somewhat less than a foot square across the top, are about 5 inches thick, and weigh from 9 to 20 pounds including their built-in rechargeable battery packs. They come with handles or shoulder straps and have optional carrying cases. They all operate (and recharge) on household current when connected to their tuner/timer or a.c. adaptor. And in field use, their battery packs are rated to supply a nominal 1 1/2 hour of continuous recording time. In actual practice, somewhat less time is available because of the starts and stops of real use. The NiCad battery packs used by Akai, GE, JVC and Sanyo will recharge in 1 1/2 hours, while lead acid types take up to 8 hours. This makes it necessary to tote a spare along if you intend to do extensive taping. The third power option, a 12-volt d.c. source, usually employs an accessory cable that plugs into your car's cigarette-lighter socket.

Most, but not all, portable recorders
offer the same two or three speeds that are available on console models. The transition editing and special effects may be included as well. But picture search, which I wouldn't want to do without, is just now being added to portables.

The companion tuner/timer modules for portables are about the same size as the recorder units and can be placed beneath or beside them on a shelf or table. In general, these timers are just as programmable as those in the console models. In case you're wondering, either the tuner/timer or the a.c. adaptor can be used to power the recorder for use with a camera and to recharge a depleted battery pack. Some a.c. adaptors can recharge two batteries at once, the one inside the VCR plus another plugged directly into the adaptor.

I don't want to overlook the new 7-pound portable recorder from Funai Electric of Japan, sold in the U.S. as the Model 212 under the Technicolor label. Using a different and incompatible format (the micro-helical system), it has one speed and records for a maximum of 30 minutes on its special small-size cassette.

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There is obviously lots of activity in the VCR marketplace, and it shows no sign of slowing down. There are almost daily new entries of competing formats despite the jitters of an unsure economy and the very real potential competition of the videodisc. VCR manufacturers are producing cheaper VCRs (at, say, $695 list price) to offset the competitive threat of the videodisc. They also plan to introduce more expensive—and higher-quality—units to appeal to the growing videophile audience. It's safe to predict that the upcoming high-end VCRs will pay increased attention to audio performance, with such sonic imperatives as noise reduction and stereo becoming commonplace. Ready for export in Japan are a variety of videophile components, including some very high-resolution picture monitors, and several U.S. audio companies are also hard at work on high-end video products. The picture is clear—the Eighties will be the video decade.

**SELECTED VIDEOCASSETTE RECORDERS—PORTABLE MODELS**

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**SPEED CODES:**
- **Beta machines:**
  - Beta I only
  - Beta II only
  - Beta III only
- **VHS machines:**
  - SP = standard speed
  - LP = long play
  - SLP/EP = super long play, also called extended play

**Special Features:**
- a: program edit/scroll
- b: transition editing
- c: auto rewind
- d: auto stop
- e: panel/channel lock
- f: memory back-up
- g: sleep timer
- h: takes POM adaptor
- i: stereo with Dolby
- j: Beta II playback
- k: mechanical tuning
- l: no audio dub
- m: 24-hour clock
- n: LCD clock display
- o: front-loading cassette compartment
- p: tape-remaining indicator
- q: four videolapse heads
- r: one-event/two-day timer available
- s: Ni-Cd battery pack
- t: wireless remote
- u: linear time indicator
- v: mid/superband cable tuning

1**Beta I only**
2**Beta II only**
3**SP only**
4**LP only**
5**SLP/EP only**
6** cue only**
7**d: Only**

1982 EDITION
The Fisher DD-300 "Studio-Standard" is a moderately priced, front-loading cassette deck with two motors, two heads, logic-controlled solenoid transport operation, and the ability to use metal tapes as well as more conventional formulations.

The single capstan of the DD-300 is directly driven by one servo-controlled motor, while a second, governor-operated d.c. motor drives the supply and take-up reels. The record/playback head is constructed from "MX/Fer-rite," which we take to mean that the pole-piece area, where the tape actually contacts the head, is made of one of the various sensit alloys while the core of the head is ferrite. Both materials are capable of accepting the high bias requirements of metal tape (approximately 50 per cent greater than is needed for CrO₂-type formulations), and both have superior wear properties compared to even "hardened" permalloy.

Cassettes are placed, tape openings downward, into slides on the rear of the transparent plastic door that covers the cassette well. The transparency of the cover, together with an illuminated orange area behind the cassette itself, permits full visibility of the cassette during operation, making it possible to estimate the amount of tape remaining on a side of a cassette.

Directly beneath the cassette well are pushbutton-actuated controls for RE-WIND, FAST FORWARD, PLAY, RECORD, STOP, and PAUSE transport functions, along with a RECORD MUTE pushbutton intended to permit the deletion of incoming material without stopping the tape—a limited kind of electronic editing. The typical three-digit mechanical tape counter is provided, but separate MEMORY and AUTO REPEAT buttons are used to permit either stopping the highspeed rewind at "000" or continuing it to the actual end of the tape, as well as to permit putting the machine into PLAY mode automatically at either point. The AUTO REPEAT function is overridden when the deck is in its fast-forward mode; in play, however, if both MEMORY and AUTO REPEAT buttons are depressed simultaneously, the recorder stops at "000," rewinds to the start of the side, and then replays again for as long as the buttons are depressed.

A three-position switch turns the Dolby noise-reduction off, on, or on with a multiplex filter to eliminate any residual 19-kHz stereo FM pilot signal that might be passed on by a tuner or receiver. A second switch enables the DD-300 to be operated from an external timer in either record or play mode. A four-position switch sets the bias and equalization for metal, ferric, CrO₂-type, or ferrichrome tapes, and a two-position switch selects whether recordings will be made from the rear-panel "line-input" jacks or from the front-panel microphone inputs; mixing is not possible. Concentric recording-level controls are provided, along with a playback-level control that affects both regular outputs and the level at the headphone jack.

The record-level meters are "VU" types, each having two scales: from -20 to +5 VU for most tapes and from -20 to +8 VU for metal formulations. A reading of 0 VU is marked at 3 dB below Dolby level on both scales, and the metering system is supplemented by peak-reading LED indicators for 0 VU, +3 VU, and +6 VU. The meter scales are illuminated in blue below 0 VU and in orange at 0 VU and above.

The normal "line-level" input and output connectors are located on the rear panel of the DD-330. Overall, the unit measures 17 3/8 x 5 3/4 x 10 inches in width, height, and depth; it weighs approximately 13 pounds. Available with either a silver or a black front panel, the DD-300 has a retail price of $349.95.

- Laboratory Measurements. Our sample of the DD-300 was supplied with Fuji metal tape, TDK SA (CrO₂-type), TDK AD (ferric), and Sony FeCr (ferrichrome), so we used these cassettes for our evaluation. Playback frequency response, measured with Teac MTT-216 and MTT-316 test tapes, was exceedingly flat over the tapes' 31.5-Hz to 14-kHz range; the slight rise at the very lowest frequencies shown in the accompanying graph is not a property of the deck but occurs when full-track test tapes are used on a quarter-track machine.

Overall record-playback response, measured at the customary -20-VU level, dropped by 3 dB at 18 kHz with the metal tape, at 16 kHz with TDK SA and AD, and, as the graph shows, rather earlier (between 7 and 8 kHz) with the ferrichrome. The considerable advantage of metal tape in the high-frequency range is clear not only from the wider frequency response, but from the curves made at a 0-VU input level. Even at 10 kHz, there is a full 8-dB advantage, and this increases...
on the low side for recording live music, but overload began to be detectable in the -VU indication and an output of 430 mV. An input of 0.075 volt at the line input produced a playback -compatible with all Dolby -B recording systems. HX-processed tapes are less than would be generated by treble overloading or low -frequency distortion, though this is at the cost of some increase in frequency capacity of the tape. By lowering the bias, the high -frequency content when strong treble content is present in the music. By lowering the bias, the high -frequency content is enhanced.

The Dolby -level markings (200 nanowebers/meter) were at +3 VU on the meter scales and were within 0.75 dB of the level on our test tape. At a 0 -VU input, using a 1,000-Hz test tone, the third -harmonic distortion was 1.25 per cent with Fuji metal tape and 0.7, 0.6, and 1.5 per cent with TDK SA, TDK AD, and Sony FeCr, respectively. The metal and ferrichrome tapes permitted a +4 -dB signal before reaching the 3 per cent distortion point used for signal-to-noise ratio measurements; the comparable "headroom" for TDK SA was +5 dB, and for TDK AD it was +6 dB. Unweighted signal-to-noise measurements, without Dolby noise reduction, were 53.5 dB for Fuji metal and Sony FeCr, 53.8 dB for TDK AD, and 54.2 dB for TDK SA. Adding Dolby and using CCIR/ARM weighting, these figures improved to 65.3, 68, 65.8, and 65.8 dB, respectively.

Wow and flutter, using a Teac MTT-111 test tape, registered 0.085 per cent on the DIN peak-weighted system and 0.07 per cent on a weighted rms basis. Fast -forward and rewind times for a C -60 cassette were between 80 and 85 seconds. An input -signal level of 0.075 volt at the line input produced a 0 -VU indication and an output of 430 mV (0.43 volt). Comparable sensitivity through the microphone preamplifier was 0.69 mV, and overload began to be detectable in the microphone stage at 0.042 volt—somewhat on the low side for recording live music, but certainly adequate for speech. The meter's ballistic characteristics were slightly slow: 500-millisecond tone bursts produced a full output indication, but tested with the standard 300-millisecond bursts, the reading was -5 VU. On the other hand, the peak-level LED indicators would catch this under -reading. Dolby tracking accuracy, checked at -20 - and -30 -VU levels, was within 1.5 dB of the non-Dolby frequency response up to 14 kHz, after which it dropped sharply.

*Comment.* For listening to prerecorded tapes and for making copies of FM broadcasts and of most disc materials, the Fisher DD -300 proved to be an excellent performer. Dubbing very demanding discs or wide range master tapes of live music brought out a slight loss below 40 Hz or so and also demonstrated the high-frequency advantage of metal-alloy tape. Given its price level, one could not expect the Fisher DD -300 to be the full sonic equal of decks in the $1,000 -and -up price range, but it functioned flawlessly throughout our tests, and we can recommend it as a fine value.

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The Harman Kardon hk 705 is the first available cassette recorder that incorporates the new Dolby HX "headroom-extension" system. The HX process (described more fully in Craig Stark's "Tape Talk" in the September 1979 issue of *Stereo Review*) extends the high-frequency overload capability of a Dolby -B equipped cassette deck during recording by reducing both the record bias and equalization at those moments when strong treble content is present in the music. By lowering the bias, the high-frequency capacity of the tape is enhanced: though this is at the cost of some increase in low -frequency distortion, this distortion is less than would be generated by treble overload (saturation). HX-processed tapes are playback-compatible with all Dolby -B recorders, and the claimed benefits in high -frequency headroom are roughly equivalent to those provided by the new metal-tape formulations.

The hk 705 is a slim, front-loading deck that uses a single Sendust record/playback head and a capstan driven by a d.c. servomotor. A second motor is used to pull the cassette inside the deck after it is laid onto a tray that pops out from the front of the unit when the eject button is pressed. When the cassette is locked into place, an angled mirror permits viewing the amount of tape remaining on a side through a window in the entry slot. Access for routine cleaning is provided by a removable tab on the top of the deck.

Control of the tape motion is provided through a series of mechanically interlocked piano-key levers. A RECORD MUTE button is provided for inserting a quiet space between selections, and a TAPE END light begins to blink when approximately three minutes of tape remain on a side. The three-digit counter contains a "memory rewind" feature that works with the zero setting, permitting quick return to a selected spot on the tape.

Twelve peak -reading LEDs per channel (green below 0 dB, red above) form the vertically oriented level indicators, which are calibrated from -20 to +8 dB with the 0 -dB point marked as Dolby level (200 nWb/m). A vertical row of pushbuttons adjacent to the LED indicators provides bias and equalization switching for four tape types: metal, CrO2, ferrichrome, and ferric. Additional front-panel pushbuttons are provided to insert a subsonic (below 20 Hz) filter and to activate either the regular Dolby noise-reduction system or its HX version. These latter two buttons are illuminated.

The large record-level control uses concentric knobs to permit independent adjustment of the left and right channels. An output-level control, which affects both channels equally, also varies the level at the headphone jack, one that is designed to accept headphones with 8 -ohm (or higher) impedance. The front-panel microphone jacks are intended for use with medium-impedance (600-ohm) mikes.

The rear panel of the hk 705 has phonoejack input and output connectors, an FM-multiplex switch, and a ground post. Overall, the unit measures 15½ x 3 x 12½ inches and weighs slightly under 13½ lbs. Price: $449.
Laboratory Measurements. Our sample of the hk 705 was factory-aligned for TDK-MA (metal), Sony FeCr (ferrichrome), Maxell UD XL-1 (ferric), and—because it was an early model intended for evaluation at Dolby Labs—for the DIN 70-microsecond reference tape (a formulation most closely matched by BASF Professional II). Production models will be set up with TDK SA, which should result in performance substantially equivalent to that shown for the 120-microsecond Maxell UD XL-1.

Playback equalization was checked using our new Teac MTT-216 (120-microsecond) and MTT-316 (70-microsecond) calibrated tapes, which extend the test range from 31.5 to 14,000 Hz. As the graph indicates, the hk 705 proved exceptionally accurate in playback response over this range, well inside ±2-dB tolerance. The Dolby-level calibration, tested with both Teac and TDK reference tapes, was also accurate, within the resolution (±1 dB) of the LED indicators on either side of the 0-dB marking.

Overall record-playback frequency response (measured at the customary −20-dB level) did not drop by more than 3 dB at approximately 33 Hz and 18 kHz with most tapes. At the 0-dB level the advantage of the TDK-MA metal formulation was strikingly apparent, giving vastly increased high-frequency headroom.

Distortion at 1,000 Hz, measured at the 200-nWb/m Dolby 0-dB level, was 0.7, 2.2, 1.7, and 1 per cent, respectively, for our ferric, CrO₂, ferrichrome, and metal reference tapes. Listed in the same order, these tapes required input levels of +5, +2, +3, and +4.5 dB before distortion reached the 3 per cent third-harmonic point used for signal-to-noise ratio measurements. Unweighted S/N without Dolby-B was 52.8, 54.4, 55.7, and 55.8 dB for the four tapes, respectively, and these figures increased to 63, 66.6, 67.7, and 67.8 dB, respectively, with Dolby noise reduction and standard IEC "A" weighting. The S/N with Dolby plus CCIR/ARM weighting was 63.2, 66.1, 67, and 66.5 dB.

Wow and flutter measured 0.035 per cent with the usually specified weighted-rms method, and 0.046 per cent when using the DIN peak-weighting scale. Both of these figures are exceptionally good, especially for a single-capstan deck. Fast-wind times for a C-60 cassette averaged 76.5 seconds.

A line-input signal level of 45 millivolts (mV) was required to produce a 0-dB indication on the LED string, and the correspond-
idly at higher frequencies. The low end of the DD-300 fell off rapidly at frequencies below approximately 40 Hz.

The Dolby-level markings (200 nanowebstors/meter) were at +3 VU on the meter scales and were within 0.75 dB of the level on our test tape. At a 0-VU input, using a 1,000-Hz test tone, the third-harmonic distortion was 1.25 per cent with Fuji metal tape and 0.7, 0.6, and 1.5 per cent with TDK SA, TDK AD, and Sony FeCr, respectively. The metal and ferrichrome tapes permitted a +4-dB signal before reaching the 3 per cent distortion point used for signal-to-noise ratio measurements; the comparable "headroom" for TDK SA was +5 dB, and for TDK AD it was +6 dB. Unweighted signal-to-noise measurements, without Dolby noise reduction, were 53.5 dB for Fuji metal and Sony FeCr, 53.8 for TDK AD, and 54.2 dB for TDK SA. Adding Dolby and using CCIR/ARM weighting, these figures improved to 65.3, 68, 65.8, and 65.8 dB, respectively.

Wow and flutter, using a Teac MTT-111 test tape, registered 0.085 per cent on the DIN peak-weighted system and 0.071 per cent on a weighted-rms basis. Fast-forward and rewind times for a C-60 cassette were between 80 and 85 seconds. An input-signal level of 0.075 volt at the line input produced a 0-VU indication and an output of 430 mV (0.43 volt). Comparable sensitivity through the microphone preamplifier was 0.69 mV, and overload began to be detectable in the microphone stage at 0.042 volt—somewhat on the low side for recording live music, but certainly adequate for speech. The meter's ballistic characteristics were slightly slow: 500-millisecond tone bursts produced a full output indication, but tested with the standard 300-millisecond bursts, the reading was -5 VU. On the other hand, the peak-level LED indicators would catch this under-reading. Dolby tracking accuracy, checked at -20- and -30-VU levels, was within 1.5 dB of the non-Dolby frequency response up to 14 kHz, after which it dropped sharply.

- **Comment.** For listening to prerecorded tapes and for making copies of FM broadcasts and of most disc materials, the Fisher DD-300 proved to be an excellent performer. Dubbing very demanding discs or wide range master tapes of live music brought out a slight loss below 40 Hz or so and also demonstrated the high-frequency advantage of metal-alloy tape. Given its price level, one could not expect the Fisher DD-300 to be the full sonic equal of decks in the $1,000-and-up price range, but it functioned flawlessly throughout our tests, and we can recommend it as a fine value.

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**Harman Kardon hk 705 Cassette Deck**

The Harman Kardon hk 705 is the first available cassette recorder that incorporates the new Dolby HX "headroom-extension" system. The HX process (described more fully in Craig Stark's "Tape Talk" in the September 1979 issue of Stereo Review) extends the high-frequency overload capability of a Dolby-B equipped cassette deck during recording by reducing both the record bias and equalization at those moments when strong treble content is present in the music. By lowering the bias, the high-frequency capacity of the tape is enhanced; though this is at the cost of some increase in low-frequency distortion, this distortion is less than would be generated by treble overload (saturation). HX-processed tapes are playback-compatible with all Dolby-B recorders, and the claimed benefits in high-frequency headroom are roughly equivalent to those provided by the new metal-tape formulations.

The hk 705 is a slim, front-loading deck that uses a single Sendust record/playback head and a capstan driven by a d.c. servomotor. A second motor is used to pull the cassette inside the deck after it is laid onto a tray that pops out from the front of the unit when the eject button is pressed. When the cassette is locked into place, an angled mirror permits viewing the amount of tape remaining on a side through a window in the entry slot. Access for routine cleaning is provided by a removable tab on the top of the deck.

Control of the tape motion is provided through a series of mechanically interlocked piano-key levers. A RECORD MUTE button is provided for inserting a quiet space between selections, and a TAPE END light begins to blink when approximately three minutes of tape remain on a side. The three-digit counter contains a "memory rewind" feature that works with the zero-setting, permitting quick return to a selected spot on the tape.

Twelve peak-reading LEDs per channel (green below 0 dB, red above) form the vertically oriented level indicators, which are calibrated from -20 to +8 dB with the 0-dB point marked as Dolby level (200 nWb/m). A vertical row of pushbuttons adjacent to the LED indicators provides bias and equalization switching for four tape types: metal, CrO2, ferrichrome, and ferric. Additional front-panel pushbuttons are provided to insert a subsonic (below 20 Hz) filter and to activate either the regular Dolby noise-reduction system or its HX version. These latter two buttons are illuminated.

The large record-level control uses concentric knobs to permit independent adjustment of the left and right channels. An output-level control, which affects both channels equally, also varies the level at the headphone jack, one that is designed to accept headphones with 8-ohm (or higher) impedance. The front-panel microphone jacks are intended for use with medium-impedance (600-ohm) mikes.

The rear panel of the hk 705 has phonojack input and output connectors, an FM-multiplex switch, and a ground post. Overall, the unit measures 15 1/4 x 3 x 12 1/4 inches and weighs slightly under 13 1/4 lbs. Price: $449.
Laboratory Measurements. Our sample of the hk 705 was factory-aligned for TDK-MA (metal), Sony FeCr (ferrichrome), Maxell UD XL-1 (ferric), and—because it was an early model intended for evaluation at Dolby Labs—for the DIN 70-microsecond reference tape (a formulation most closely matched by BASF Professional II). Production models will be set up with TDK SA, which should result in performance substantially equivalent to that shown for the 120-microsecond Maxell UD XL-1.

Playback equalization was checked using our new Teac MTT-216 (120-microsecond) and MTT-316 (70-microsecond) calibrated tapes, which extend the test range from 31.5 to 14,000 Hz. As the graph indicates, the hk 705 proved exceptionally accurate in playback response over this range, well inside a ±2-dB tolerance. The Dolby-level calibration, tested with both Teac and TDK reference tapes, was also accurate, within the resolution (± 1 dB) of the LED indicators on either side of the 0-dB marking.

Overall record-playback frequency response (measured at the customary -20-dB level) did not drop by more than 3 dB at approximately 33 Hz and 18 kHz with most tapes. At the 0-dB level the advantage of the TDK-MA metal formulation was strikingly apparent, giving vastly increased high-frequency headroom.

Distortion at 1,000 Hz, measured at the 200-W/m Dolby 0-dB level, was 0.7, 2.2, 1.7, and 1 per cent, respectively, for our ferric, CrO₂, ferrichrome, and metal reference tapes. Listed in the same order, these tapes required input levels of +5, +2, +3, and +4.3 dB before distortion reached the 3 per cent third-harmonic point used for signal-to-noise ratio measurements. Unweighted S/N without Dolby-B was 52.8, 54.4, 55.7, and 55.8 dB for the four tapes, respectively, and these figures increased to 65, 66.6, 67.7, and 67.8 dB, respectively, with Dolby noise reduction and standard IEC "A" weighting. The S/N with Dolby plus CCIR/ARM weighting was 63.2, 66.1, 67, and 66.5 dB.

Wow and flutter measured 0.035 per cent with the usually specified weighted-rms method, and 0.046 per cent when using the DIN peak-weighting scale. Both of these figures are exceptionally good, especially for a single-capstan deck. Fast-wind times for a C-60 cassette averaged 76.5 seconds.

A line-input signal level of 45 millivolts (mV) was required to produce a 0-dB indication on the LED string, and the corresponding output (maximum) was a very high 1.5 volts. Microphone sensitivity, using our 600-ohm generator, was 0.15 mV, and the microphone overload level was reached at 15 mV—not an overgenerous margin, but undoubtedly adequate for the medium-impedance microphones that would be used for anything but the recording of music with a very wide dynamic range. Headphone listening level was more than adequate with both 600-ohm and 200-ohm (nominal 8-ohm) phones.

The tracking accuracy of the regular Dolby-B circuits, measured at -20- and -30-dB levels, was very good (± 1 dB or better) up to 15 kHz, above which levels the curves tended to diverge somewhat. We were naturally more interested in the performance of the Dolby HX "headroom-extension" system, however. The best way to illustrate its effectiveness in terms of measurements is to refer to the 0-dB level curves for overall record-playback response. With Maxell UD XL-1 tape, the high-frequency overload point using the HX system fell almost exactly halfway between the curve shown for Maxell UD XL-1 and that shown for the metal TDK-MA.

Comment. The audible benefits of the Dolby HX system in the hk 705 are clearly evident in direct-comparison listening tests, though they depend considerably, like the benefits of metal-alloy tape, on the material being taped. On straight FM material and on most regular discs we did not hear a "night-and-day" difference, but on the most demanding material (FM hiss and master tapes with substantial high-frequency content) the difference was very clear. In normal recording of such material, the highs can often be dulled because of tape saturation. The HX system (or metal tape) dramatically alleviates this problem. The effect of the HX process was most noticeable with less-than-premium cassettes, which can cost one-fourth as much as metal cassettes yet sound very nearly as good. Most important, we could hear no unwanted side effects when using the HX system; if any are there to be heard, it is probable that they could be spotted only with a three-head machine capable of instant direct comparisons. With its overall high performance, sleek styling, and the HX feature, the Harman Kardon hk 705 regains a more than worthwhile value at what, in today's market, is not a very high price.
The Hitachi D-3300M is a three-head, two-motor cassette deck featuring the microprocessor-controlled ATRS (Automatic Tape Response System) developed by Hitachi and used in a slightly different form in its top-of-the-line Model D-5500M. Although some of the convenience features of the D-5500M have been deleted from the lower-priced D-3300M, in their essentials the two machines are very much alike.

The D-3300M has metal-tape record/play capability, a double-Dolby system for monitoring off the tape with correct frequency response and noise levels, solenoid-operated tape transport functions, and fast-acting fluorescent peak-level indicators that hold readings above 0 dB for an extended time. Some unusual operating modes, such as auto rewind play/stop, are found in the recorder. It can be set to automatically rewind the tape at the end of play and stop when the beginning has been reached or go into play and repeat the tape indefinitely. There is also a conventional memory rewind that stops the tape when the index counter returns to 000. The D-3300M can be controlled from an external clock timer in the power line for untended recording or playback.

In most respects, the front-loading D-3300M presents a conventional appearance, with light touchbuttons below the cassette door controlling the transport through solenoids. Colored lights above the buttons show the selected mode of operation. A REC MUTE button kills the incoming signal to the recording circuits while it is held in. This allows program material to be conveniently deleted from a recording.

Although they are electronically and magnetically distinct, the record and playback heads of the D-3300M are housed in a single case. Separate line and microphone input record-level controls are provided, and the two sources can be mixed. Each control is actually a pair of clutch-coupled potentiometers for individual channel level adjustment. Playback level is controlled by a single knob.

The fluorescent peak-level indicators—a pair of horizontal lines formed of closely spaced luminous segments—are calibrated from −20 to +6 dB and respond very rapidly to program peaks. Pressing PEAK HOLD causes the maximum level above 0 dB to be displayed until the button is pressed a second time or the recorder is shut off.

Most novel among features of the deck is its ATRS. To use it, one first selects the basic tape type by pressing one of the four pushbuttons—UD-ER (NOR), UD-EX (CrO₂), FeCr, or METAL. In general, ferric tapes use the NOR setting, while ferricobalt and chromium-dioxide tapes take the CrO₂ setting. A green light in the center of each button glows when a given button is activated.

Next, the machine is put into the REC mode and the button marked TEST is pressed. The automatic test sequence begins and, after about 10 seconds, the tape rewinds to the start of the test section and the machine stops. At this point, the red light in the center of the TEST MEMORY button comes on, signifying that optimal parameters of bias, record level, and equalization are stored in the computer's memory. If desired, recording can be made without further use of the ATRS controls. Data is retained in memory, even with power off, with two silver cells.

Alternatively, one can store the computer-derived information in a memory assigned only to the tape-type button that was used for the ATRS operation. This releases the TEST MEMORY for use with another type of tape. To load this data into the regular memory, it is necessary to press only the TEST MEMORY and adjacent MEMORY buttons in that order, holding both in and releasing TEST MEMORY first. From this point on, touching the tape type button will optimize the recorder for that particular tape formulation. The information assigned to each button can be changed at any time by running another tape through the test and loading the test memory into memory.

A window next to the buttons contains red lights that illuminate in rapid sequence to show which test frequency (1, 7, or 15 kHz) is being used at any time during the ATRS operation. A fourth light (BATT) shows that the memory cells are installed and operating properly; if the cells become weak or are absent, this light flashes.

In the automatic test, the computer first records a 1-kHz standard-level tone on the tape and checks the playback level. If the primary tape selection is incorrect, or if the leader tape is passing over the heads, the test
button light flashes to indicate an error.

If the correct tape type has been selected, the machine's logic circuits vary the bias current in 32 steps, noting which value gives the maximum playback level as bias is increased and again as it is decreased. The average of these two bias levels is stored and used for the following tests. Next, the recording level is varied in 32 steps of 0.25 dB each to find the value that gives a correct playback level at 1 kHz. Then, frequencies of 7 and 15 kHz are recorded in turn, with the computer adjusting equalization in 32 steps to obtain uniform output at all three frequencies.

Since there is some interaction between these adjustments, the entire process is repeated two more times before the parameter settings are stored in TEST MEMORY. During the tests, the turns of the tape hubs are monitored by the computer so that the tape is wound to where the test began.

When the stored data is transferred to the individual tape memories, it is available at any time the associated buttons are pressed. This transfers the information in 5-bit data units to the peripheral circuits, establishing bias, level and equalization.

Although the D-3300M lacks the wireless remote-control feature of the D-5500M, it has an optional wired remote-control unit that operates all transport functions.

The Hitachi D-3300M is 17”W X 10”D X 6½”H and weighs 18.5 lb. Suggested retail price is $750.

- Laboratory Measurements. For our bench tests, we used Maxell UD-XLI for CrO2, Sony Duad for FeCr, and TDK MA-R for metal tape. Frequency response at -20 dB was virtually identical for all tapes, typically +2 dB from 35 to 20,000 Hz, with slightly depressed output after 10 kHz and falling response below 50 Hz. Differences between the tapes became more apparent in measurements taken from a 0-dB record level. Here, the two Maxell tapes showed a falling response above 8 kHz, which intersected the +20-dB curve between 15 and 20 kHz. The Duad tape response began to fall off at 4 kHz, but it did not meet the +20-dB curve until 8 kHz. Not surprisingly, the TDK MA-R metal tape was flat to 10 kHz, falling off modestly to -8 dB at 20 kHz, where it was still 12 dB above the -20-dB response.

Dolby tracking was fairly good at levels of -20 and -30 dB, with response changing by no more than 2 dB at any frequency when the Dolby system was turned on. At -40 dB, the tracking was nearly perfect. The switchable MPX filter had no effect on the response up to 15,000 Hz but attenuated the 19-kHz response by at least 30 dB.

Playback frequency response was measured with BASF (DIN) and Teac 116SP test tapes for the 120- and 70-microsecond playback characteristics, respectively. Both responses were within ±1 dB over the range of the tapes, from 30 or 40 Hz to 10 kHz.

A 0-dB recording indication required a line input of 71 to 72 millivolts (mV) at 1 kHz, the corresponding maximum playback level was between 0.49 and 0.70 volt, depending on the tape (Daud gave the lowest output, UD-XLI the highest). Microphone sensitivity for 0 dB was 0.82 millivolt; overload occurred at 62 millivolts.

Third-harmonic distortion in the playback of a 1-kHz tone recorded at 0 dB was between -37 and -44 dB (1.4% to 0.36%), depending on the tape. Metal tape gave markedly lower distortion than any of the others. The input level that gave 3% distortion in playback was around +2 to +2.5 for ferric tapes, +5.5 dB for Duad tape, and +6.5 dB for metal tape. Referred to that level, the unweighted signal-to-noise ratio (S/N) in the output was 54 to 55 dB with all tapes except UD-XLI (sonor), which measured 50.5 dB.

Using the Dolby system and CCIR/ARM weighting, the NOR tape gave a 60.5-dB S/N reading; UD-XLI, 64.5 dB; metal, 65.8 dB; and Sony Duad (FeCr), 66.7 dB. Noise increased by only 2.5 dB through the microphone input at maximum gain.

The fluorescent "meters" responded with exactly correct VU ballistics characteristics, and the 0-dB indications corresponded with the 200-nWb/m standard Dolby level. Tape speed was 0.75% slow, and a C60 cassette was moved from one end to the other in 92 seconds in fast forward and rewind. Flutter was extremely low, meeting Hitachi's specification of 0.023% wms. A weighted peak (CCIR) reading reached 0.04%. These are excellent flutter data.

- Comment. The short ATRS cycle time of about 10 seconds makes it perfectly practical to use it before making any recording, instead of using a set of previously stored data in one of the tape memories. This also has the advantage of compensating for any possible batch-to-batch tape formulation property differences.

One demanding test of a cassette deck's fidelity is to record FM tuner interstation noise and compare the playback with the incoming signal. This had to be done via the amplifier's tape-monitor switch, since the "source" playback from the tape deck was slightly brighter than the incoming signal. Playback from the D-3300M was almost perfectly accurate with UD-XLI tape, even at a -6-dB recording level—and very nearly as good at 0 dB! UD-XLI performed nearly as well. Sony Duad gave a distinctly duller sound than either ferric tape in this test, and TDK MA-R's playback was slightly brighter than the incoming signal, even at levels of 0 dB and higher! This recorder proved itself capable of making highly accurate recordings of just about any program one might encounter. With records and FM broadcasts, it was audibly perfect in its reproduction of the original program.

Although everything on the D-3300M worked with total smoothness and freedom from "bugs," one must practice with this machine to get the most out of it. For example, the procedure for making the ATRS alignment and storing it in memory is not at all obvious from the control markings. It is necessary to read the manual and make a few trial runs to render it as automatic for the operator as for the recorder. Also, the operation of the PAUSE button is somewhat unusual. A momentary touch on the button stops the tape, without disengaging REC if it is in use. However, to release PAUSE, the play button must be touched. It is not necessary to use REC simultaneously, since the machine's logic system will remember that it was in the recording mode.

Since Hitachi's introduction of ATRS, similar systems have appeared in some competitive machines. All the others we have seen sell for more than the D-3300M, and to our knowledge, none can top its performance. This is an excellent recorder that eliminates tape characteristics from the recording equations. Essentially, the only differences between tapes with the D-3300M are minor variations in residual noise.

Solenoid-operated transport controls and full compatibility with all tape formulations are included in the two-head, single-motor K-8 cassette deck from Luxman. Among its operating conveniences are fast-responding fluorescent peak level "meters," light-touch transport control buttons, timer-controlled operation in both record and playback modes, and several automatic play/rewind functions. A highly legible three-digit fluorescent display is used for the tape counter. Microphone inputs can be substituted for, but not mixed with, the line inputs, and unwanted noises can be deleted by manual recording temporarily without stopping the tape.

Access to the cassette well is gained by pushing a button at the upper left of the front panel. Most of the cassette, which is back-

Luxman K-8 Cassette Deck
lighted, can be seen through the transparent door while in operation. If Luxman cassettes are used, it is possible to minimize azimuth error from a tape made on another machine by adjusting tape skew with a small screwdriver through a hole in the cassette door.

Transport controls are flat "feather-touch" buttons that operate solenoids through logic circuits. These enable switching from any mode to any other without use of the STOP button. The tape normally halts before changing speed or direction but does so automatically. It is possible to make a "flying start" recording while playing a tape, by holding the PLAY button and pressing RECORD simultaneously.

Each time the recorder is turned on, the counter resets to 000, unlike mechanical index counters. Manual reset can be accomplished by pressing a small button circuit, which causes the tape to stop at 000 when in the rewind mode. Arrows near the index numerically indicate tape motion.

The level indicators are a pair of blue fluorescent 12-segment horizontal lines. Each channel is calibrated from -20 to +5 dB (segments are solid below 0 dB and outlines above 0 dB). When the deck is set for metal tape, the range of the displays is extended to a top end +8 dB.

Two three-position lever switches select bias and equalization. Each has positions marked NORM CrO2 and METAL. Basic bias settings can be altered by ±10% via a center-detented vernier control. The switch for the Dolby noise-reduction system has an OFF and two ON positions, one of which engages an MPX filter to remove any 19-kHz pilot carrier that might remain in the audio from an FM tuner. Recording levels are adjusted by two concentric controls coupled by a slip clutch, and a single knob sets the playback level. Another three-position switch selects MIC or LINE inputs or a spring-loaded RECORD position that kills the signal to the record head. This does not remove the incoming signal from the line outputs or affect the readings of the level indicator. Front-panel microphone jacks (for medium-impedance mikes) are provided, as is a headphone jack.

Automatic operation under timer control is possible using a small rotary switch. It chooses between normal operation, timer-controlled playback, timer-controlled recording, and three automatic modes: PLAY, REWIND, and REPEAT. Touching REWIND when PLAY has been selected causes the tape to rewind to its beginning (or to 000 if the MEMORY button is engaged) and go into play automatically. REWIND causes the tape to rewind automatically when it reaches its end, stopping at either 000 or its beginning. REPEAT is similar except that play begins again when the beginning reference point has been reached.

Sendust record/playback and erase heads are used in the K-8, along with a direct-coupled recording amplifier—an unusual touch in a cassette deck. "Analogue switches," presumably solid-state devices such as FETs, are used for various control functions. With these, the leads routed to the front-panel controls handle only dc signals and cannot degrade the audio.

Specifications for the K-8 include record/playback frequency response (±3 dB) from 30 Hz to either 15, 18, or 20 kHz (normal, CrO2, and metal tapes, respectively). The corresponding S/N ratios (with Dolby) are 60 to 65 dB, while the rated flutter is 0.55% weighted rms.

The Luxman K-8, with a suggested retail price of $499.95 is housed in a wood-grain veneered cabinet with pale-colored panel and knobs. It measures 17 1/4"W x 11 1/4"D x 4 1/4"H and weighs 13.2 lb. An 8-KID remote-control unit is available for $99.95.

**Laboratory Measurements.** Lacking specific recommendations—other than an implication that Luxman tapes (not widely available) were suitable—we measured record/playback frequency response with a number
of tape formulations. For normal (normal bias, 120-microsecond EQ) tape, we used TDK AD and OD, Maxell UD-XL, and Fuji FX-I. The CrO₂ (high bias, 70-microsecond EQ) tapes were TDK SA-X, Maxell UD-XLII, and Fuji FX-II, and metal tapes were TDK MX, and Fuji Metal.

Although good results were obtained with all the tapes, our curves suggest that the recorder had been set up for TDK tapes, which we used for our subsequent tests. All the other tapes yielded a slightly drooping high-end response, suggestive of slight overbias. The bias fine control was found to vary response above 10 kHz by about ±1 to ±2 dB, enough to flatten out the response curves from the Maxell and Fuji tapes. Measurements were made with this control centered.

Response with TDK AD was within ±2 dB from 20 to 16,500 Hz at −20 dB, with the 0-dB curve dropping off above 7 kHz to intersect the −20-dB curve at 12.5 kHz. OD tape was close but not quite as good at high frequencies. TDK SA-X delivered a response within ±0.5 dB from 37 to 17,000 Hz and −3 dB at 20 and 18,500 Hz. Intersection of the 0- and −20-dB curves occurred at 13.8 kHz. Metal tape (TDK MA) was almost identical in response to SA-X (±0.5 dB from 40 to 17,500 Hz), but its dramatically better high-frequency characteristics were demonstrated by the fact that the 0-dB curve was still 12 dB above the −20-dB curve at the frequency extreme of 20 kHz.

Playback equalization was measured with Teac 116SP (70 μs) and TDK AC-336 (120 μs) test tapes. Data from both lay within ±1 dB over the full range (40 to 10,000 or 12,500 Hz, respectively). Dolby tracking was superb. From −20 to −40 dB, the Dolby system affected the response curves by less than 1 dB at any frequency in a record/playback measurement. The MPX filter gave a flat response to about 12 kHz, rising to +1.5 dB peak at 14.5 kHz and cutting off sharply. By 17 kHz, output was down more than 25 dB and was negligible at higher frequencies.

For a 0-dB recording input a line signal of 76 millivolts or mic signal of 0.17 mV was required. Overload of the mic inputs occurred at a rather low level of −16 dB input. Playback output from a 0-dB signal was between 1.14 and 1.3 volts, depending on the tape being used.

Playback distortion (third harmonic of a 1-kHz signal) at 0 dB input was about 0.8% with AD and MA and 1% with SA-X. Reference distortion of 3% required an input of +5 dB with AD and MA and +4 dB with SA-X. S/N relative to these levels, with CCIR/ARM weighting and Dolby on, was about 68 dB for AD and SA-X and about 65.5 dB with MA tapes.

The effect of tape type on distortion is shown in the spectrum analyzer photos from two-tone IM distortion tests. Using an input signal consisting of equal-amplitude tones at 14 and 15 kHz, each of them at a −16-dB level (so that their combined peak was equivalent to a −10-dB sine-wave input), playback output was displayed on the 0-to-20,000-Hz scan of the analyzer. TDK AD gave the lowest output from the two high-frequency tones, with the third-order IM products at 13 and 16 kHz suppressed by only 10 to 11 dB. The second-order difference component, at 1 kHz, was down 53 dB relative to the recorder’s 0-dB level. TDK SA-X gave reproduced levels 3 to 4 dB higher than AD tape, and its IM products were about 16 to 17 dB below the tones. The 1-kHz distortion product was at −64 dB. Although TDK MA produced playback test tones only 1 or 2 dB higher than SA-X, third-order distortion products were down a full 33 dB. The 1-kHz product was about the same as with SA-X and may well represent the distortion of the playback amplifier rather than tape nonlinearity, which normally creates only odd-order distortion products.

The level indicators responded instantaneously to program peaks or short tone bursts, and a standard Dolby-level tape gave a +1-dB indication on playback (the Dolby calibration mark was at 0 dB). Crosstalk from right to left channel at 1 kHz was −55 dB, and headphone volume was excellent, even with high-impedance phones. Tape speed was 1.8% fast, and in the fast-wind modes, a C-60 cassette was moved from end to end in 75 to 81 seconds. JIS shutter (wrms) was 0.05%, and weighted peak flutter was ±0.08%. Except for a single component at 30 Hz, most of the flutter was below 15 Hz.

The Nakamichi 1000ZXL is certainly the most expensive and, possibly, the most sophisticated cassette deck we have yet encountered. Its $3,800 price obviously puts it well beyond the reach of most readers, but the combination of features, design considerations, and performance embodied in it so nearly defines the current “state of the art” that it must be of considerable interest to all serious home recordists since state-of-the-art features have a tendency to filter down, with time, to less expensive units.

The Crystalloy record and playback heads of the 1000ZXL are completely separate (each has its own alignment adjustments), but they have been so miniaturized that both will fit into the standard head opening in the cassette shell. Each has an optimum “gap width” for its function, and both have been “slotted,” using a photoetching process, to ensure that any head wear will remain even. Additionally, the playback head is fitted with

Nakamichi 1000ZXL Cassette Deck

Comment. To judge the quality of a cassette deck audibly, we record interstation hiss from an FM tuner at various levels and compare the playback to the sound of the original. Even slight high-frequency tape saturation will cause a pronounced dulling of the sound in playback so that few recorders give accurate playback when noise is recorded at 0 dB and many not even at −20 dB. In our tests, the tapes used behaved just as about their measured performance would suggest. TDK AD was nearly perfect at −10 dB but had noticeable dulling of the extreme highs at 0 dB. SA-X at 0 dB matched the performance of AD at −10 dB, and MA was essentially perfect at 0 dB.

It must be realized that these levels were true peak readings, which gives the K-8 a tactical advantage over other machines that use slower, average-reading meters. If one were to record at a 0-dB indicated level with such meters, peaks would be considerably higher and would cause more high-frequency tape saturation.

On the basis of our listening tests, the Luxman K-8 is capable of true high-fidelity performance. Dubbed program material coming out of it sounds just like what went in, although some types of live material can exceed the recorder’s capabilities or overload the microphone inputs.

In use, the deck is an unalloyed pleasure. Minor or rarely used controls are located on the front panel, but with very small knobs that avoid a cluttered appearance while preserving operational flexibility. Styling, thus, is at once tasteful and functional. Such niceties as flying-start recording, REC MUTE, and automatic and timer-operated modes help to distinguish this unit even more.
a device that pushes the cassette’s built-in pressure pad out of the way in order to reduce modulation distortion.

Four servo-controlled d.c. motors are used in the transport. One drives the dual capstans, which have slightly different diameters and flywheel masses so they do not reinforce each other’s rotational wow-and-flutter frequencies. Another turns the supply and take-up hubs. The third replaces the solenoids normally used in a "full-logically-controlled" transport, while the fourth turns a cam that automatically adjusts the azimuth (perpendicularity) of the record head to match that of the playback head.

Digital logic—a microprocessor "chip"—is used to control the transport and adjustment operations in the 1000ZXII. Pressing the RUN button when entering the record mode, for example, initiates a sequence in which the record-head azimuth is adjusted, followed by individual automatic optimization for each channel of the record bias, equalization, and tape sensitivity. The tape is then rewound, and an infrasonic code recorded to indicate the proper playback-equalization and noise-reduction settings. (Manual playback-equalization and noise-reduction switches are provided for use with cassettes recorded on other decks.) The user can store the optimized settings in any of four memories for future use with that kind of tape. We found that the entire process took between 30 and 40 seconds, but this time can be reduced considerably when using one of the four "stored" settings by pressing the AZIMUTH button (which optimizes azimuth only) instead of RUN.

In addition to the ABLE (azimuth, bias, level, equalization) sequence just described, the 1000ZXII has a sophisticated RAMM (random-access music memory) that can digitally encode the tape with up to fifteen identifying selection numbers. This can be done either automatically or manually, and the machine can be set to play (or repeat) the selections in any desired order—up to thirty commands. The infrasonic code is read bidirectionally, and—lest owners of d.c. amplifiers worry—it is entirely filtered from the deck’s output. While the description of all this "computer" circuitry may appear complex, it has ever been seen on a cassette deck and so close to the limits of our automatic chart-recording equipment that we had to double-check using spot-frequency measurements. Our spot checks, moreover, put the -0.5-dB points at 17 Hz and 24 kHz, using the ferric EX-II, with 3-dB points at 13 Hz and 26 kHz. It is hard to conceive of any meaningful improvement on such a frequency response.

Third-harmonic distortion at an indicated 0 dB was 0.39, 0.46, and 0.38 per cent for the Nakamichi ZX-metal, SX-CrO₂-type, and EX-II (ferric) tapes. The headroom (the amount of additional output required to increase the distortion to the 3 per cent level) was 8.8, 6.3, and 7.9 dB, respectively. Referred to the 0 per cent distortion level, the unweighted signal-to-noise ratios, without benefits of Dolby, were 55, 53.3, and 51 dB; adding a standard IEC A-weighting curve and Dolby-B processing improved these figures to 68.5, 67.5, and 65.6 dB. Using the Memorex Metal IV raised the A-weighted S/N (with Dolby) to 70.3 dB.
Wow and flutter measured 0.05 per cent (DIN-B) and 0.038 per cent (weighted rms) with our Teac MTT-111 tape, increasing just slightly to 0.055 (DIN-B) and 0.042 (weighted rms) when measured on an overall record/rewind/replay basis. The Dolby calibration was within 0.5 dB, and overall frequency-response variations between Dolby and non-Dolby operation were inside ±1 dB tolerance throughout the audio range.

A 1-kHz line-level input signal of 0.05 volt (50 millivolts) was sufficient to produce a 0-dB indication, at which point the output level was 0.95 volt. The comparable microphone sensitivity was 0.173 millivolt. Erasure of a 100-Hz tone recorded at +10 dB on metal tape exceeded 70 dB, and at 1,000 Hz (the usual measurement point) it increased to the approximate 80-dB limit of our wave analyzer. Fast forward and rewind times for a C-60 cassette were 50 and 45 seconds.

**Comment.** Given these outstanding measurements, it should come as no surprise that the 1000ZX XL was able to make virtually perfect copies of any musical material (FM, disc, or master tape) we checked it with. Only with high-level FM interstation hiss could we hear the high-frequency advantage of metal tape, though it would obviously be the choice for live recording. While we did not test the deck in this latter application, the outstanding quietness and high overload margins of its microphone circuitry were noted.

Any recorder with all the features and options as this one obviously hasn’t been completely ignored. But once we learned our way around it, the 1000ZX XL was remarkably easy to use. The electronic counter was exact, the tape handling gentle. Our only disappointment is that, having tested it, we must now return it to the manufacturer.

### Tandberg TCD-440A Cassette Deck

Heading the latest line of cassette decks from Tandberg is the TCD-440A, a deluxe three-motor, three-head machine. The TCD-440A incorporates Tandberg’s DYNEQ dynamic equalization system for greatly reduced high-frequency tape overload, and the Actilinear recording system that permits effective use of metal tapes without saturating the recording amplifiers. The transport is controlled by light-touch buttons that operate solenoids. The usual pause feature is lacking, but recording can be activated by touching a single button if a separate KNOB button has been previously engaged. Logic circuits make it possible to change from any speed or mode to any other. “Flying-start” recordings can be made by pressing the RECORD and PLAY buttons simultaneously while the tape is playing, and releasing PLAY before RECORD.

Other pushbutton switches control Power, Dolby NR, and internal equalization time constants. A Dolby FM button, when used in conjunction with the Dolby NR button, converts the deemphasis time constant of a received FM broadcast from 75 to 25 microseconds before decoding and recording it. Separate pushbuttons set the machine for Type I and Type II tapes. These are IEC designations for general tape classes, respectively, exemplified by ferric-oxide (normal) tapes and either CrO₂ or high-bias ferricobalt equivalents. When both buttons are engaged the machine is set for Type IV (metal) tape. Another button controls tape/source monitoring. An MPX filter can be switched in to attenuate 19-kHz pilot leakage from FM broadcasts being recorded.

Above the control buttons are two illuminated level meters that read peak levels of the equalized signal. They have two scales; the upper one, for Types I and II tapes, has its 0-dB calibration corresponding to a tape flux of 250 nWb/m, while the lower, for metal tape, is set 3 dB higher (400 nWb/m).

Playback output and recording levels are controlled by dual slide-type potentiometers. A three-position toggle switch sets recording bias for Type I, II, or IV tapes. Access holes are provided for internal screwdriver adjustment. A recessed door cannot be opened unless the record head before making a recording. Also on the panel of the TCD-440A are a headphone jack, a socket for the optional remote-control accessory, and two microphone jacks, as well as the tape index counter. The cassette is hinged vertically and opens from the right side. The eject button operates through a solenoid, so that normally the cassette door cannot be opened unless the recorder is powered. If access is required to the cassette with power off, there is a special mechanical ejection lever under the recorder.

Pressing on the upper edge of a narrow metal door causes it to swing open and reveal the recording-head azimuth adjustment knob, a test switch, and instructions for aligning the head before making a recording. The separate record and playback heads are far enough apart for slight tape skewing within the cassette to allow for the adjustment of their gaps. The playback head is factory aligned, but before making a recording, it is necessary to adjust recording-head alignment for the particular cassette being used. An internal 10-kHz oscillator facilitates this test. DYNEQ is Tandberg’s answer to tape saturation at high frequencies. It monitors the incoming program level—particularly its high-frequency content—and uses this information to control the response of a 20-kHz resonant peaking circuit in the recording amplifier. As the high-frequency energy in the signal increases, the high-frequency boost in the amplifier is progressively reduced. This minimizes the possibility of tape saturation. High-frequency recorded flux is thus maintained constant over a wide range of input signal levels, resulting in an effective increase of high-frequency response that amounts to about 10 dB at 15 kHz. DYNEQ operates only during record and yields a tape that is fully compatible with other recorders. In addition, it provides a dramatic reduction in intermodulation distortion.

The Actilinear system isolates the recording amplifier output from the bias signal injected into the recording head, reducing further any interaction between the signal and the bias oscillator. In addition, it allows the recording amplifier some 15 dB of reserve headroom, even with the high signal levels recorded on metal tape.

The Tandberg TCD-440A can be installed in a vertical or a horizontal position, with removable supporting feet supplied for vertical mounting. The all-black recorder measures 18½” W x 8½” D x 4” H and weighs 14.5 lb. Suggested list price is $995. An optional infrared remote-control unit is $150.  

**Laboratory Measurements.** Bias levels in the Tandberg TCD-440A had been factory adjusted for Maxell UD-XLI (Type I), Maxell UD-XLII (Type II), and Fuji Metal (Type IV) tapes, which we used in our tests. Playback equalization was first measured using TDK, Teac, and BASF test cassettes for tape broadcasting and live recording. While we did not test the deck in this latter application, the outstanding quietness and high overload margins of its microphone circuitry were noted.  

Any recorder with all the features and options as this one obviously hasn’t been completely ignored. But once we learned our way around it, the 1000ZX XL was remarkably easy to use. The electronic counter was exact, the tape handling gentle. Our only disappointment is that, having tested it, we must now return it to the manufacturer.
both 120- and 70-microsecond equalization. There were the expected minor differences between the different tapes, but playback response was typically within 2 dB from 40 Hz to the upper limit of the tape (either 10 or 12.5 kHz).

Record/playback frequency response was measured with each of the basic tapes, using levels of 0, –20, and –30 dB on the recorder’s meters. The response of the TCD-440A is specified at a –30-dB level relative to 250 nWb/m, although most other cassette recorders are rated at a –20- or a –26-dB level. We found negligible differences between the –20- and –30-dB curves, and those were confined to the range above 15 kHz.

This deck is exceptionally free of the low-frequency “head bumps” that are present in the playback response of almost every cassette deck. Its response could be specified as ±1.5 dB from 20 to 18,000 Hz with any of the tapes we used, at either a –20- or a –30-dB level. The 0-dB response curves began to roll off above 3 to 4 kHz, regardless of the tape. However, they did not fall to –20 dB until 18 or 20 kHz and never went below that. On most cassette decks, metal tape will give superior high-frequency response at high levels, but DYNEQ seems to extract almost identical response from any kind of tape.

The Dolby circuits tracked well, resulting in a net response change of no more than 1 dB up to 10 kHz, or 2 dB between 10 and 15 kHz, between the Dolby on and off conditions, at levels of –20, –30, and –40 dB.

Depending on the tape used, a 0-dB meter reading required a recording input of 65 to 92 millivolts at 1 kHz. The corresponding maximum line playback levels were between 1.15 and 1.82 volts. At a 0-dB recording level, playback third-harmonic distortion was 0.8% with Type I, 0.5% with Type II, and 1.6% with Type IV tape (the last being recorded to its 0-dB reference, which is 4 dB higher than the others). The recording levels corresponding to 3% playback third-harmonic distortion were +5.4, +6, and +2.5 dB, respectively, for the three tapes.

Unweighted signal-to-noise ratios (S/N) referred to the 3% distortion signal level were 52.8, 55.7, and 56.1 dB for Type I, II, and IV tape, respectively. Using the Dolby system and CCIR/ARM weighting, these figures improved to 63.8, 67.5, and 67.3 dB. Through the microphone inputs, noise increased by 7 dB at maximum recording gain with a 1-kHz input signal. (Gain of the microphone amplifier is a function of source impedance.) Crosstalk at 1 kHz was –60 dB.

Standard test tapes confirmed that a flux level of 250 nWb/m produced a 0-dB meter reading in playback. Dolby calibration marks are set at –2 dB, corresponding to 200 nWb/m, and Dolby test tapes gave meter readings of –1 and –1.5 dB on the two channels. The meters responded very rapidly to transients, reading 100% of steady-state values on 0.3-second tone bursts.

The tape transport ran 0.5% fast. Weighted rms (JIS) flutter was 0.07%, and weighted peak (CCIR) flutter was ±0.1%. On a combined record/playback measurement, these readings increased to 0.1% and 0.15%, respectively. In fast forward and rewind, a C-60 cassette was moved from end to end in the very fast times of 43 and 50 seconds, respectively. The transport slows the tape near the end of a fast wind to lessen the stress on the tape leader in sudden stops.

Comment. Performance specifications of the Tandberg TCD-440A are listed in some detail in the product literature, and in every case where we were able to make a measurement, performance of the test sample met or surpassed its ratings.

In spite of—or perhaps because of—its unconventional control and data storage features, the TCD-440A is easy to use. Our only criticism of its design concerns the cassette door, which does not swing open far enough for easy loading or unloading of a cassette. In installations where access to the right side of the deck is limited, the process becomes quite clumsy, since the cassette must be moved beyond the right edge of the recorder to clear the door when loading and unloading.

A standard subjective test we apply to cassette decks is to record interstation hiss from an FM tuner and compare playback to the incoming signal. With many good recorders, the two sound almost exactly alike—except for minor midrange coloration. But this degree of accuracy can be realized only when the recording is kept below –20 dB (–10 dB on a few of the better machines).

With very careful matching of the signal levels being compared, we heard no difference between our tuner hiss and the playback of the TCD-440A at an input level of 0 dB.

The other aspect of the DYNEQ system—reduced intermodulation distortion and bias oscillator beats—is more difficult to verify because there is no way to compare performance of the machine with DYNEQ to that of the same machine without DYNEQ. Fortunately, Tandberg has made a demonstration cassette in its laboratories, using a TCD-440A modified so that DYNEQ can be switched in or out, that leaves no doubt about the effectiveness of the system. It contains various test signals, recorded with DYNEQ being switched on and off at a slow rate.

How much of this improvement will be apparent in recordings made on the TCD-440A depends largely on the program material. We are convinced that it is capable of making cleaner recordings of program material rich in high-frequency energy than most other cassette recorders. Even if that capability is not always in demand—or realized in practice—this recorder removes much of the worry from making recordings when the dynamic range is not known in advance. If meter readings do not exceed 0 dB except for brief peaks, first-rate recording is hard to avoid. Our experience suggests that metal tape is rarely necessary with this deck. A Good Type II tape seems to extract virtually all the performance of the machine is capable—and it is more than most people will ever need.

For more information on the products whose test reports appear in this section, write directly to the manufacturers. Manufacturer addresses can be found in the Directory of Manufacturers that begins on page 4.
The Teac X-3 is a two-speed, quartertrack stereo open-reel deck with three motors, three heads, and a solenoid-controlled transport. Designed to operate at 7 1/2 and 15 ips, it accepts reel sizes up to 7 inches in diameter and permits mic/line mixing, external timer activation, and "punch-in" recording—that is, going directly from play into record mode to replace old material with new.

The capstan of the X-3 is belt-driven by a d.c. servomotor, and a pair of induction motors are used to turn the reel hubs. Two tape lifters hold the tape away from the heads during fast winding in either direction. Spring-loaded arms on either side of the head block, each equipped with a rotating tape guide, take up the tape slack during start and stop operations, and a third rotating bearing to the left of the head helps reduce wow and flutter.

Positive-locking (except for stop) push-buttons with relatively long travel (3/8 inch) control the rewind, fast forward, play, record, and pause functions as well as tape-speed selection and power on/off. Other buttons select either source (input) or tape (playback) monitoring, a momentary-contact record mute function, and one of two alternative settings for equalization and bias. Concentric (left- and right-channel) rotary controls adjust microphone and line-level inputs and the line-level output (which also affects the volume level at the front-panel headphone jack). Front-panel phone jacks are also provided for a pair of microphones with a rated impedance of 200 ohms or higher.

The record/playback indicators are VU-type meters calibrated from -20 to +3 VU. A four-digit counter, driven by the take-up reel, indicates tape position, and the head-block cover is easily removable for access to the heads for cleaning, demagnetizing, and editing. The X-3 has mounting feet that permit either vertical or horizontal operation.

The rear panel of the X-3 contains the usual input and output phone jacks. Overall, the unit measures 16 15/16 x 12 1/8 x 7 1/4 inches (width, height, depth) and weighs a little less than 31 lbs. Retail price: $550.

**Laboratory Measurements.** Teac did not supply us either with test data or with the specific tape types for which our sample of the X-3 was adjusted. Playback frequency response, shown in the accompanying graph, was checked with our new MRL (Magnetic Reference Laboratory) calibrated tapes, which we believe are the most accurate available. The slight high-end roll-off (3 dB at 20 kHz and 7 1/2 ips) was not repeated in overall record-playback tests. This, together with the fact that the 0-VU point on the meters corresponded exactly to the Ampex operating level of 185 nanowatts/meter, leads us to suspect that Teac probably used Ampex alignment tapes (which have a slightly hotter high end) in setting up the X-3. In any event, we could discern no audible degradation in high-frequency response with prerolled tapes.

While checking overall record-playback frequency response, we found that switching from position No. 1 to position No. 2 on the equalization selector raised the response approximately 2 dB at 20 kHz—a very slight difference. The reduction in bias current caused by changing the bias switch from position No. 1 to position No. 2 had a much more profound effect on 20-kHz response, increasing it by 3.5 dB at the 7 1/2-ips speed and by 10 dB at 3 1/4 ips. When using premium tapes, however, distortion increased severely in bias position No. 2; it is intended for older or "second-line" tape formulations that require less bias.

Both TDK Audua and Memorex Quantum gave outstanding record-playback performance at both tape speeds. The Audua was marginally flatter at 7 1/2 ips and the Quantum (using equalization No. 2) slightly flatter at 3 1/4 ips, so there was little to choose between the three. The Quantum (3 1/4 ips, 3 3/4 ips) and the Audua (7 1/2 ips) gave outstanding record-playback performance, both being essentially flat up to 20 kHz, and the response held up very well to slightly above 20 kHz. This, together with high-fidelity response Laboratory) calibrated input and output phono jacks. Overall, the unit measures 16 1/8 x 12 1/8 x 7 1/4 inches (width, height, depth) and weighs a little less than 31 lbs. Retail price: $550.

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While checking overall record-playback frequency response, we found that switching from position No. 1 to position No. 2 on the equalization selector raised the response approximately 2 dB at 20 kHz—a very slight difference. The reduction in bias current caused by changing the bias switch from position No. 1 to position No. 2 had a much more profound effect on 20-kHz response, increasing it by 3.5 dB at the 7 1/2-ips speed and by 10 dB at 3 1/4 ips. When using premium tapes, however, distortion increased severely in bias position No. 2; it is intended for older or "second-line" tape formulations that require less bias.

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The Technics RS-M24 is a front-loading, two-head cassette deck that employs a single-capstan, single-d.c.-motor drive system. The record/playback head is made of "MX" permalloy, which is capable of accepting the very high bias current required by metal-alloy tape. The transport controls, though mechanical, utilize soft-touch pushbuttons that provide much of the feel and flexibility normally associated with solid-operated controls.

Cassettes are inserted, tape openings downward, into slides behind the transparent cassette-well door. The cassette well is not illuminated, but label and tape visibility is adequate with normal ambient light levels. The lid of the well may easily be removed, affording access to the heads and pinch roller for routine cleaning.

The fast-forward and rewind buttons are used in the RS-M24 not only for their normal functions but, in conjunction with the play button, to provide facilities through which the tape can be heard during high-speed winding; they will revert immediately to the play mode when the fast-wind button is released. The record-button set up is unusual in that it is used alone (not simultaneously with play) to put the RS-M24 into record mode. Since the record and play pushbuttons are interlocked, however, it is not possible to go directly from play into record. While the deck has no memory-rewind/play feature, it can be set to rewind a tape to its beginning and then replay it automatically. Activation of either the record or play modes by an external timer switch is also possible, and the pause and record mute functions can be operated, if desired, by an optional remote-control accessory. Only the record button has a status-indicator light. Record and playback levels register on a pair of eighteen-segment peak-reading fluorescent displays calibrated from -20 to +8 dB. The highest reading is held for approximately 2 seconds to make setting the record level easier. The Dolby-calibration mark falls at +3 dB. Large concentric knobs are used to control the recording level, and a single smaller knob adjusts the output level both at the rear jacks and at the front-panel headphone jack.

Four pushbuttons set the bias and equalization of the RS-M24 for metal, CrO₂-type, ferrichrome, or ferric formulations, and similar buttons are used to turn the Dolby noise reduction on and off and to select between microphone and line-level record inputs. No mixing facilities are provided, but there is a pushbutton-operated record mute function. The rear panel of the RS-M24 contains the customary phonojacks connectors for line-level inputs and outputs, plus a DIN-type socket for the $15 remote-control accessory. Overall, the RS-M24 measures approximately 17 x 4½ x 10¼ inches (width, height, depth) and weighs about 11 pounds. Price: $250.

Comment. As its excellent measurements would imply, the performance of the Teac X-3 in our listening tests was first-rate. Even when using high-level FM interstation noise—an extremely severe test—we could detect no frequency-response losses between the original and the taped copy. Using very wide-range material we could detect a very small amount of added hiss at 7½ ips and a little more at 2 3/4 ips, but for anyone to whom this is a problem an external Dolby-B processor—desirable in any case if you wish to listen to prerecorded tapes—would be a completely effective answer. Tapes were handled smoothly, and the controls and pushbuttons had a positive feel. More expensive machines might bring with them additional features of interest to the semi-professional recordist (10½-inch reel capacity, a "dump-edit" mode, etc.), but for the average home user the low price and excellent performance of the Teac X-3 would be very hard to beat.

Technics RS-M24 Cassette Deck

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**Laboratory Measurements.** Our sample of the RS-M24 was supplied with the tapes used to make its factory adjustment. These were Maxell UD XL-I (ferric), Sony Duad (ferrichrome), Technics RT-60XA (CrO₂-type), and Technics RT-60MX (metal). Since the two Technics tapes are not widely marketed, we used the nearest generally available equivalents: TDK SA for the CrO₂-type and TDK MA for the metal-alloy tape.

Playback frequency response was checked using Teac MTT-216 (120-µsec, ferric) and MTT-316 (70-µsec CrO₂/metal/ferrichrome) test tapes. Response was within ±2 dB from the tapes' lower limit of 31.5 Hz up to the very highest tones, where it fell off slightly, being down 2 and 4 dB at 14,000 Hz in the 120- and 70-µsec positions. Since this high-end loss was not reflected in the overall record-playback response curves, we are inclined to believe it results from a difference in the azimuth alignment between our test tapes and those used by Technics.

Overall record-playback frequency response, measured at 20 dB below the 0-dB

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**Frequency-response curves for four different types of tape.**
The Vector Research VCX-600 is a deluxe three-head cassette deck with a logic-controlled, two-motor transport. Among its operating conveniences is a MEMORY system for full automatic stop or replay when a tape has rewound to 000 on the index counter. Rewind can be made to occur automatically at the end of a tape, permitting automatic repetition of a tape in whole or part.

The VCX-600, which is compatible with metal tapes, has a vernier bias-adjust control for optimizing performance with different tape formulations. A programmable music search feature gives fast access to up to eight recorded selections per cassette. Recording and playback levels are indicated on parallel rows of fast-responding green LEDs from -20 to 0 dB, while red LEDs are used from 0 to +8 dB.

The door over the cassette well is opened by pushing the EJECT button. Small momentary-contact pushbuttons, whose functions can be duplicated by an optional plug-in remote-control accessory actuate the transport solenoids. Lights adjoining the buttons show the recorder's operating mode. It is possible (except while recording) to go from any mode to any other mode without having to first press the STOP button.

With the recorder in play, pressing either the REW/RW or FF/CUE button moves the tape at high speed, allowing modulation on the tape to be heard at a low level to aid in locating specific passages. When the button is released, the machine returns to the play mode. For normal fast forward or rewind, the tape is first brought to a stop and one of the fast-speed buttons is touched momentarily.

The memory system stops the tape when it is rewound to 000 on the index counter. If the AUTO PLAY button is also engaged, the machine goes immediately into play. In addition, AUTO REWIND automatically switches the machine to rewind when the end of a tape.

When MUSIC SEARCH is touched (in normal play), a warning light on the panel starts to blink. A touch of REW/RW or FF/CUE will cause the tape to rewind to the beginning of that selection or advance to the beginning of the next selection, respectively; the recorder then goes back into normal play.

A system called PROGRAMMABLE MUSIC SEARCH is controlled by buttons marked from 1 through 8 plus CLEAR. The user chooses selections to be played by touching the appropriate buttons before pressing PLAY. The tape advances rapidly to the first selected segment and plays it, after which it advances to the next one, and so on. The program can be erased at any time by touching CLEAR. Like MUSIC SEARCH, this feature operates by sensing the quiet intervals between recorded selections, provided these are at least 3 seconds in duration.

The LED display reads peak program levels; its 0-dB index corresponds to the standard Dolby level of 200 nW/meter. Concentric knobs with a slip-clutch coupling set the recording levels for the two channels, and there is a separate playback-level knob. Switches select bias and equalization for FE, CO, and METAL tapes. Equalization time constants are identified as 70 or 120 microseconds, and bias levels are expressed in terms of percentages: FE = 100%; CO = 150%; METAL = 250%. A small bias vernier knob adjusts each of these over a nominal ±10% range.

A single three-position switch turns on the Dolby system, with or without the 19-kHz FM stereo pilot filter. Another switch connects either the SOURCE or the TAPE playback programs to the line outputs.

The Vector VCX-600 is finished in black, with clearly contrasting white panel markings. Its overall dimensions are 17¾" W X 14¾" D X 5½" H, and it weighs 22 lb. Suggested retail price is $750.

**Laboratory Measurements.** The Vector VCX-600 is biased for TDX AS (FE), TDK SA (CO), and TDK MA-R (METAL) tapes, sharply as a result of a built-in stereo-FM multiplex filter that is automatically inserted in the signal path when the Dolby circuitry is active.

**Comment.** As its modest price suggests, the RS-M24 is not designed to compete directly with the most sophisticated decks on the market, but within its intended arena it proved to be an excellent performer. When demonstration-quality prerecorded cassettes were played through a wide-range speaker system there was a slight dulling of the highest frequencies, which was also perceptible when we made copies of the most demanding discs and master tapes. On the other hand, for most tape, disc, and FM dubbing the loss in the copy was insignificant if the recording level was kept at the levels suggested in the owner's manual. The transport controls were a joy to use, infinitely superior to the customary "piano-key" mechanical levers. For readers seeking a quality cassette deck at a moderate price, the Technics RS-M24 is certainly worth serious consideration when you're in the market for a cassette deck.
which were used for our laboratory evaluation. A 0-dB recording level was obtained with a line input of 55 millivolts; the corresponding playback output was 0.575 volt, regardless of tape type. Sensitivity of the mic input was 0.24 millivolt, with overload at a safe -53-millivolt level.

Recorded as a 0-dB level at 1-kHz, AD and SA tapes produced about 1% third-harmonic distortion, while MA-R produced 1.4%. The respective levels corresponding to 3% (reference) distortion were +4, +5, and +4.5 dB. Signal-to-noise ratio was measured unweighted, with A weighting, and using the Dolby system with CCIR/ARM weighting, for each of the tapes. AD gave readings of 50.5, 58, and 64.5 dB; SA 53.5, 59.7, and 66.5 dB; and MA-R 50, 59, and 65.5 dB. Noise increase for the mic input at maximum gain was 3.5 dB, indicating a very quiet microphone preamp.

Erasure of a 0-dB, 1-kHz recording left a residual signal level of -66 dB on SA and unmeasurable levels on the other tapes. Crossover between tracks (at 1 kHz) was -58 dB with a TDK AC-352 tape.

Tapes were recorded with a TDK AC-342 test tape, which was a very low 0.047% weighted rms (JIS) and 0.07% weighted peak (CCIR). Speed, measured on the basis of the 3-kHz tone on TDK AC-342 tape (whose accuracy is specified as 0.03%) was fast by about 0.9%. Fast forward time for a C-60 cassette was 70 seconds (86 seconds in rewind) from end to end.

Record/playback frequency response was measured for each tape with the bias adjustment control at its nominal (center) setting. At a -20-dB recording level, all three tapes gave exceptionally flat response; AD was ±1 db from 40 to 17,500 Hz; SA was within ±0.5 to ±1 dB from 40 to 16,000 Hz. The high-frequency response of each tape could be trimmed slightly with the bias control, but the center settings were close to optimum. We made a check of the metal setting with Scotch Metafine and found that a -10% bias gave results much like those obtained with MA-R at the nominal setting.

Substantial differences between tapes were evident at a 0-dB recording level. With AD and SA tapes, the 0-dB playback curve intersected the -20-dB curve at 12,500 to 13,000 Hz; MA-R, on the other hand, gave about 15 dB more output at 13,000 Hz than the others, and its 0-dB and -20-dB curves did not intersect within the audio range. The test results confirmed the existence of additional headroom in metal-alloy tapes.

Spectra-analyzer photographs give a dramatic illustration of the difference between metal-alloy and oxide-based tapes. The input signal (lower trace in each photo) consisted of 14 and 15 kHz at equal amplitudes, with a combined peak level equal to that of a 1-kHz tone that gave a 0-dB meter reading. Frequency scan extends from 0 to 20,000 Hz, with a vertical scale of 10 dB per division. The upper trace is the playback from the recorder. Levels of the 14 and 15 kHz signals in the playback from the TDK AD and SA tapes are down by 23 and 25 dB compared to the input level. In addition, a large number of odd-order intermodulation products (up to 13th order) fills the spectrum between 8 and 20 kHz. TDK MA-R gives the two input tones a playback level 18 to 20 dB higher and produces only a few odd-order IM products (the 3rd, 5th, and 7th).

Playback equalization of the VCX-600 was measured for both the 70- and 120-microsecond time constants, using test tapes from TDK, Teac, and BASF. In general, the response was within ±1 dB from 20 to 12,500 Hz, which was the range covered by the test tapes.

The LED readout responded very rapidly to short-duration signals, reading 100% of steady-state values on 0.3-second tone bursts used to verify the ballistic response of VU meters. A standard Dolby-level tape gave a reading of about +1 dB on the recorder's indicators. The resolution of the LED segments is about 1 dB near a 0-dB reading and from 3 to 5 dB elsewhere.

The deck's headphone output, unaffected by the volume control, is nominally specified for 8-ohm phones. We found the level inadequate to drive phones that, like most high-fidelity models, have impedances of 200 ohms or more.

Comment. Although operation of the VCX-600 deck is basically straightforward, familiarization is needed in order to realize the full potential of some of its unusual features. The MUSIC SEARCH feature allows the attractive option of exploring the content of a tape containing a number of recorded selections, much as one would sample a phonograph record by cueing the pickup manually to the beginning of each band. If a few seconds of listening to a taped selection shows that it is not to one's liking, a touch of MUSIC SEARCH and FF/CUE speedily advances the tape to the next selection, which begins automatically.

Recording and playback performance of the VCX-600 was first rate. Even such demanding signals as interstation FM tuner hiss could be recorded and reproduced with no audible differences, even at rather high levels. (Such hiss makes a good test for fine adjustments of bias.)

Lower flutter readings than those of the VCX-600 are hard to find, and the S/N with Dolby is very good, with little dependence on choice of tape. The convenience features of the deck and its ability to "fine-tune" bias represent definite advantages. While the VCX-600 is not cheap, it affords excellent value for its price.
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And the specs on the GX-F95 are equally impressive.

Frequency response with metal tape is an amazing 25-21,000 hertz. And Signal-to-Noise with metal tape is 62dB (Dolby* on improves up to 10dB, above 5000 hertz). Harmonic Distortion, less than .06%.

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AD-3600U Cassette Deck
Front-loading 3-head stereo cassette deck with dual capstans, Dolby HX and double Dolby noise-reduction system. Features tension-stabilized capstans, feather-touch microprocessor-controlled transport; A.D.M.S. (Automatic De-Magnetizing System); microgran processing capstan; illuminated mode indicators; LH-bias fine adjust control; automatic repeat; 3-color, 12-LED signal-level display; metal-tape capability. Wow and flutter 0.029% wrms...$460

AD-R500U Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system with multi-p flex filter, frequency-generator servo capstan and dc real motors, and Sendust record/playback and double-gap ferrite erase heads. Features quick auto reverse (turnaround time 0.4 sec) for one-time record/playback of one side, single playback or record both sides, and continuous uninterrupted playback with LED mode indicators; solenoid IC logic tape function controls; automatic LH/Cr02 tape switching; separate metal tape button; backlit record/playback of one side, single playback or plex filter, frequency-generator servo capstan and AD-R500U Cassette Deck
0.029% wrms el display; metal-tape capability. Wow and flutter 0.038% wrms; frequency response 25-21,000 Hz ±3 dB with metal tape; dist. 0.6% at 1000 Hz, 0 VU with metal tape; S/N 52 dB without Dolby HX, 0 VU with metal tape; S/N 62 db without Dolby, improved 10 db above 5000 Hz using metal tape with Dolby; 41.1" H x 17.3" W x 14.6" D...$875

GX-F60R Deluxe Bidirectional Deck
Front-loading bi-directional record/play metal-compatible stereo cassette deck with Dolby noise-reduction system and super GX twin-field record/playback head. Features quick reverse in record, play, and continuous play with LED indicators; dual fluorescent bar graph display with switchable VU/peak control; illuminated feather-touch logic solenoid controls; four-position tape selector with LED indicators; remote-controllable record mute; record and output level controls; three-digit tape counter with memory on/off and reset; timer record/play with external audio timer. Wow and flutter 0.04% wrms; frequency response 30-19,000 Hz ±3 dB with metal tape; S/N 60 dB using metal tape without Dolby; walnut vinyl cabinet; 5.9" H x 17.3" W x 11.4" D...$570

AKAI

GX-F9X5 Deluxe Stereo Cassette Deck
Deck has concealed cassette well, Dolby noise reduction circuitry, digital numeric tape counter (four digits). Features Super GX combo head, tape/source monitoring; computerized Bias Equalization and Sensitivity tuning (B.E.S.T.) for all tape media. Features auto/manual reverse record/play, and continuous play with LED indicators; dual fluorescent bar graph display with peak LED; normal/Cr02/metal tape selector; record level control with mic/DIN/line input selector; output level control; rec mute; timer standby with external audio timer. Wow and flutter 0.039% wrms; frequency response 30-16,000 Hz ±3 dB with metal tape; S/N 60 dB using metal tape without Dolby; walnut vinyl cabinet; 5.9" H x 17.3" W x 11.4" D...$570

CS-M40R Bi-Directional Cassette Deck
Front-loading bi-directional record/play metal-compatible stereo cassette deck with Dolby noise-reduction system and sendust record/playback head. Features auto/manual reverse record/play and quick reverse continuous play; fluorescent bar graph display with peak LED; normal/Cr02/metal tape selector; record level control with mic/DIN/line input selector; output level control; rec mute; timer standby with external audio timer. Wow and flutter 0.039% wrms; frequency response 30-16,000 Hz ±3 dB with metal tape; S/N 60 dB using metal tape without Dolby; walnut vinyl cabinet; 5.9" H x 17.3" W x 11.4" D...$570

GX-F35 Stereo Cassette Deck
Front-loading cassette deck with Instant Program Search System (IPSS), Dolby noise reduction, two-color, 16-segment fluorescent peak/VU meters with hold. Features twin field super GX head; 19
program selector; sensor full-logic feather-touch transport controls; four-position tape selector (includes metal); memory rewind/auto play; auto mute; timer record/play capability; remote-control plug. Wow and flutter less than 0.04% rms; frequency response 30-19,000 Hz ± 3 dB with metal tape; S/N ratio better than 70 dB with metal tape, Dolby on; distortion less than 0.7% at 1 kHz, 0 VU; 17.3" W X 11.2" D X 4.6" H; 15.2 lb. $52

**GAN & OLFUSEN**

Beocord 8000 Cassette Recorder

Dual-microcomputer-controlled metal-compartment top-loading cassette recorder with Dolby noise-reduction systems and single Sendust combination head containing Sendust alloy poles and bedding. Features electronic time measurement of tape travel in all operational modes, shown on illuminated digital display and full-screen measurement accomplished by microcomputer control of calibrated infrared cassette tape based on varying tape lengths, types, and thicknesses of magnetic coating (calibration data erased upon ejection); electronically-controlled gathering system; automatic time-indexed selection through push-button operation—user can also instruct recorder to hold until otherwise specified and when to turn record or playback functions off. Head turns tape to beginning of last recorded segment; automatic four-second pause effected from stop button; electronically-controlled dual eight-LED peak program meters set signal strength; built-in electronic timer shows correct time when TIME SET is pressed; automatic demagnetization of tape head; fast forward/rewind time 70 sec (C-60). Wow and flutter less than 0.02%; frequency response 30-16,000 Hz ± 2.5 dB (chrome); S/N with Dolby 68 dB (metal), 65 dB (chrome), 63 dB (ferro); input sensitivity/impedance 1 mV/10k ohms (radio), 120 mV/12k ohms (aux); 0.1 mV/2k ohms (mic); output level/impedance 800 mV/2k ohms (receiver), 9 V/56 ohms (headphones); 51/2" H X 201/2" W X 11" D. $995

**BANG & OLUFSEN**

Beocord 1700 Cassette Deck

Top-loading, metal-compatible cassette deck has built-in Dolby noise-reduction circuitry and Sendust recording head. Features illuminated tape counter, fast-acting peak LED "meters" that are active during both record and playback; memory and reset functions; automatic bias and alignment for all tape formulations plus separate manual selector for metal tapes; built-in electronic demagnetizer after every recording to assure better signal-to-noise ratio and high-frequency response. Specifications: frequency response 30-16,000 Hz ± 2.5 dB (C-60); input sensitivity/impedance 1 mV/10k ohms; wow and flutter less than 0.15%; S/N 64 to 68 dB with Dolby C on; harmonic distortion 0.34%; wow and flutter 0.03% rms. Specifications at 3X ips: frequency response 20-19,500 Hz with ferrichrome tape (20-20,000 Hz with metal tape); head separation better than 35 dB; fast-forward/rewind time 90 sec for C60 cassette, 16" W X 10" D X 4 1/2 H; 11 lb. $995

**DUAL**

C844 Cassette Deck

Front-loading, metal-compatible stereo cassette deck with Dolby B and C noise-reduction systems. Two-speed (11" and 3X) motor, two-motor, dual-capstan closed-loop drive system. Sendust record/playback and ferrite erase heads; direct load and lock transport with photoelectric stop switches; automatic head shield; electronic fade/edit with playback monitoring; electronic 4-digit tape counter with memory set, stop, play; automatic music finder; auto spacing; auto repeat; 6-position tape selector; equalized VU meters; mic/line mixing; switchable MPX filter; provisions for optional extended timer and 12-command remote control. Specifications at 1 ips: frequency response 20-19,500 Hz with ferrichrome tape (20-20,000 Hz with metal tape); head separation better than 35 dB; wow and flutter less than 0.04% rms; provisions for optional wired remote-control accuracy. Frequency response 20-22,000 Hz metal, 25-20,000 Hz L.H. tape; S/N ratio more than 67 dB with Dolby; wow and flutter less than 0.04% rms; fast wind time 85 sec (C-60); crossover – 65 dB at 1 kHz, power consumption 25 W at 120 V ac, 60 Hz and 220 V ac, 50/60 Hz; 17 1/2" W X 11 1/2" D X 4 1/2" H; 15.4 lb. $426

C830 Cassette Deck

Front-loading, metal-compatible stereo cassette deck with Dolby noise-reduction system, three heads with true monitoring capability, and direct load-and-lock transport system featuring four-point tape guide and automatic head protection. Logic-controlled inter-mode switching; phase-locked-loop dc servo motor with integral frequency generator; twin-belt drive system; electronic tape motion sensor/protection; switchable MPX filter; switchable limiter; two-way memory stop; mic/line mixing; headphone level controls; easy access to tape capstan; 12-command remote. Frequency response 20-17,000 Hz ± 3 dB with ferric (normal) tapes and 15 Hz with C60 tape; wow and flutter 0.035% rms. Specifications at 3X ips: frequency response 20-20,000 Hz with ferrichrome and metal tapes; S/N 78 dB with ferrichrome and metal tapes (with Dolby C). Harmonic distortion 0.3%...

C828 Cassette Deck

Front-loading, metal-compatible slim-line stereo cassette deck with Dolby noise-reduction system, auto-reverse in record and playback with friction resistance 4/4-track M+Y head and double-gap ferrite erase head, and two-motor, dual-capstan drive system. Direct load-and-lock tape transport with photoelectric stop switches; microcomputer-controlled drive function using solenoids and logic system; automatic head shield; electronic fade/edit with playback monitoring; electronic 4-digit tape counter with memory set, stop, play; automatic music finder; auto spacing; auto repeat; 6-position tape selector; equalized VU meters; mic/line mixing; switchable MPX filter; provisions for optional extended timer and 12-command remote control. Specifications at 1 ips: frequency response 20-19,500 Hz with ferrichrome tape (20-20,000 Hz with metal tape); head separation better than 35 dB; fast-forward/rewind time 90 sec for C60 cassette, 16" W X 10" D X 4 1/2 H; 11 lb. $500

C822. Similar to C828 except no auto reverse...

**TAPE RECORDING & BUYING GUIDE**

**DENON**

DR-320 Cassette Deck

Front-loading, three-head cassette deck with Dolby noise-reduction system, P.L.L. servo capstan and dc real motors, and source/tape monitoring capability. Features F-alloy heads for record and playback, double-gap ferrite head for erase; dual VU meters; display—multi-acting LED peak level indicator; normal/FaGr/CoCr/Co metal tape selector;...
**EUMIG USA, INC.**

**FL-1000 Cassette Deck**
Front-loading microprocessor-controlled metal-compatible stereo cassette deck with Dolby noise-reduction system, three separate heads, and optoelectronic servo control motor. Unit can interface with any 8-bit home computer system, and up to 16 units can be interconnected through one computer and individually controlled simultaneously or sequentially to play or record any section of any tape. Features logic-controlled solenoid tape function controls; 14-segment/channel fluorescent level display with switchable Vu, peak-meter, and peak-hold functions; separate 400- and 16,000-Hz oscillators; bias controls for metal, high bias, and normal bias tapes; master fader for mic/line and line/mic mixing; variable output control; LED digital counter display with microprocessor-controlled indexing; speed accuracy 15,000 times/sec. Wow and flutter 0.06% wrms; frequency response 30-20,000 Hz ± 3 dB (metal and CrO₂), 30-18,000 Hz ± 3 dB (ferric); S/N ratio 72 dB (metal), 66 dB (CrO₂), and 66 dB (ferric); rack-mountable. $1550

**FISHER**

**DD450 Cassette Deck**
Three-head, direct-drive cassette deck with separate tape-hub motor, Dolby noise-reduction system, full-logic IC solenoid transport controls, Dolby system for normal, FeCr, and CrO₂ tapes; stereo head-to-head recording; separate bias controls (concertmic with motor pitch control); memory/auto-repeat function; fluorescent level display with separate peak-level LEDs; hard Permalloy record/playback head; separate input level and single output level controls; full automatic stop. Wow and flutter 0.06% wrms; frequency response ± 3 dB 30-14,000 Hz normal, to 16 kHz CrO₂ and FeCr, and to 18 kHz metal tape; S/N ratio 62 dB with Dolby on; THD at 0 VU 1.5%; fast-forward/rewind time 90 seconds for C-60 cassette; 17"x W x 10/2" D x 4/12" H. $1560

**CRM300 Cassette Deck**
Direct-drive servo capstan motor cassette deck with Dolby noise-reduction system, full-logic solenoid transport controls, and auto repeat. Features normal/metal CrO₂ bias/ EQ switches, two illuminated VU meters; timer standby function. Wow and flutter 0.05% wrms; frequency response ± 3 dB 30-14,000 Hz normal tape, to 15,000 Hz CrO₂ and metal tape; S/N ratio 62 dB, Dolby on; THD 1.5% at 0 VU; 115V X 4/3 X 4/12" H. $350

**CRM200 Cassette Deck**
Deck offers powered-assistant transport controls, Dolby noise-reduction system, and large dual-scale VU meters. Features normal/CrO₂/metal bias/EQ selectors; record/mute switch; timer standby function; solenoid transport controls with electronic automatic program search. Wow and flutter 0.06% wrms; frequency response ± 3 dB 40-12,500 Hz normal tape, to 14 kHz CrO₂ tape, to 15 kHz metal tape; S/N ratio 60 dB, Dolby on; THD 1.5% at 0 VU; 115V X 4/3 X 4/12" H. $250

**CRM500 Microcassette Deck**
Microcassette deck with metal-tape capability, Dolby noise-reduction system, and large LCD digital bar graph recording-level display and peak level readouts. Features two coreless motors; Sendust heads; full-logic solenoid transport controls; metal/metal bias/EQ selectors; remote control; separate tape selector for metal tape; S/N ratio 65 dB, Dolby on; THD 1.8% at 0 VU; 115V X 4/3 X 4/12" H, 5 lb. $480

**HARMAN/KARDON**

**hk400xm Cassette Deck**
Front-loading direct-drive fixed-transport compatible stereo cassette deck with Dolby HX circuitry with LED headroom safety indicators, two motors, and three heads. Features separate bias and equalization switches (CrO₂, FeCr, and metal), two digital tape crash control using bias fine trim and bias and Dolby tone generators; dual 12-LED peak read-back bar graph display with slow/normal meter ballistics switch; solenoid transport controls with electronic automatic program search and LEDs; rec mute, digital tape counter readout with memory and reset; auto rewind and replay; separate line and mic level controls; output level control; fader control; tape/source monitoring; rec/play timer with external timer. Wow and flutter 0.03% wrms (NAB); frequency response 15-20,000 Hz ± 3 dB with FeCr and CrO₂ low-noise tapes; S/N 68 dB with Dolby, A weighted; mic impendence 600-50,000 ohms. $660

**hk300xm Cassette Deck**
Front-loading metal-compatible stereo cassette deck with Dolby HX circuitry with LED headroom safety indicators, two motors, and two heads. Features tone generators for bias and Dolby calibration; solenoid transport controls with electronic auto-program search and opto-magnetic automatic tone/width controls (NAB); frequency response 15-20,000 Hz ± 3 dB with FeCr and CrO₂ low-noise tapes; S/N 67 dB with Dolby, A weighted; mic impendence 600-50,000 ohms. $660

**hk200xm Cassette Deck**
Front-loading metal-compatible stereo cassette deck with Dolby HX circuitry with LED headroom safety indicators, two motors, and two heads. Features auto program search; three-digit tape counter with memory replay; bias and equalization select-
**CASSETTE TAPE MACHINES**

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**D-3300MB.** Similar to D-5500M except has membrane control.
- Frequency response: 15-20,000 Hz
- SAR 1000 Hz, 63 dB with Dolby; power output 1000 W
- Sensitivity 0.036% (metal)
- 1274.3 dB
- Size: 9.5" H x 17.8" W x 12.6" D
- Weight: 60 lb 3 oz.
- Price: $350

**hk100M Cassette Deck**
- Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system with switchable multiplex filter and two heads.
- Features PEAK metering meters; bias and equalization selectors; and preset line control; output level control.
- Wow and flutter 0.05% (NAB); frequency response 15-19,000 Hz
- 3 dB with FeCr and CoCr tape, 10" H x 17.8" W x 12.6" D
- Price: $750

**D-1100M.** Similar to D-3300M except wow and flutter 0.038% (metal), frequency response ±3 dB 20-19,000 Hz.
- Price: $750

**High Technology Separates**
- **hd705 Cassette Deck**
  - Front-loading metal-compatible stereo cassette deck with Dolby BX and Dolby B circuitry, dc servo-vomotor, and Sendust Alloy heads.
  - Features push-button tape selectors for low noise, FeCr, CoCr, and metal tapes; subsonic filter; dual vertical 12-
  - LED peak-level meter display; record and output levels control; three-digit tape counter with memory and reset; rec mute; LED tape warning indicators; fast-forward/rewind time 75 sec.
  - Price: $450

**JVC**
- **DD-9 Cassette Deck**
  - Front-loading microcomputer-controlled metal-compatible stereo cassette deck with Dolby noise-reduction system.
  - Unitorque direct-drive capstan and dc servo reel motors, dual-capstan transport, and closed-gap ferrite record/playback and erase heads.
  - Features microcomputerized automatic bias and equalization calibration with push-button test, four memory, tape formulation (CoCr, FeCr, and metal), and manual controls with bias and equalization level meters and LED display chart for system infrared wireless remote control with tape function controls and LEDs.
  - Price: $750

**K D-A7 Cassette Deck**
- Similar to KD-A77 without multi-LED peak indicator and three-head monitor switch.
- Features 12-level spectrum peak indicator with C-1, C-40, 100, 1000, 1000 Hz, 1.2 kHz, 10 kHz, 20 kHz, and 200 kHz.
- X-cut SA record/playback and two-gap SA erase heads.
- Price: $570

**K D-A66 Cassette Deck**
- Front-loading computer-controlled metal-compatible stereo cassette deck with super ANRS noise reduction system, electronic governor, and dc reel motors, and 4-cut Sen-Alloy ferrite record head.
- Features direct-drive transport, gapless 12-level peak indicator, and three-digit tape counter with memory and reset.
- Price: $500

**DD-9 Cassette Deck**
- Front-loading stereo cassette deck with ANRS, Dolby A, B, and C noise-reduction systems.
- Features B.E.S.T. tuning system that automatically sets up bias, equalization, and sensitivity for any tape to achieve a flat response; pulse-direct drive transport with four-channel bias adjustment, fine bias adjustment, and equalization.
- Price: $500
KD-D4 Cassette Deck

Front-loading stereo cassette deck with Metaperm record/play tape head, Super ANRS (Automatic Noise Reduction System), and multi-function digital counter display. Features Music Scan system that operates in both fast forward and rewind; fluorescent Spectro Peak Indicator that displays record levels for 7 frequency zones; memory stop/play; cue; review; timer standby; 6" x 11" x 12" x 47/8"; 19 lb. Comes with head-cleaner, remote control, and audio connection cord. $390

DD-5. Similar to DD-7 except has no digital levels for 7 frequency zones; memory stop/play; operates in both fast forward and rewind; fluorescent green plasma display; IC logic-controlled dc motor; and Sendust playback heads. Features separate tape selectors for normal, FeCr, Cr02, and metal; variable pitch control; output level control. $330

KD-D3. Similar to KD-D4 except has no digital tape counter display, memory stop/play, cue, or review. Features 7-LED multi-peak indicator (~20 to +9 dB); soft-touch controls; remote control; dual-ball cassette holder. Features separately biased tape heads for normal, FeCr, Cr02, and metal; 3-digit tape counter. $215

Cassette-Deck Accessories

RM-30. Remote-control unit for KD-A8 and KD-A77 cassette decks $50

R-50. Remote-control unit for DD-9, DD-7, KD-A66, and KD-D5 cassette decks $50

KENWOOD

KX-1060 Cassette Deck

Front-loading metal-compatible stereo cassette deck with dual Dolby noise-reduction system, electronically-controlled dc motor, and ferrite erase heads. Features bias and equalization selectors for normal, chrome, and metal tapes with separate left/right bias control adjustments and built-in 400-Hz and 10-kHz tone oscillators with LEDs; tape/source meter switch; input control with mic/line/DIN all mic selector; output level control; three-digit tape counter with memory and reset; 11 1/2 VU meters with peak-reading LED; full auto-shut-off; shelf tape function controls with LEDs; fully auto-shut-off; shelf tape function controls with LEDs; FIR timer; search cue/review; IC logic-controlled dc motor; and Sendust playback heads. Features separate tape selectors for normal, FeCr, Cr02, and metal; provision for optional remote control; headphone jack; flip out and turntable speaker. $225

KX-70 Cassette Deck

Front-loading deck with Dolby noise-reduction system, DPSS (Direct Processed Signal System) for full repeat and one music repeat and one music repeat, electronically controlled dc capstan and dc reels motors. Features normal/Cr02/metal bias/ Cr02 selector switch; 7-LED multi-peak meter; full shut-off mechanism in all modes; ammonia alloy record/playback and double-gap ferrite erase heads. Wow and flutter 0.04% rms; frequency response ±3 dB 30-17,000 Hz normal and Cr02, 17 kHz for metal tape; S/N ratio 67 dB normal and Cr02, 68 dB metal with Dolby on; fast wind time 105 sec. $349

KX-500 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, and Sendust Guard record/playback heads. Features ferrite erase heads and Sendust playback heads, and Dolby noise-reduction system. Features four-digit, seven-segment LED digital tape counter/timer, fluorescent green plasma level meter with peak hold function; IC logic-controlled operations controls; record mute; mic mixing; memory rewind; separate line/mic recording level controls; bias/equalization selector for normal, Cr02, and EX (metal) tapes; provision for optional remote control; headphone jack; and dual-core reel motors. $285

KX-50 Cassette Deck

Front-loading stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, and Sendust Guard record/playback heads. Features ferrite erase heads and Sendust playback heads, and Dolby noise-reduction system. Features four-digit, seven-segment LED digital tape counter/timer, fluorescent green plasma level meter with peak hold function; IC logic-controlled operations controls; record mute; mic mixing; memory rewind; separate line/mic recording level controls; bias/equalization selector for normal, Cr02, and EX (metal) tapes; provision for optional remote control; headphone jack; and dual-core reel motors. $275

KX-600 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, and Sendust Guard record/playback heads. Features ferrite erase heads and Sendust playback heads, and Dolby noise-reduction system. Features four-digit, seven-segment LED digital tape counter/timer, fluorescent green plasma level meter with peak hold function; variable bias with "Bridge Recording by Bias Current and Signal Current"; azimuth adjustment with two lamps; search cue/retro; IC logic-controlled operations; equalization for normal, Cr02, and EX (metal) tapes; tape/repeat monitor switch; separate mic/line record level controls; rec mute; headphone jack; two mic jacks; 400 and 6000 Hz oscillator; provision for optional remote control. Wow and flutter 0.05% rms; S/N with Dolby on 86 dB (metal); 30-17,000 Hz, (metal), 17 kHz, (metal); 10 kHz, (metal); 1 kHz, 0 VU with metal; input sensitivity 100 mV (line), 0.25 mV (mic); headphone output 1 mW into 8 ohms; 5 μV X 17" X 14" X 16"D. $800

K-12 Cassette Deck

Front-loading metal-compatible stereo cassette deck with real-time processed dc record/playback amps, FG servo capstan and electronic gov. servo motors, Sendust record/playback and ferrite erase heads, and Dolby noise-reduction system. Features four-digit, seven-segment LED digital tape counter/timer, fluorescent green plasma level meter with peak hold function; IC logic-controlled operations controls; record mute; mic mixing; memory rewind; separate line/mic recording level controls; bias/equalization selector for normal, Cr02, and EX (metal) tapes; provision for optional remote control; headphone jack; and dual-core reel motors. Wow and flutter 0.04% rms; S/N with Dolby 69 dB (metal), 65 dB (Cr02), 63 dB (Cr02); frequency response ±3 dB 30-20,000 Hz (metal) to 30-18,000 Hz (Cr02), 18 kHz (metal); input sensitivity 100 mV/50 kohms (line); 0.25 mV 50 kohms (mic); headphone output 1 mW into 8 ohms; 5 μV X 17" X 14" X 16"D. $745

KB Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, dc servo motor, and two sendust heads. Features solenoidately-controlled dc motor, and Sendust Guard record/play and ferrite erase heads. Features tape selector buttons for normal, FeCr, Cr02, and metal with bias fine adjustment; dual VU meters with 0+3, -6 dB peak indicator display; rec mute; record function controls; three-position bias and equalization for LH, Cr02, and metal with bias fine adjustment; dc record amp, fluorescent meters; LED digital tape counter display with memory recall and auto rewind/rewind switch; rec mute; output level control. Wow and flutter 0.05% rms; frequency response 30-17,000 Hz (metal); S/N 65 dB with metal tape, Dolby on: 5 μV X 17" X 14" X 16"D. $800
**SD9000 Stereo Cassette Deck**

Two-speed (1% and 3% ips), three-head Compu-disc stereo cassette deck with total programmability. Features Sendust-alloy tape heads; double-Dolby noise-reduction system; metal-tape capability; 24-karat gold plated input and output connectors; LED peak level display meters; soft-touch electronic transport controls; Electronic tape-mode controls; dual VU meters; total mechanism shockoff. Wow and flutter 0.06% wrms; frequency response ±3 dB 35-17,000 Hz, to 16 kHz FeCr, to 17 kHz normal tape; S/N ratio 54 dB Dolby off, 64 dB beyond 5 kHz Dolby on; 16%W × 11%T/D × 4%H; 13 lb 4 oz. $395

**SD2030 Stereo Cassette Deck**

Front-loading stereo cassette deck with Dolby B noise-reduction system, metal-tape capability, and super-hard metal-alloy heads. Features 24-karat gold plated input and output connectors; soft-touch electronic transport controls; Electronic tape-mode controls; dual VU meters; fine bias control; total shut-off mechanism. Wow and flutter 0.07% wrms; frequency response ±3 dB 35-17,000 Hz, metal to 15 kHz FeCr, to 16 kHz C02, to 17 kHz normal tape; S/N ratio 54 dB Dolby off, 64 dB beyond 5 kHz Dolby on; 16%W × 11%T/D × 4%H; 13 lb 4 oz. $275

**SD1015 Stereo Cassette Deck**

Front-loading stereo cassette deck with Dolby noise-reduction system and super-hard metal-alloy tape heads. Features metal-tape capability; 24-karat gold plated input and output connectors; dual VU meters; total mechanism shockoff. Wow and flutter 0.06% wrms; frequency response ±3 dB 35-17,000 Hz, metal to 15 kHz FeCr, to 16 kHz C02, to 17 kHz normal tape; S/N ratio 54 dB Dolby off, 64 dB beyond 5 kHz Dolby on; 16%W × 11%T/D × 4%H; 12 lb 2 oz. $200

**SD5010 Stereo Cassette Deck**

Slim-line front-loading cassette deck with motorized linear-skating cassette drawer mechanism. Features metal-tape capability; 24-karat gold plated input and output connectors; LED peak level display meters; soft-touch electronic transport system; electronic tape mode controls; super-hard metal-alloy heads. Wow and flutter 0.05% wrms; frequency response ±3 dB 35-18,000 Hz, metal to 16 kHz FeCr, to 17 kHz C02, to 15 kHz normal tape; S/N ratio 54 dB Dolby off, 74 dB Dolby C on; 16%W × 11%T/D × 4%H; 13 lb 4 oz. $395

**M-TO1 Cassette Deck**

Compact direct front-loading stereo cassette deck with Dolby noise-reduction system, closed-loop dual-driver dc servomotor, and sendust record/playback head. Features solenoid-operated microswitch controls; automatic spacing/pause button; twin peak-reading VU meters; three-pole equalizer and equalization for normal, special, and FeCr tapes; fine bias control; external timer unit; memory-stop and memory-play; pitch control; timer control with external audio timer; tape counter with memory rewind; fast-winding time 105 sec (C-60). Wow and flutter 0.2% wrms; frequency response ±3 dB 35-20,000 Hz (metal), to 14,000 Hz (normal), 0.04% wrms (33 1/3 ips); frequency response ±3 dB 35-17,000 Hz, metal tape (A and B), 0.08% wrms (33 1/3 ips); Dolby B noise-reduction system; 15 program RAMM with 30 minute timer; computer automatically calibrates azimuth, bias, level and equalization of any quality tape; features four-tape memories for recording conditions obtained by computer; 15 second automatic timer; command memories via high-speed bi-directional search; LED status indicators. Additional features include 70/120-sec equalizer selection; under/normal bias set selector; 400-1500 Hz test oscillator; quartz-controlled bias oscillator; multiplex and subsonic filter switches; dual fluorescent recording level bar graph display with peak hold and VU meters; pitch control; timer re-set via external audio timer; C-MOS logic function controls powered by motor-driven cam; direct-coupled recording and playback amplifiers and doubled NF equalizer circuitry; three microphone inputs for tri-mic recording and mic line mix.

**M-TO1C Cassette Deck**

Compact direct front-loading stereo cassette deck with Dolby noise-reduction system and dc servo control. Features tape selector switch for normal, FeCr, and special metal; template tapes; separate left/right record level controls; four-tape memories for recording conditions obtained by computer; timer standby with external audio timer; fast forward/rewind time 105 sec (C-60). Wow and flutter 0.07% wrms; frequency response 40-14,000 Hz (normal), 16,000 Hz (FeCr, special, metal); S/N 66 dB with Dolby (weighted at 3% THD, 400 Hz, metal tape); total input sensitivity/impedance 0.3 mV/1k ohms (mic), 90 mV/50k ohms (line); 6%H × 16%W × 14%D. $620

**NAD (USA)**

6150C Cassette Deck

Front-loading, metal-compatible stereo cassette deck with Dolby C noise-reduction system, dc servo capstan motor, Sendust record/play and ferrite erase heads. Features dual LED peak level bar graph display; bias and EQ for normal, FeCr, metal tapes and user-adjustable fine bias control; record and playback level controls; solenoid transport controls; 3-digit tape counter with memory rewind; timer start switch for automatic play and record when power is applied. Fast wind time 70 sec for C-60 cassette; wow and flutter 0.045% wrms; JIS frequency response ±3 dB 35-20,000 Hz (metal) with Dolby, to 17 kHz with Cr02, to 18 kHz with metal tapes; S/N 70 dB with Dolby C, metal tape (A weighted); input sensitivity/impedance 0.6 mV/10 kohms mic, 90 mV/50k ohms (line), 3 mV/15k ohms (line), 4.5/16 × 15/4 × 2.4 "H. $469

6040 Cassette Deck

Front-loading, metal-compatible stereo cassette deck with Dolby H and B noise-reduction system, dc servo capstan motor, and Sendust record/play and ferrite erase heads. Features illuminated peak-reading VU meters, bias and equalization pushbuttons for normal, FeCr, C02, and metal tapes; record and output level controls; three-digit tape counter with memory rewind; fast-winding time 100 sec (C-60), Wow and flutter 0.2% wrms; frequency response 20-18,000 Hz ±3 dB (C02, FeCr, and metal); S/N 64.5 dB with Dolby tape, metal tape (CCIR weighted); input sensitivity/impedance 0.2 mV/2k ohms (mic), 80 mV/50k ohms (line), 3 mV/15k ohms (line), 4.5/16 × 15/4 × 2.4 "H. $27.9

**Nakamichi**

1000X2L Cassette Deck

Front-loading computer-controlled discrete stereo cassette deck with Dolby noise-reduction system, double-capstan transport, and head-security controls. Uses computer automatically calibrates azimuth, bias, level and equalization of any quality tape; features four-tape memories for recording conditions obtained by computer; 15 second automatic timer; command memories via high-speed bi-directional search; LED status indicators. Additional features include 70/120-sec equalizer selection; under/normal bias set selector; 400-1500 Hz test oscillator; quartz-controlled bias oscillator; multiplex and subsonic filter switches; dual fluorescent recording level bar graph display with peak hold and VU meters; pitch control; timer re-set via external audio timer; C-MOS logic function controls powered by motor-driven cam; direct-coupled recording and playback amplifiers and doubled NF equalizer circuitry; three microphone inputs for tri-mic recording and mic line mix.
680ZX Cassette Deck
Front-loading auto-tuning stereo cassette deck with automatic noise reduction of azimuth, bias, and level for each cassette and a RAMM (automated playback) system that counts silent sections between programs. Features 3-head, dual-capstan, CMOS-logic-controlled transport, 4-digit LED digital tape counter, LED bargraph signal-level meters (-40 to +10 dB) with peak-hold function; 3-memory inputs (left, right, center "blend") that can be mixed with line inputs; subsonic filter; 400-Hz, 0-dB test tone to calibrate noise-reduction system; direct-coupled record and playback amplifiers; timer re-cord/playback function; high-output headphone jack; Dolby B noise-reduction system plus facilities for switching in and out an external NR system; kicker jack; Dolby B noise-reduction system plus facilities for automatic two-speed cueing; master and record level meter calibration/peak hold/VU meter switch; auto stop; record and playback amplifiers; RAM program search system with LED program indicator; manual high-speed cueing; fluorescent VU/peak-reading meter display with meter calibration/peak hold/VU meter switch; manual two-speed cueing, and RAMM function. Comes with 15-ft cable

NEAL-FERROGRAPH (USA)

312 Cassette Recorder
Front/top-loading metal-compatible stereo cassette recorder with Dolby HX and B noise-reduction systems, three-position tape selector for horizontal or vertical operation. Features tape selector switch for normal, ferric oxide, Cr02, and metal tapes; dual peer-reading meters with bias and phase correlation; 5000- and 10000-Hz oscillators in the record-controlled solenoid transport controls with LED stopper; record level control with separate mic, DIN, and line pushbutton switches; mono switch (enables recording on both tracks from mono input and gives mono output). Features 4-position tape bias/selector and line controls: recorded output level control; optional full-function remote control; fast forward/rewind time 50 sec (C-60). Wow and flutter 0.09% wrms (DIN); frequency response 20-19,000 Hz; THD with metal tape 0.8%; S/N 62 dB with metal tape, Dolby out; input level/magnitude 0.3 mV/50k ohms; output level/magnitude 3.0 mV/100k ohms (DIN); output level/impedance 0.775 V/50k ohms (line), 0.1 mV/5k ohms (DIN); output level/impedance 0.045% wrms; frequency response 20-19,000 Hz (metal); S/N 60 dB without Dolby B; format

RM-200 Remote-Control Unit
Wired remote-control unit duplicates control systems of 680 and 680ZX cassette decks, including record, two-speed cueing, and RAMM function. Comes with 15-ft cable

680ZX Cassette Deck
Front-loading two-speed (17 s and 14.4 s) metal-compatible stereo cassette deck with double Dolby noise-reduction system, PLL dc servo main, dc reel, and dc cam motors, phonocontrol circuitry, PLL dc servomotor in two-belt drive transport, hyperbolic S&S Sendust head, and metal-tape capability. Features "Accu-Bias" with built-in 400- and 10,000-Hz oscillators with Accu bias adjustment; three-position bias and equalization for Cr02, FeCr, and normal tapes; three-digit tape counter with reset and memory rewind; piano-key tape function controls; dual VU meters with two peak input levels; record control; auto stop; record/ playback and ferrite erase heads. Features self-rec mute; Dolby FM,line/mic-DIN input selector; input and output level controls; high/low impedance headphone jack. Wow and flutter 0.055% wrms; frequency response 20-19,000 Hz (metal); S/N 60 dB without Dolby B; format

RC-5. Remote control unit for TA-2040

TA-2040 Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, two direct-drive motors, and sendust alloy record and play and double-gate ferrite erase heads. Features normal, high, and metal tape selectors with LED indicators and Accubias adjust for any tape type; Dolby NR/HX selector with LED HX indicator; peak-hold meters; fade out control; tape/source monitoring; input and output level controls; rec mute; full logic tape function controls; three-digit tape counter with memory play/stop; timer/record/play and external audio timer; IC-logic electronic soft-touch tape function controls; VU meters with left/right 10-step LED peak indicators; fade out control; mic mixing; three-digit tape counter with reset and memory rewind; built-in timer function operates with optional audio timer; Dolby output level/impedance 0.3 mV/50k ohms (mic), 50 mV/100k ohms (line); output level 775 mV at 0 VU (line out); 60 mV/100k ohms at 0 VU (mic). $50 USD

TA-630DM Cassette Deck
Front-loading stereo cassette deck with dual-Dolby B noise-reduction system, Sendust alloy record and playback and ferrite erase heads. Features automatic "Accu-Bias" with built-in 400- and 10,000-Hz oscillators with Accu bias adjustment; three-position bias and equalization for Cr02, FeCr, and normal tapes; three-digit tape counter with reset and memory rewind; piano-key tape function controls; dual VU meters with two peak input levels; record control; auto stop; record/ playback and ferrite erase heads. Features self-rec mute; Dolby FM/line/mic-DIN input selector; input and output level controls; high/low impedance headphone jack. Wow and flutter 0.055% wrms; frequency response 20-19,000 Hz (metal); S/N 60 dB without Dolby B; format

TA-2050 Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system with multiplex filter, direct-drive servomotor and dc reel motors, and hyperbolic-designed hard permanently record playback and minimum-core ferrite erase heads. Features automatic "Accu-Bias" control with built-in 400- and 10,000-Hz oscillators; sendust alloy tape selector for metal, high, and normal tape with "Accu-Bias" adjust for fine tuning; dual peak-reading meters; fade-out/in control for gradual equalization at beginning or end of tape; record and playback and ferrite erase heads. Features normal, high, and metal tape selectors with LED indicators and Accubias adjust for any tape type; Dolby NR/HX selector with LED HX indicator; peak-hold meters; fade out control; tape/source monitoring; input and output level controls; rec mute; full logic tape function controls; three-digit tape counter with memory play/stop; timer/record/play and external audio timer; IC-logic electronic soft-touch tape function controls; VU meters with left/right 10-step LED peak indicators; fade out control; mic mixing; three-digit tape counter with reset and memory rewind; built-in timer function operates with optional audio timer; Dolby output level/impedance 0.3 mV/50k ohms (mic), 50 mV/100k ohms (line); output level 775 mV at 0 VU (line out); 60 mV/100k ohms at 0 VU (mic). $50 USD

TA-2060 Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby HX and noise-reduction system, two direct-drive motors, and sendust alloy record and play and double-gate ferrite erase heads. Features normal, high, and metal tape selectors with LED indicators and Accubias adjust for any tape type; Dolby NR/HX selector with LED HX indicator; peak-hold meters; fade out control; tape/source monitoring; input and output level controls; rec mute; full logic tape function controls; three-digit tape counter with memory play/stop; timer/record/play and external audio timer; IC-logic electronic soft-touch tape function controls; VU meters with left/right 10-step LED peak indicators; fade out control; mic mixing; three-digit tape counter with reset and memory rewind; built-in timer function operates with optional audio timer; Dolby output level/impedance 0.3 mV/50k ohms (mic), 50 mV/100k ohms (line); output level 775 mV at 0 VU (line out); 60 mV/100k ohms at 0 VU (mic). $800 USD

TA-2065 Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, two direct-drive motors, and sendust alloy record and play and double-gate ferrite erase heads. Features normal, high, and metal tape selectors with LED indicators and Accubias adjust for any tape type; Dolby NR/HX selector with LED HX indicator; peak-hold meters; fade out control; tape/source monitoring; input and output level controls; rec mute; full logic tape function controls; three-digit tape counter with memory play/stop; timer/record/play and external audio timer; IC-logic electronic soft-touch tape function controls; VU meters with left/right 10-step LED peak indicators; fade out control; mic mixing; three-digit tape counter with reset and memory rewind; built-in timer function operates with optional audio timer; Dolby output level/impedance 0.3 mV/50k ohms (mic), 50 mV/100k ohms (line); output level 775 mV at 0 VU (line out); 60 mV/100k ohms at 0 VU (mic). $800 USD
touch tape function controls; optional RC-5 remote control; direct function change; input selector switch; peak signal level LED indicators; frequency response 40-14,000 Hz ± 3 dB S/N ratio Dolby in/out 64/56 dB; THD 1.2% at 200 mW; fast-forward/rewind time 90 sec (C-60)...

$550

1900 Series Two Cassette Deck

Front-loading fully-programmable metal-compatible stereo cassette deck with Dolby noise-reduction system and APSS (Automatic Program Search System); dual head; two-speed (1.0 cm/sec, 2.0 cm/sec) playback; 120 min recording time; 60 min fast forward/rewind; 18" x 22" x 12" D; 16.5 lb...

$300

7800 Series Two Cassette Deck

Hidden-loaded (behind front panel) microprocessor-controlled metal-compatible stereo cassette deck with dual Dolby noise-reduction system, quartz PLL direct-drive, and heavy-duty coreless dc reel motors, and uni-crystal ferrite record/play head and separate erase heads. Features MicroScan system that automatically adjusts and optimizes Dolby settings for all tape types including metal; nine memory locations with function change; input selector switch; large VU meters; metal-tape capability. Wow and flutter 0.05% wrms; frequency response 40-14,000 Hz ± 3 dB S/N ratio Dolby in/out 64/56 dB; THD 1.2% at 200 mW; fast-forward/rewind time 95 sec (C-60)...

$190

PHASE LINEAR

7000 Series Two Cassette Deck

Hidden-loaded (behind front panel) microprocessor-controlled metal-compatible stereo cassette deck with dual Dolby noise-reduction system, quartz PLL direct-drive, and heavy-duty coreless dc reel motors, and uni-crystal ferrite record/play head and separate erase heads. Features MicroScan system that automatically adjusts and optimizes Dolby settings for all tape types including metal; nine memory locations with function change; input selector switch; large VU meters; metal-tape capability. Wow and flutter 0.05% wrms; frequency response 40-14,000 Hz ± 3 dB S/N ratio Dolby in/out 64/56 dB; THD 1.2% at 200 mW; fast-forward/rewind time 95 sec (C-60)...

$190

PANASONIC

RN-006A Microcassette Recorder

Two-hour, two-speed microcassette recorder with electronic governor motor and capacitor drive. Features built-in condenser mic; full-auto/stop; LED record/battery indicators; adf function; tape speed change; lockout control; cue/rewind controls; locating function; replaceable microphone system; comes with ac adapter, five-hr rechargeable pack, telephone pick up, two blank cassettes, earphones, carrying case, and strap; champagne gold finish; 5½" H x 2½" W x 9" D...

$260
control; record/playback timer capability with external timer. Wow and flutter: 0.035% w rms; frequency response ±3 dB 25-16,000 Hz (standard), to 18,000 Hz (FeCr and Cr02) to 19,000 Hz (metal); S/N 70 dB with Dolby; THD 1.0%; input sensitivity/ impedance 0.3 mV / 10k ohms (mic), 60 mV / 100k ohms (line); fast winding time 75 sec (C-60). All controls, except tape transport and LED readout and VU meter displays, behind front panel; 12½"H X 20¼"W X 29¼"D

PIONEER

CR-9R Stereo Cassette Deck
Computer-controlled stereo cassette deck with 3-motor, direct-drive transport and Dolby B/C/auto noise reduction. Features digital-electronic real-time tape counter (indicates in minutes and seconds, even in fast forward and rewind); automatic bias, level, ED adjustment; Blank Search/Index Scan system that runs transport in fast forward until unrecorded portion of tape is located and leaves 5-second blank space after each recording; Music Search/Repeat; Blank Skip that operates transport in fast forward between program selections to eliminate blanks during playback. Wow and flutter: 0.03% w rms; frequency response 20-22,000 Hz with metal tape recorded at -20 dB level; S/N ratio 60 dB with Dolby C on, at 5 kHz; 16½"W X 12½"D X 5¾"H; 14 lb 5 oz. ………… $575 CT-8R. Similar to CT-9R except standard mechanical index counter; wow and flutter: 0.04% w rms; frequency response 20 kHz; S/N 79 dB; 3¾"H X 12 lb 2 oz. ………… $450 CT-6R. Similar to CT-7R except auto-reverse in playback only. ………… $350 CT-5 Stereo Cassette Deck
Stereo cassette deck with Dolby B/C noise reduction and IC full-logic transport control system, and dc-servo motor. Wow and flutter 0.05% w rms; frequency response 20-18,000 Hz with metal tape; ±3 dB 20-16,000 Hz with ferric tape; 12-segment fluorescent peak-level bar graph display; auto stop; separate record level controls with memory ring; output level control. Wow and flutter 0.07% w rms; frequency response ±3 dB 30-13,000 Hz (ferric), to 14,000 Hz (Cr02), to 15,000 Hz (metal); S/N 65 dB with metal tape. Dolby on (3.0% THD, CCIR weighted) ………… $220 CT-4. Similar to CT-5 except no full-logic control system; frequency response to 17 kHz; 99½"D X 4¼"H

FEATURES

Features tape selector for ferric, Cr02, and metal tapes; digital tape counter. Wow and flutter 0.15% w rms; frequency response ±3 dB 30-14,000 Hz (normal), to 15,000 Hz (chrome), to 16,000 Hz (FeCr), to 17,000 Hz (metal); dist. 0.6% w rms with metal at 400 Hz; S/N 64 dB with Dolby, chrome tape, input sensitivity/impedance 0.3 mV /10k ohms (mic), 25 mV /47k ohms (line); 23½"H X 16½"W X 10½"D ………… $320 RD-550. Same as RD-500 except has discrete-indicator displays instead of VU meters; record and pause indicators; memory function; Sendust record/playback level displays with separate tape-formulation selector buttons; microwave; rec mute; tape selector buttons for ferric, Cr02, and metal tapes; digital tape counter. Wow and flutter: 0.045% w rms; frequency response 15,000 Hz ±3 dB on normal, 16½"W X 11½"D X 4½"H; 11.4 lb ………… $350

SAE

SAE Two Line
C4 Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system and FG servo motor. Features solenoid logic tape function controls; three-position bias and equalization for normal, FeCr, and high output (includes metal); input sensitivity/impedance 0.08% DIN, 0.035% w rms; frequency response ±3 dB 22-22,000 Hz metal, 22-16,000 Hz ferric, Cr02; S/N 68 dB at 3% THD, 1 kHz, A weighted, Dolby on (60 dB at 0 dB VU, 1 kHz, Dolby on; 17.8"H X 13.85"W X 6"H) ………… $1899

REALISTIC

SCT-22 Cassette Deck
Front-loading, metal-compatible stereo cassette deck with Dolby noise-reduction system and hard permalloy record/play and ferrite erase heads.

SCT-24 Cassette Deck
Front-loading, metal-compatible stereo cassette deck with Dolby noise-reduction system with switchable multiplex filter. Features dual LED peak metering; auto stop; tape selector buttons for ferric, Cr02, and metal tapes; digital tape counter. Wow and flutter 0.05% w rms; frequency response ±3 dB 30-14,000 Hz (normal), to 15,000 Hz (chrome), to 16,000 Hz (FeCr), to 17,000 Hz (metal); S/N 65 dB with metal tape, Dolby on (3.0% THD, CCIR weighted) ………… $150

REVOX

B710 Cassette Deck
Three-head, four-motor, front-loading deck has microprocessor-activated controls and counter display. Features dual direct-drive, crystal-controlled capstan and separate servo-controlled reel motors; constant-speed fast-forward/rewind with electrical braking; pneumatically damped solenoid-controlled head assembly; four-digit electronic counter with run-up button and real-time clock with internal timer switching for both B710 and external equipment; automatic bias/equalization sensing for metal, Cr02, ferrichrome, and ferric tape formulations, with manual override; mic/line mixing; separate playback level control; peak-reading LED record/playback level displays with 1-dB resolution; tone arm sensitivity adjustment from +30 to +10 dB for 1 dB intervals from 30 to 10 dB; full plug-in modular construction with optional rack-mounting adaptors. Wow and flutter 0.06% DIN; 0.035% w rms; frequency response ±2 dB 22-22,000 Hz metal, 17-16,000 Hz ferric, Cr02; S/N 68 dB at 3% THD, 1 kHz, A weighted, Dolby on (60 dB at 0 dB VU, 1 kHz, Dolby on; 17.8"H X 13.85"W X 6.17"D) ………… $1899

ROTEL

RD-1001 Cassette Deck
Front-loading, metal-compatible stereo cassette deck with Dolby noise reduction, Sendust record/play and ferrite/Peralloy erase heads. Features solenoid logic transport controls, bar-graph peak level displays; separate tape-formulation selector buttons; bias-adjust control; output level control; three-digit tape counter; memory function. Frequency response 30-14,000 to 30-17,000 Hz ±3 dB depending on tape type used; S/N 65 dB, Dolby in; wow and flutter 0.05% w rms; 16½"W X 11½"D X 4½"H; 11.4 lb ………… $360 RD-1010. Same as RD-1001 except has automatic rewind and repeat, memory functions; monitor, MPX filter, rec mute pushbuttons; timer standby switch; 17 to 19 kHz high-end response, depending on tape used; wow and flutter 0.045% w rms; 18½"W X 11¼"D X 4½"H; 13.8 lb ………… $500

RD-500 Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, electronic governor dc motor, and High B permalloy record/playback and ferrite core erase heads. Features four-position tape selection for normal, chrome, ferric, and metal tapes with bias adjust and LED indicators for each tape; twin VU meters with peak LED; full auto shutoff; three-digit tape counter; headphone and mic jacks; fast-winding time 90 sec (C-60). Wow and flutter 0.05% w rms; frequency response ±3 dB 30-14,000 Hz (normal), to 15,000 Hz (chrome), to 16,000 Hz (FeCr), to 17,000 Hz (metal); dist. 0.6% w rms with metal at 400 Hz; S/N 64 dB with Dolby, chrome tape, input sensitivity/impedance 0.3 mV /10k ohms (mic), 25 mV /47k ohms (line); 23½"H X 16½"W X 10½"D ………… $320 RD-550. Same as RD-500 except has discrete-indicator displays instead of VU meters; record and pause indicators; memory function; Sendust record/playback head; frequency response 30-15,000 Hz ±3 dB on normal; 16½"W X 11½"D X 4½"H; 11.4 lb ………… $350

SANOSUI

D-550M Cassette Deck
"Direct-O-Matic" front-loading three-head cassette deck with Tenasion Servo Mechanism for constant tape tension and Dyna-Scraper Filter to minimize modulation noise. Features full IC-logic transport controls; double-Dolby noise reduction; FG servo direct-drive capstan and electronically-controlled dc reel motors; 16-segment peak-reading...
LED record/playback indicators; metal/CrO₂/fer- ric select with ±20% bias-adjust control; memo- ry rewind with automatic play/rewind modes; exter- nal timer activation; switchable MPX filter; "Tape Lead-out" to bypass leader; separate playback level- el control; provisions for optional remote controller. Wow and flutter 0.035% w rms; frequency response ± 3 dB 25-21,000 Hz with metal, 25-17,000 Hz with CrO₂, 25-18,000 Hz with ferric tapes; S/N 70 dB with metal tape, Dolby on; black (rack mount) or silver finish; 16 1/4"W X 11 1/2"D X 5 1/2"H. $520

D-350M. Similar to D-550 M, except it has only two heads, no output level control. Frequency response goes to 18 kHz (metal), 16 kHz (CrO₂), 15 kHz (fer- ric); S/N 69 dB. $420

D-300M Cassette Deck
Front-loading cassette deck with Automatic Music Program Search for easy selection of recorded segments. Features electronically-controlled dc motor and full ic-logic transport controls; 24-segment peak-reading LED record/playback indica- tors; separate bias/EQ switches for metal, CrO₂, and ferric tapes; external timer or optional remote- control operation; H-B permalloy record/playback head and double-gap ferrite erase heads; black or silver finish. Wow and flutter 0.05% w rms; frequency response ± 3 dB 30-17,000 Hz with metal, to 16,000 Hz with CrO₂, and to 14,000 Hz with ferric tapes; S/N 68 dB with metal tape, Dolby on; 16 1/4"W X 9 3/8"D X 5 1/2"H. $320

D-95M Cassette Deck
Metal-compatible, front-loading cassette deck with 18-segment peak-reading LED record/playback indica- tors. Features direct-change transport mode controls with single-button record activation; separate bias/EQ switches for metal/CrO₂/ferric tapes; separate channel-record/level controls; H-B permalloy record/playback and double-gap ferrite erase heads; black or silver finish. Wow and flutter 0.07% w rms; frequency response ± 3 dB 30-15,000 Hz with metal, to 16,000 Hz with CrO₂, and to 14,000 Hz with ferric tapes; S/N 66 dB with metal tape, Dolby on; 16 1/4"W X 9 3/8"D X 5 1/2"H. $200

SANYO

RD10 Stereo Cassette Deck
Front-loading cassette deck with metal tape capa- bility and Dolby noise-reduction system. Features dc governor motor; LED signal-level meters; auto- stop at end of play; damped cassette door; illumi- nated record-mode indicator; digital tape counter; 2-patch cords. Frequency response with metal tape 30-14,000 Hz ± 3 dB. $100

RD8. Similar to RD10 except no Dolby noise re- duction; CrO₂ and normal tape capability. Frequency response 30-12,500 Hz normal, to 14 kHz ± 3 dB metal tape. $85

Plus Series

D65 Cassette Deck
Front-loading metal-compatible auto-reverse cassette deck with Dolby noise-reduction system, SharpScan peak level display, dual-gap ferrite erase heads, and dc servo capstan drive; mechanical tape tension servo; auto-stop system; timer standby; removable damped cassette door; optional rack mounting. Wow and flutter 0.04% w rms; frequency response ± 3 dB 20-20,000 Hz metal, to 17 kHz CrO₂ and FeCr, to 18 kHz normal tape; S/N ratio (Dolby on/off) 70/62 dB metal, 67.5/59 dB CrO₂, 69/61 dB FeCr, 66/58 dB normal tape; THD 0.15%/0.8%; separation 42 dB; crosstalk = 70 dB; 17 1/2"W X 11 1/2"D X 5 1/2"H. $300

D64 Stereo Cassette Deck
Front-loading stereo cassette deck with metal tape capability, built-in Dolby noise-reduction sys- tem, and Programmatic Automatic Music Select System (AMSS). Features Sendust-alloy record/ play head; auxiliary noise-reduction switching and connectors; mic/line mixing; output level controls; fluorescent peak-hold meters; defeatable FM MPX filter; record mute control; full-logic transport control; wow and flutter 0.05% w rms; frequency response 30-15,000 Hz metal, to 18,000 Hz CrO₂ and FeCr, to 17,000 Hz (metal); S/N 67 dB with Dolby 5 1/4"W X 16 1/2"D X 10 3/4"H. $330

D65 Stereo Cassette Deck
Front-loading stereo cassette deck with metal tape capability, Automatic Music Select System (AMSS), iC-logic transport controls, and built in Dolby noise-reduction system. Features 2-color, 12-segment peak level meters; permalloy record/ play and ferrite erase heads; timer operation in both record nd playback modes; normal/CrO₂ metal tape selector switches. Wow and flutter 0.05% w rms; frequency response ± 3 dB 30-19,000 Hz metal, to 17 kHz CrO₂ to 14 kHz normal tape; S/N ratio (Dolby on/off) 67.5/59 dB metal, 65/57 dB CrO₂, 63/55 dB normal tape; THD 0.15%/1.5%; separation 40 dB; crosstalk = 70 dB; 17 1/2"W X 10 3/4"D X 4"H. $260

SHARP

RT-1178 Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system. Features three-position bias and equalization for normal, CrO₂, and FeCr tapes plus metal tape selector; electronic auto stop; separate left right record level controls; output volume control; SharpScan peak level display; auto program search system in for- ward or reverse. Wow and flutter 0.065% w rms; frequency response 30-15,000 Hz (normal), to 18,000 Hz (CrO₂ and FeCr), to 17,000 Hz (metal); S/N 67 dB with Dolby 5 1/4"W X 16 1/2"D X 10 3/4"H. $290

RT-32 Stereo Cassette Deck
Stereo cassette deck with Dolby noise-reduction system, full-logic controls, 9-position Auto Pro- gram Locate Device (APLD) and indicators. Features nine-position auto program locate device (scans tape in forward or reverse and stops at de- sired selection); four-position bias and equalization for normal, CrO₂, FeCr, and metal tape; SharpScan peak level display with peak hold function; automatic auto stop; output volume control; SharpScan peak level display; auto program search system in fast forward or rewind; SharpScan peak level display; bias and equaliza-
When you record your favorite music on a cassette, you want only the music—not the added noise, distortion, or loss of musical nuances that rob you of the musical quality you deserve. Sansui’s full line of fine cassette decks is designed and engineered to give you just that, pure music. Thanks to a host of new design innovations.

Take the question of tape noise. We’ve reduced it to inaudible levels. All Sansui decks use Dolby® for a ten-to-one reduction of the annoying hiss you hear on so many tapes.

But we’ve also reduced other forms of noise—in particular, modulation noise which makes the music sound gritty whether the sound is loud or soft. Sansui’s exclusive Dyna-Scrape Filter (patent pending) on the new D-550M cassette deck reduces this kind of noise by as much as ten-to-one, too.

Take the question of wow and flutter which on a cassette deck creates distortion of the music. Sansui’s special 2-motor drive reduces wow and flutter on the D-550M and the D-350M to a miniscule 0.035% (WRMS), once again, inaudible.

Both decks have easy-to-use controls that optimize recording characteristics for any tape you choose to use, insuring flattest musical response, widest dynamic range and lowest distortion, so that you hear all of the music that’s in the grooves or coming off the air. And, of course, all of Sansui’s cassette decks can handle the new metal tape for your most critical recording needs.

More music, less noise. More machine. Better value. That’s what Sansui cassette decks are all about. Come see and hear the full line now at your local Sansui dealer.
RT-20 Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, and hard permalloy record/play and three-gap ferrite erase heads. Features computer-controlled front-loading tape display showing Sharpscan peak level meters, time, AM, PM, electronic tape counter, and time counter; bias and equalization for normal, C02, and metal tapes; pushbutton tape time remaining counter for C-90, C-60, and C-46 tapes with 3-min warning; timer alarm; 50/60 Hz ac frequency selector; mic/line input selector; auto stop. Wow and flutter 0.09% wrms; frequency response 30-14,000 Hz (normal), to 17,000 Hz (S/N), to 15,000 Hz (C02, and FeC0); to 17,000 Hz (metal); S/N 66 dB with Dolby; 5½" H X 16½" W X 9¾" D ... $190

S-300C Cassette Deck
Front-loading stereo cassette deck with Dolby noise-reduction system, metal/chrome/new capability, and alloy Sendust head. Features electronically governed dc motor; 12-segment, 2-color LED peak-level signal display; memory rewind; auto-damped cassette door with backlighting; automaticic audio muting during rewind and fast forward; pause control; automatic shut off at end of play; memory rewind. Wow and flutter 0.06% wrms; frequency response +1/-3 dB at 20-10,000 Hz; 20-15,000 Hz normal, to 17 kHz, to 19 kHz, to 17 kHz, to 19 kHz, to 17 kHz, to 19 kHz, to 17 kHz, to 19 kHz; S/N ratio with chrome tape Dolby on/off 63/54 dB, THD 1½ at 1 kHz with metal tape ......... $350

S-100CP Cassette Deck
Front-loading, metal-compatible stereo cassette deck with Dolby noise-reduction system, super-hard Dynalloy record/play head, new Dolby C and B noise-reduction systems, BSL transport with two motors. Features BSL servo capstan, and dc reel motors. Wow and flutter 0.06% wrms; frequency response +1/-3 dB at 20-10,000 Hz; 20-15,000 Hz normal, to 17 kHz, to 19 kHz, to 17 kHz, to 19 kHz, to 17 kHz, to 19 kHz, to 17 kHz, to 19 kHz; S/N ratio with metal tape 59/54 dB, THD 1½ at 1 kHz with metal tape ......... $200

TC-K78 Stereo Cassette Deck
Reference Standard three-head deck with Sendust and ferrite independent Sendust record and play heads and ferrite erase head. Metal-tape capable; quartz-locked direct-closed-loop dual-capstan transport; leather-touch solenoid transport controls; fine tuning controls for bias and level trim with built-in test-tone generators; electronic metering system for professional-grade display of recording levels; automatic/manual peak reset; digital linear "real-time" tape counter for accurate account even in fast-forward and reverse modes. Wow and flutter 0.25%/w rms; frequency response +3 dB 20-20,000 Hz types III and IV, to 18 kHz types I and II; S/N 60 dB A weighted with Dolby off; 17 kHz; 15½" H X 10½" D ... $550

TC-FX71 Stereo Cassette Deck
Three-head, front-loading, metal-compatible stereo cassette deck with Dolby noise-reduction system, BSL servo capstan, and dc reel motors. Features separate independent Sendust Sendust ferrite and record heads; four-gap ferrite-and-ferrite erase head; separate bias and EQ control for normal, FeC02, and metal tapes with bias and separate left/right record level adjustment. THD 1½ at 5 kHz (C02, and FeC0); to 15 kHz normal; S/N 59 dB with FeC02 tape, Dolby off; fast-forward/rewind time 80 sec with C-60 cassette, 17" W X 11¾" D X 5½" H ... $560

TC-FX6C Stereo Cassette Deck
Cassette deck with Sendust-and-ferrite record/play head, new Dolby C and B noise-reduction system, BSL transport with two motors. Features metal-tape capability, leather-touch solenoid-logic transport controls; auto space rec mute; line/out phones level control; timer stand-by option; linear "real-time" tape counter; playback with memory function; AMS; repeat play; auto play; switchable FM MPX filter; headphone level control; peak program meters with hold capability; function RM-50 and RM-65 remote-control option and tunable sync RM-65 option; 17" W X 10¾" D X 4½" H ...... $420

TC-FX6D Stereo Cassette Deck
Cassette deck with Sendust-and-ferrite record/play head, new Dolby C and B noise-reduction system, BSL transport with two motors. Features metal-tape capability, leather-touch solenoid-logic transport controls; auto space rec mute; timer stand-by option; linear "real-time" tape counter; playback with memory function; AMS; repeat play; auto play; switchable FM MPX filter; headphone level control; peak program meters with hold capability; function RM-50 and RM-65 remote-control option and tunable sync RM-65 option; 17" W X 10¾" D X 4½" H ...... $420

TC-FX6X Stereo Cassette Deck
Cassette deck with Sendust-and-ferrite record/play head, new Dolby C and B noise-reduction system, BSL transport with two motors. Features metal-tape capability, leather-touch solenoid-logic transport controls; auto space rec mute; timer stand-by option; linear "real-time" tape counter; playback with memory function; AMS; repeat play; auto play; switchable FM MPX filter; headphone level control; peak program meters with hold capability; function RM-50 and RM-65 remote-control option and tunable sync RM-65 option; 17" W X 10¾" D X 4½" H ...... $420

TC-FX6C Stereo Cassette Deck
Cassette deck with Sendust-and-ferrite record/play head, new Dolby C and B noise-reduction system, BSL transport with two motors. Features metal-tape capability, leather-touch solenoid-logic transport controls; auto space rec mute; timer stand-by option; linear "real-time" tape counter; playback with memory function; AMS; repeat play; auto play; switchable FM MPX filter; headphone level control; peak program meters with hold capability; function RM-50 and RM-65 remote-control option and tunable sync RM-65 option; 17" W X 10¾" D X 4½" H ...... $420

TC-FX6X Stereo Cassette Deck
Cassette deck with Sendust-and-ferrite record/play head, new Dolby C and B noise-reduction system, BSL transport with two motors. Features metal-tape capability, leather-touch solenoid-logic transport controls; auto space rec mute; timer stand-by option; linear "real-time" tape counter; playback with memory function; AMS; repeat play; auto play; switchable FM MPX filter; headphone level control; peak program meters with hold capability; function RM-50 and RM-65 remote-control option and tunable sync RM-65 option; 17" W X 10¾" D X 4½" H ...... $420

SHERWOOD
S-5000CP Cassette Deck
Microprocessor-controlled, front-loading stereo cassette deck with Dolby noise-reduction system, super-hard alloy Sendust heads, and record/play timer function. Features soft-touch controls; air-damped cassette door with backlighting; very smooth electronically governed dc motor; LED indicators for play, record, and pause; dual-function, two-color fluorescent display with peak/hold average signal level indication; metal/chrome/chrome/normal tape EQ selector with separate bias fine adjust control; MPX filter; separate line output and headphones-level controls.Wow and flutter 0.05% wrms; frequency response ±3 dB 30-17,000 Hz (metal and FeC0); to 15,000 Hz (metal); S/N 59 dB with FeC02 tape, Dolby off (HFA weighted); 6½" H X 17" W X 12¾" D ...... $600

TC-881 Stereo Cassette Deck
Three-head, front-loading, metal-compatible stereo cassette deck with Dolby noise-reduction system, BSL servo capstan, and dc reel motors. Features separate independent suspension Sendust ferrite record and play heads; four-gap ferrite-and-ferrite erase head; separate bias and EQ control for normal, FeC02, and metal tapes; six-gap ferrite-and-ferrite erase head; separate left/right level adjustment. Wow and flutter 0.06% wrms; frequency response +2/-3 dB 20-15,000 Hz with Dolby on; 30-15,000 Hz +3 dB at 0 dB rec level with metal tape; S/N ratio with metal tape Dolby on/off 63/54 dB, THD 1½ at 1 kHz with metal tape ......... $350

TC-877 Stereo Cassette Deck
Front-loading, metal-compatible stereo cassette deck with IC Dolby noise-reduction system, BSL servo capstan and dc reel motors, and infrared sensor rotating three-head system with sendust-ferrite record/play and two-gap ferrite-and-ferrite erase heads for auto reverse play/record at end of tape; includes full-function remote control feature. Features tape selector for normal, C02, FeC0, and metal tapes with two-position bias adjust for normal tape; auto reverse system; two-gap play back; sides once or reverse continually up to five times; auto stop; dual LED peak-reading bar graph display (+10 to +6 dB) with auto/manual peak hold reset buttons; record level with line/mic input selector; line out/phones level control; microphone-controlled tape transport controls with indicators; auto space rec mute; three-digit tape counter with memory function in recording/tape record/play with external timer; fast forward/rewind time 90 sec (C-60). Wow and flutter 0.05% wrms; frequency response ±3 dB 30-17,000 Hz (metal and FeC0); to 15,000 Hz (metal); S/N 59 dB with FeC02 tape, Dolby off (HFA weighted); 6½" H X 17" W X 12¾" D ...... $600
<table>
<thead>
<tr>
<th>Model</th>
<th>Features and Specifications</th>
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<tbody>
<tr>
<td>TC-FX2</td>
<td>Stereo Cassette Deck&lt;br&gt; - Coreless motor with FG servo control and DC-to-DC on the run.&lt;br&gt; - Features Dolby noise-reduction system; cue and review transport for stable recording.&lt;br&gt; - Peak indicator; 17”W x 9”D x 4”H.</td>
</tr>
<tr>
<td>TC-D5M</td>
<td>Portable Cassette Deck&lt;br&gt; - Lightweight, metal-compatible stereo cassette deck designed for high-quality field recording with anti-roll transport for stable recording.&lt;br&gt; - Features Dolby noise-reduction system; coreless motor with FG servo control and DC-to-DC converter power supply; Sendust-ferrite record/play head; dual VU meters with LED peak indicator; switchable limiter; monitor level control; low-impedance microphone input; line inputs and outputs; stereo headphone jack with level control; 4-hour operation on two D cells; 9”W x 6”D x 1”H; 13 lb 2 oz.</td>
</tr>
<tr>
<td>AC-L1</td>
<td>Ac adapter&lt;br&gt; - CDS5. Carrying case&lt;br&gt; - DR-M5. Fold-up high-efficiency headphones. $65</td>
</tr>
<tr>
<td>TCD 3004</td>
<td>Cassette Deck&lt;br&gt; - Microprocessor-controlled metal-compatible vertical front-loading stereo cassette deck with dual Dolby B noise-reduction system, three-motor, four-heads, and three-heads. Features PROM-programmed microprocessor function controls with LED indicators; recording preset; DYNEX headequalization and ACILINER recording systems; four-position bias/record and 70/120-usec bias adjust selectors for each tape; separate left and right input and output level vertical slide levers; equalized peak-reading/VU meters; three-digit tape counter with reset; headphone and two microphone jacks; Wow and flutter 0.13% wrms; frequency response 30-18000 Hz ±3 dB; THD 3.0% (metal, 2.0% ferric and chrome); S/N with metal tape 68 dB (IECA); input sensitivity/impedance 8 mV/47K ohms (radio), 40 mV/220K ohms (left/right inputs), mic input sensitivity 0.15-20 mV at 200 ohms.</td>
</tr>
<tr>
<td>TCD 440A</td>
<td>Cassette Deck&lt;br&gt; - Metal-compatible stereo cassette deck with dual Dolby noise-reduction system, separate record, playback, and Tandberg erasure heads (80 dB erasure at 1000 Hz and 60 dB erasure at 100 Hz), and three motors in dual capstan transport system. Features &quot;DYNEQ&quot; record equalization circuitry designed to automatically adjust record pre-emphasis of deck to maximize potential treble response while simultaneously minimizing treble distortion; &quot;Actilinear&quot; recording system; dual peak-reading meters with second scale reflecting metal-particle signal levels; 10-kHz test oscillator; bias control attenuator for chrome, Co and ferric tapes with set of left/right LEDs; separate left and right track bias and output level controls; source/tape monitor button; record preset; three-digit tape counter with reset; PROM logic-controlled tape function controls with LEDs; Dolby D/A, tape I and II/metal, source/tape, rec preset on/off, and power on/off indicators; optional PCM infrared wireless remote control available. Frequency response 20-20,000 Hz ±3 dB; S/N 70 dB (&quot;A&quot; weighted); anodized matte black finish. 4”H x 15”W x 8”D.</td>
</tr>
<tr>
<td>TEAC</td>
<td>C-1 MkII Cassette Deck&lt;br&gt; - Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system and three-motor and three-head dual-capstan transport system with PLL DC servo control and two DC coreless reel motors. Features LSI logic tape function operation controls; winding speed control; azimuth control. Frequency response 20-20000 Hz ±3 dB; S/N 70 dB.</td>
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**THE EUROPEAN ALTERNATIVE**


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**TANDBERG**

**1982 EDITION**

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**TANDBERG OF AMERICA INC.**

CIRCLE NO. 20 ON READER SERVICE CARD
CX-400 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, 3-head, soft-touch transport, and single motor, 3-belt drive. Features peak-hold fluorescent meters; metal/FeCr/CrO2 normal tape selector; re-record play, rewind control, output level control; cued automatic record review; full auto stop; mic/line switchover. Wow and flutter 0.056% rms; frequency response ±3 dB 25-19,000 Hz; microphone and line level blending; mic blend level controls; separate left and right channels; mic blend level controls; full auto stop; auto/normal reset, and dimmer controls; 16 1/8" W X 11 1/2" D X 4 3/4" H; 11 lb 3 oz. ...$350

RS-M260 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, 3-head, soft-touch transport, and single motor, 3-belt drive. Features peak-hold fluorescent meters; metal/FeCr/CrO2 normal tape selector; re-record play, rewind control, output level control; cued automatic record review; full auto stop; mic/line switchover. Wow and flutter 0.056% rms; frequency response ±3 dB 25-19,000 Hz; microphone and line level blending; mic blend level controls; separate left and right channels; mic blend level controls; full auto stop; auto/normal reset, and dimmer controls; 16 1/8" W X 11 1/2" D X 4 3/4" H; 11 lb 3 oz. ...$350

RS-M45 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, planar-opposed direct-drive dc servo capstan and dc reel drive mechanical transport, and SX (Sendust)/CrO2 and metal tapes. Features 4-position bias and equalization selector for normal, FeCr, CrO2, and metal tapes; two-color 18-segment fluorescent peak-reading display with auto-reset 2-peak hold memory circuit; power consumption 16 W; 16 1/8" W X 11 1/2" D X 4 3/4" H; 16 lb 3 oz. ...$500

RS-M51 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, electronically-controlled dc motor, and high-saturation flux density MX record/play head and sendust/ferite erase heads. Features automatic recording level system with automatic erase and sendust erase. (searching red LED checks peaks levels during seven-second period and green LED indicates level is set and recording begins) plus manual and up/down level line switch; automatic tape selection for normal, FeCr, CrO2, and metal tapes; two-color 18-segment fluorescent peak-reading display with auto-reset 2-peak hold memory circuit; power consumption 16 W; 16 1/8" W X 11 1/2" D X 4 3/4" H; 16 lb 3 oz. ...$500

RS-M240X. Similar to RS-M270X except S/N 91 db with dbx, 67 db with Dolby; wow and flutter 0.056% rms; frequency response ±3 dB 30-17,000 Hz (metal) to 17 kHz (CrO2 tape); no output level control; no auto/rewind control; 9 1/4" W X 4 3/4" H; 10 lb 2 oz. ...$500
**RS-M225 Cassette Deck**

Special Series soft-touch auto-tape select front-loading stereo cassette deck with Dolby noise-reduction system. Features music select and auto-tape select; peak-hold fluorescent level meters; stereo and mono cue/record/playback; cue and review; mic/line and rec mute switches; output-level and dual-concentric input-level controls; oil-damped cassette loading/unloading; removable cassette-well door; MX record/play and double-gap ferrite erase heads. Wow and flutter 0.048% rms; frequency response ±3 dB 20-18,000 Hz metal, to 14,000 Hz (normal); S/N 59 dB (Dolby off), 69 dB (above 5 kHz, Dolby on); signal level meters. Features include twin 11-segment peak/hold, flat component style; quartz-locked -planar -drive motor, and high-linearity dc amplification, and Aurex -Sendust record/play and Aurex-Ferrite erase heads. Features bias and equalization selectors for normal, Cr02, and metal tape with LED tape indicator, -10 dB peak level meters; IC logic-controlled feather-touch tape function controls; record level control with mic/line/rec mute input selector; output level control; three-gap tape counter with reset and memory; micro taper/rewind/stop; optional RP-9690-P or RP-070P remote control unit available; black metal cabinet... $200

**RS-M182 Cassette Deck**

Stereo cassette deck with Dolby noise-reduction system, peak-hold metering, and auto tape select. Features soft-touch transport controls; fluorescent level meters; MX record/play and double-gap ferrite erase heads; separate left and right input level controls; mic/line switch; single-tap recording; timer-assisted record/play; full auto stop; oil-damped soft-touch transport controls; removable cassette-well door. Wow and flutter 0.05% rms; frequency response 20-17,000 Hz metal, to 16 kHz Cr02, to 15 kHz normal tape; S/N ratio 66 dB Dolby on, 56 dB Dolby off; forward/rewind time 90 sec (C-60); power consumption 28 W. 16"w x 9"h x D x 4 1/8"h; 8 lb 13 oz. $165

**RS-M205 Cassette Deck**

Special Series stereo cassette deck with metal-tape compatibility, soft-touch transport controls, and dual analog VU meters. Features built-in Dolby noise-reduction system; separates left and right input level controls; cue/record/play; mic/line switch; oil-damped soft-load and unloading of cassette; removable cassette-well door. Wow and flutter 0.05% rms; frequency response 20-17,000 Hz metal, to 16 kHz Cr02, to 15 kHz normal tape; S/N ratio 66 dB Dolby on, 56 dB Dolby off; fast-forward/rewind time 90 sec (C-60); MX record/play and double-gap ferrite erase heads; power consumption 10 W. 16"w x 8 3/4"h x 4 1/8"h. $140

**Professional Series**

**RS-M95 Cassette Deck**

Front-loading quartz-latched metal-compatible stereo cassette deck with Dolby noise-reduction system, quartz-latched direct-drive motor, and high-linearity dc servomotor. Features incl. separate coreless reel motor; full IC logic control; laminated Sendust head; low noise equalizer and high linearity amplifier; MPX filter. Features fluorescence electronic bar graph peak meters dim/bright and VU/peak meter switch; four-position tape selector with fine bias adjustment; electronic full auto stop; record muting; mic/line mixing; output level control; three-gap tape counter with memory; micro taper/rewind/stop; optional RP-9690-P or RP-070 remote control unit available; black metal cabinet. $350

**Micro Series**

**RS-M02 Cassette Deck**

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, FG servo direct-drive dc capstan and dc coreless reel motors; oil-damped ferrite record/playback and erase heads in three-head system. Features dual-color fluorescent VU/instant peak/hold peak bar graph display; four-position bias and equalization for normal, FeCr, Cr02, and metal tapes with bias fine adjust; microprocessor tape counter with memory/rewind/stop; optional RP-9690-P or RP-070 remote control unit available; black metal cabinet. $140

**Remote Control Series**

**RS-M45 Cassette Deck**

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, FG servo direct-drive dc capstan and dc coreless reel motors; oil-damped ferrite record/playback and double-gap ferrite erase heads. Features tape selector buttons for normal, FeCr, Cr02, and metal tapes; dual-faceted peak-reading bar graph display with peak hold; separate coreless reel motor; full IC logic control; laminated Sendust head; low noise equalizer and high linearity amplifier; MPX filter. Features fluorescence electronic bar graph peak meters dim/bright and VU/peak meter switch; four-position tape selector with fine bias adjustment; electronic full auto stop; record muting; mic/line mixing; output level control; three-gap tape counter with memory; micro taper/rewind/stop; optional remote control available. Wow and flutter 0.035% rms; frequency range ±3 dB 10-20,000 Hz; THD 0.8% (metal, Cr02, and FeCr), to 15,000 Hz (normal); S/N 68 dB (Dolby on, 56 dB (Dolby off); fast-forward/rewind time 90 sec (C-60). Wow and flutter 0.05% rms; frequency response ±3 dB 20-18,000 Hz (metal); 30-16,000 Hz (metal, Cr02, and FeCr), to 17 kHz normal tape; S/N 59 dB (Dolby off), 69 dB (above 5 kHz, Dolby on); mic input sensitivity 0.25 mV; mic impedance 400-10,000 ohms; 30-16,000 Hz ± 3 dB. $750

**SH-R808**

Infrared wireless remote control unit... $200

**PC-X60 Cassette Deck**

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system with multi-plex filter, dc servo motor and dc coreless motors, high-linearity dc amplification, and Aurex-Sendust record/play and Aurex-Ferrite erase heads. Features bias and equalization selectors for normal, Cr02, and metal tape with LED tape indicator, -10 dB peak level meters; IC logic-controlled feather-touch tape function controls; record level control with mic/line/rec mute input selector; output level control; three-gap tape counter with reset and memory micro taper/rewind/stop; optional external audio timer; fast forward/rewind time 70 sec (C-60). Wow and flutter 0.045% rms; frequency response ±3 dB 20-18,000 Hz (metal); 30-16,000 Hz ± 3 dB with metal; S/N 60 dB (metal, Dolby off); 16"w x 9"h x D. S/N 60 dB (metal, Dolby off); 16"w x 9"h x D. $330

**PC-X22 Cassette Deck**

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system with multi-plex filter, dc servo motor, and super-hard Aurex-Permalloy record/play and four-gap Aurex-Ferrite erase heads. Features bias and equalization selectors for normal, Cr02, and metal tapes; recording and output level controls; mic/line input selector; oil-damped soft eject, cue and review, dual-lighted VU meters; one-touch recording, timer standby with external audio timer; fast forward/rewind time 90 sec (C-60). Wow and flutter 0.05% rms; frequency response ±3 dB 30-18,000 Hz ± 3 dB with metal; S/N 60 dB (metal, Dolby off); 4 1/8"w x 16"s x W x 11"D. $250

**PC-X12 Cassette Deck**

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system with multi-plex filter, dc servo motor, and super-hard Aurex-Permalloy record/play and four-gap Aurex-Ferrite erase heads. Features bias and equalization selectors for normal, Cr02, and metal tapes; recording and output level controls; mic/line input selector; oil-damped soft eject, cue and review, dual-lighted VU meters; one-touch recording, timer standby with external audio timer; fast forward/rewind time 90 sec (C-60). Wow and flutter 0.05% rms; frequency response ±3 dB 30-18,000 Hz ± 3 dB with metal; S/N 60 dB (metal, Dolby off); 16"w x 9"h x D. $199

**PC-X15 Cassette Deck**

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system with multi-plex filter. Features include twin 11-segment peak-reading LED "meters," dual concentric level controls, cue/review tape transport, dc servo motor, super-hard Aurex-Permalloy and Aurex-Ferrite erase heads, and three-position tape-select switch. Wow and flutter 0.05% rms; frequency response ±3 dB 18,000 Hz (metal, Cr02, and FeCr), to 15,000 Hz (normal); S/N 69 dB with Dolby; THD 0.8% (metal, 400 Hz, 0 dB); input level/impedance 0.25 mV/600 ohms (mic), 70 mV/50k ohms (line); silver finish; 5"x 10" x 16"w x D x 10"h. $200
PC-X10M Cassette Deck
Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, dc servo motor, and permalloy record/play and ferrite erase heads. Features bias and equalization selectors; separate left/right record level control; ccw meters; LED record and noise-reduction indicators; cue and review; timer record/play with external timer; full auto stop; fast forward/rewind time (sec); Cr02, 21 kHz metal tapes; S/N ratio no NR/Dolby B on/Dolby C on 56/65/75 dB; 17.4"W X 14.5"D X 5.4"H.......... $1000

VCX-500 Cassette Deck
Similar to VCX-600 less eight selectable programme music search (eight program buttons with LEDs represent eight selections on tape side, of which one or several choices are sought out and played); programmable search that automatically seeks next selection; separate bias and egalization for Fe, Co, and metal tapes with bias adjust; dual peak level bar graph meters; separate auto play and rewind buttons; memory top; IC logic tape function controls with LEDs; rec mute; cue and view; input and output level controls; tape/source monitor switch; three-digit tape counter with reset; optional remote control; 3 dB 30-16,000 Hz (Cr02, 20,000 Hz (metal); S/N (A weighted, 3.0% THD) 65 dB (normal), to 18,000 Hz (Co/Cr02), to 20,000 Hz (metal); frequency response ±3 dB 30-16,000 Hz (normal), to 17,000 Hz (Co/Cr02), to 19,000 Hz (metal); wow and flutter 0.028% wrms; input sensitivity/impedance 0.3 mV/5k ohms; microphone with auto mute with LED and auto rec/pause; slidable record/replay function; IC logic tape function controls, including rec mute with LED and auto rec/pause; sliding record and input level controls; hidden controls behind front panel include bias and egalization selector for LH, Cr02, and metal tapes with bias adjust; Dolby NR with multiplex filter switch; subsonic filter selection; record baffle; line/mic input selector; tape/source/mode selector; seven auto transport functions; status display (controls quality of sound images during tape playback); memory rewind; timer record/play (seven timers); two mic jacks. Wow and flutter 0.028% wrms (JIS); frequency response ±3 dB 30-16,000 Hz (LH), to 19,000 Hz (Cr02), to 22,000 Hz (metal); S/N 60 dB with Cr02 Dolby off (JIS weighted); input sensitivity/impedance 0.3 mV/5k ohms; microphone with auto mute with LED and auto rec/pause; slidable record/replay function; IC logic tape function controls, including rec mute with LED and auto rec/pause; sliding record and input level controls; hidden controls behind front panel include bias and egalization selector for LH, Cr02, and metal tapes with bias adjust; Dolby NR with multiplex filter switch; subsonic filter selection; record baffle; line/mic input selector; tape/source/mode selector; seven auto transport functions; status display (controls quality of sound images during tape playback); memory rewind; timer record/play (seven timers); two mic jacks. Wow and flutter 0.028% wrms (JIS); frequency response ±3 dB 30-16,000 Hz (LH), to 19,000 Hz (Cr02), to 22,000 Hz (metal); S/N 60 dB with Cr02 Dolby off (JIS weighted); input sensitivity/impedance 0.3 mV/5k ohms; microphone with auto mute with LED and auto rec/pause; slidable record/replay function; IC logic tape function controls, including rec mute with LED and auto rec/pause; sliding record and input level controls; hidden controls behind front panel include bias and egalization selector for LH, Cr02, and metal tapes with bias adjust; Dolby NR with multiplex filter switch; subsonic filter selection; record baffle; line/mic input selector; tape/source/mode selector; seven auto transport functions; status display (controls quality of sound images during tape playback); memory rewind; timer record/play (seven timers); two mic jacks. Wow and flutter 0.028% wrms (JIS); frequency response ±3 dB 30-16,000 Hz (LH), to 19,000 Hz (Cr02), to 22,000 Hz (metal); S/N 60 dB with Cr02 Dolby off (JIS weighted); input sensitivity/impedance 0.3 mV/5k ohms; microphone with auto mute with LED and auto rec/pause; slidable record/replay function; IC logic tape function controls, including rec mute with LED and auto rec/pause; sliding record and input level controls; hidden controls behind front panel include bias and egalization selector for LH, Cr02, and metal tapes with bias adjust; Dolby NR with multiplex filter switch; subsonic filter selection; record baffle; line/mic input selector; tape/source/mode selector; seven auto transport functions; status display (controls quality of sound images during tape playback); memory rewind; timer record/play (seven timers); two mic jacks. Wow and flutter 0.028% wrms (JIS); frequency response ±3 dB 30-16,000 Hz (LH), to 19,000 Hz (Cr02), to 22,000 Hz (metal); S/N 60 dB with Cr02 Dolby off (JIS weighted); input sensitivity/impedance 0.3 mV/5k ohms; microphone with auto mute with LED and auto rec/pause; slidable record/replay function; IC logic tape function controls, including rec mute with LED and auto rec/pause; sliding record and input level controls; hidden controls behind front panel include bias and egalization selector for LH, Cr02, and metal tapes with bias adjust; Dolby NR with multiplex filter switch; subsonic filter selection; record baffle; line/mic input selector; tape/source/mode selector; seven auto transport functions; status display (controls quality of sound images during tape playback); memory rewind; timer record/play (seven timers); two mic jacks. Wow and flutter 0.028% wrms (JIS); frequency response ±3 dB 30-16,000 Hz (LH), to 19,000 Hz (Cr02), to 22,000 Hz (metal); S/N 60 dB with Cr02 Dolby off (JIS weighted); input sensitivity/impedance 0.3 mV/5k ohms; microphone with auto mute with LED and auto rec/pause; slidable record/replay function; IC logic tape function controls, including rec mute with LED and auto rec/pause; sliding record and input level controls; hidden controls behind front panel include bias and egalization selector for LH, Cr02, and metal tapes with bias adjust; Dolby NR with multiplex filter switch; subsonic filter selection; record baffle; line/mic input selector; tape/source/mode selector; seven auto transport functions; status display (controls quality of sound images during tape playback); memory rewind; timer record/play (seven timers); two mic jacks. Wow and flutter 0.028% wrms (JIS); frequency response ±3 dB 30-16,000 Hz (LH), to 19,000 Hz (Cr02), to 22,000 Hz (metal); S/N 60 dB with Cr02 Dolby off (JIS weighted); input sensitivity/impedance 0.3 mV/5k ohms; microphone with auto mute with LED and auto rec/pause; slidable record/replay function; IC logic tape function controls, including rec mute with LED and auto rec/pause; sliding record and input level controls; hidden controls behind front panel include bias and egalization selector for LH, Cr02, and metal tapes with bias adjust; Dolby NR with multiplex filter switch; subsonic filter selection; record baffle; line/mic input selector; tape/source/mode selector; seven auto transport functions; status display (controls quality of sound images during tape playback); memory rewind; timer record/play (seven timers); two mi...
What Dolby C-type NR is

Dolby C is a new noise reduction system developed by Dolby Laboratories for consumer tape recording. It provides 20 dB of noise reduction above about 1 kHz, compared to the standard Dolby B-type system's 10 dB of noise reduction above about 4 kHz. Like the original system, the new Dolby C-type system operates without side effects on virtually all kinds of program material. It does not replace the standard Dolby B system, but will supplement it in a number of new high-performance cassette decks appearing in 1981.

How Dolby C-works:
dual-level processing

In some respects, Dolby C-type noise reduction operates like Dolby B. When a recording is made, the middle and higher frequencies of low-level signals are selectively boosted, while loud signals are essentially untouched. On playback, the previously-boosted signals are attenuated to where they were in the original program material, thus restoring proper musical balance while simultaneously effecting noise reduction. With Dolby C, signals are boosted and attenuated more than with Dolby B. In addition, Dolby C operates down to a lower frequency to maintain subjectively uniform noise reduction across the audible range.

Dolby C-type noise reduction is based upon a new and unique dual-level processing scheme. Two sliding-band processors operate in tandem at different levels to solve the problem of achieving 20 dB of compression and expansion without introducing undesirable side effects. Dolby C also incorporates several other new developments which reduce the effects of high-frequency tape saturation and minimize encode-decode errors, so that the new system puts no special demands on the user and requires no special recorder adjustments.

Figure 2: Dolby C-type noise reduction features dual-level processing, whereby two sliding-band processors operate in tandem at different levels. Like Dolby B, companding action is restricted to part of the dynamic range, above which there is essentially no action, and below which the system acts as a fixed-gain amplifier. Minimizing the system's dynamic action minimizes the possibility of side-effects on the signal being recorded.

Availability

More than 30 product models equipped with Dolby C, including cassette decks and add-on noise reduction units, are either here or have been announced by the following companies (and many other models are being developed):

- Aiwa
- Dual
- Hitachi
- JVC
- Marantz
- Mitsubishi
- Nakamichi
- Onkyo
- Pioneer
- Rotel
- H. H. Scott
- Sony
- NAD
- Vector Research

What Dolby C means to cassette recording

Combined with good tape formulations and a well-engineered cassette deck, Dolby C reduces tape noise to a level below the noise of virtually any program source available now or likely to be available in the foreseeable future. In fact, even at high listening levels, tape noise is lower than the ambient noise in many listening rooms. Thus for all intents and purposes, with Dolby C-type noise reduction, tape noise in cassette recording will no longer be of any practical consequence.

For further information, including technical details and the first independent review of Dolby C, please write us at the address below.

Dolby Laboratories Licensing Corp., 731 Sansome St., San Francisco, CA 94111, Telephone (415) 392-0300, Telex 34409.

"Dolby" and the double-D symbol are the registered trademarks of Dolby Laboratories for its A-type, B-type, and C-type noise reduction systems. 581/1283/1287
OPEN-REEL TAPE MACHINES

AKAI
GX-625 Stereo Tape Deck
Two-speed (33⅓ and 7½ ips) 4-track two-channel stereo tape deck with ac servo direct-drive capstan and two eddy-current reel motors and two GX heads for record and playback and one erase head; max. reel capacity 10½ in. Features auto repeat, play, and stop; illuminated solenoid tape function controls with LED standby indicator; LED digital timer/tape counter readout; two-deck tape monitoring; mic/line mixing/output level control; variable pitch control; mono/stereo recording; timer record/playback with external timer; computerized electronic braking system. Wow and flutter 0.03% rms at 7½ ips; frequency response 30-20,000 Hz ±3 dB at 7½ ips; S/N 52 dB weighted, with low-noise tape and peak recording level at 3% THD; distortion less than 0.03% rms at 1 kHz, 0 VU; 17.3 W X 12.4 H X 9.1 D; $357

GX-44000D Compact Tape Deck
Contains GX record and playback and separate erase heads and accommodates reels up to 7-in. dia. Features tape/source monitoring; mic/line mixing; sound-on-sound and sound-with-sound; track selector; auto-stop; output level control; VU meters. Tape speeds 7½ and 3⅞ ips; wow and flutter less than 0.06% rms at 7 ips; frequency response 30-24,000 Hz ±3 dB at 7½ ips; S/N ratio better than 60 dB weighted at wide range tape setting with peak level at 3% THD; distortion less than 1% at 1 kHz, 0 VU; 17.3 W X 12.4 H X 9.1 D; $249

1722⅞ Stereo Tape Deck
Two-speed (7½ and 3⅞ ips), 4-track, two-channel stereo tape system with record/playback and erase heads and two-speed induction motor; handles up to 7-in. reels. Features low noise/wide range tape selector switch; three-way speaker switch for mute/recording monitor, normal, and PA; auto shut-off; rear-panel speaker switch convertible to PA system; pause control; built-in phono equalizer amp directly records from magnetic phono cartridge; built-in 5 X 7-in speakers with speaker jacks; line and DIN in and out connections; two VU meters. Wow and flutter 0.14% rms (7½ ips), 0.18% rms (3⅞ ips); frequency response ±3 dB at 7½ ips 30-21,000 Hz (wide-range tape), to 18,000 Hz (low-noise), at 3½ ips 40-15,000 Hz (wide range), to 13,000 Hz (low-noise); dist. 2.5% at 1000 Hz, 0 VU; S/N 50 dB; output 10 W total music power; 6 W continuous; crosstalk 60 dB (mono), 45 dB (stereo); input sensitivity/impedance 0.5 mV/100k ohms (mic), 150 V/330k ohms (line); output level 1.3 V (line), 100 mV into 8 ohms (headphone). 5 W into 8 ohms (speaker); 14.1 H X 14 W X 9.8 D; $2295

NEAL-FERROGRAPH (USA)
SP7 Tape Recorder
Three-speed (choice of 15, 7½ and 3⅞ high, 7½, 3⅞ and 1⅝ medium, or 3⅞, 1⅝, and 1⅛ low ips) tape recorder with three motors, 250 µ in record, 80 µ in replay, and erase heads; choice of mono full-track or half-track or stereo half-track or quarter-track heads; max. reel capacity 10½ in. Features illuminated VU meters logic-controlled transport functions; 0.1sec fast start/correct speed operation; ramped tension arms; remote control facility. Other options include balanced line in/out power amp/speaker, rack mounting, Cannon XLR connectors, stainless-steel retainers, and Dolby noise-reduction in stereo only. Wow and flutter (peak, DIN weighted) at high speed 0.08% (15), 0.1% (7½), 0.17% (3⅞); at medium speed 0.08% (7½), 0.15% (3⅞), 0.2% (1½); at low speed 0.15% (3⅞), 0.2% (1½), 0.4% (1⅛); frequency response 30-20,000 Hz ±2 dB (15), 30-14,000 Hz ±3 dB (3⅞), 50-7000 Hz ±3 dB (1½), 60-3000 Hz ±3 dB (1⅛). S/N 60 dB (½ track, Dolby out), 58 dB (¼ track, Dolby out); 16½ H X 18½ W X 10 D.

SP7A1. Mono line in/line out .................. $1707
SP7A2. Stereo line in/line out .................. $1993

SP7A4. Stereo line in/line out with mic ...... $2279
Balanced lines (per channel) .................. $357
Power amp and speaker (per channel) ...... $214
Cannon XLR sockets (per channel) .......... $71
Rack-mounting brackets ....................... $214

OTARI
MX-5050-B Stereo Tape Recorder
Two-channel ¼-track (¼-track reproduce) three-speed (internally switchable pairs of 15 and 7½ ips or 7½ and 3⅞ ips) compact professional tape recorder with variable three-speed (±7%) dc servo capstan and two induction torque reel motors and four plug-in rugged Permalloy head stacks (¼ track erase, record and reproduce and ¼-track reproduce); handles 10½-in EIA or NAB reels and 5- or 7-in plastic reels; ¼-in tape. Features dual VU meters with +9 dB peak-reading LEDs; adjustable bias; record equalization for high and low speeds for each channel; two-speed operation button in speed pairs; four-digit tape counter with reset and selection locator memory that recues machine to zero setting; cue control; selective reproduce; TTL-IC edit control; logic noise-free punch-in/punch-out record; motion-sensing play mode directly from fast forward or rewind; fixed output level control; two line/mic input level controls; LED flashing record; built-in 1000-Hz test oscillator; rewind time 90 sec for 2500-ft reel. Wow and flutter (NAB weighted) 0.05% (15 ips), 0.06% (7½ ips), 0.01% (3⅞ ips); frequency response ±2 dB 30-22,000 Hz (15 ips at 0 VU), 25-20,000 Hz (7½ ips at -10 VU), 30-12,000 Hz (3⅞ ips at -10 VU); dist. 1.0% at 1000 Hz, 250 µWb/m; S/N (weighted) 65 dB (15 and 7½ ips), 64 dB (3⅞ ips); crosstalk 55 dB at 1000 Hz on adjacent tracks; line inputs 15 dBm, 50 ohms unbalanced and 600 ohms balanced; mic input −70 dBm, 50 ohms unbalanced; line output 4 dBm −10 dBm (fixed level, switch selectable); max. output +28 dBm, before clipping, headroom +24 dBm load impedance 600 ohms balanced, output impedance 50 ohms balanced; headphone jack −24 dBm, 8-ohm impedance; standard 3-pin XLR connector. Includes 10½-in NAB reel, precision hold down knob, and NAB reel shims; vinyl wooden cabinet; vertical or horizontal operating position; 21½ W X 21½ H X 8½ D; $2295

4/8 Channel
Mark II Four-Channel Recorder
Incorporates features of MX-5050 plus separately packaged transport and electronics, dc capstan servo with pitch control, pin electrolyte electronics completely accessible to electronics adjustments, and...
interface jack for adding dbx or Dolby noise-reduction system; tape speeds 15 and 7 1/2 ips; three four-track heads in line stacks for erase, record, reproduce; wow and flutter 0.05% at 15 ips, 0.006% at 7 1/2 ips; frequency response 50,000-20,000 Hz ±2 dB, 35-25,000 Hz ±3 dB (15 ips at O VU), 50- 18,000 Hz ±2 dB, 40-20,000 Hz ±3 dB (7 1/2 ips at ±10 dB); 600-ohm balanced output; 10% in NAB reels; ±1 V, 0.075 in-track width; 25"x 19" standard rack mount. $3895 Two-Channel. Same as Mark II but uses ±1 in -tape playback. Features plastic reels designed in EIA or NAB, 211/4" x 19" standard rack mount. $2495

OF5050 60 Series II Recorder
Four-channel, 1/4 in -recorder has motion-sensing control logic, variable-speed dc capstan servo motor, built-in test and cue oscillator, and plug-in head assembly. Features 15 and 7 1/2 ips speeds; selective controls; easy accessible electronics and adjustments; proprietary microprocessor to govern transport logic; electronic real-time counter with numeric LED display; automatic monitor switching; selectable 20-dB mic input attenuator; selectable track headphone monitoring; peak-reading indicators on each channel; separate mic/line mixing on track headphone monitoring; peak-reading indicators; automatic monitor switching; adjustments; proprietary microprocessor to govern professional use. Electronics console features record and playback level controls, record switch with LED, input/sync/replicate switch with LEDs, VU level meters for each channel with peak-reading LEDs, and safe/ready switch preventing accidental recording and erasure; equalization internally switchable to CCIR- or NAB-standard curves; logic-controlled LSI-circuit transport functions; editing through integral splicing block and momentary rewind button; electronic digital counter; hour, minutes, and seconds (accuracy ±0.5%); rear-panel connector for external oscillator. Wow and flutter 0.06% at 15 ips (weighted peak); frequency response 30,000-5 Hz ±2 dB (15 ips); 50-600-ohm d.c. in stereo (NAB, unweighted); HD echo delay 1%, 10.0% at 1000 Hz (NAB); die-cast chassis; 19.5" H x 19" W X 10.5" D. $3910

PIONEER

RT-909 Stereo Tape Deck
Two-speed (3 1/4 and 1/2 ips), 1/4-track, three-motor, four-head stereo tape deck; FG dc servo dual -capstan motor and two six-pole inner-rotor motor motors; accepts both 10" and 7-in reels. Features two-step bias and equalization selector with variable conductance circuit for lower intermodulation distortion; automatic line levels selectors with peak and average functions; four-digit electronic counter; reel and speed selector; pitch control; repeat switch; timer start with external timer; auto reverse; tape monitor/mic/mic line/mic mix and line right input level controls; output level control; Wow and flutter 0.04% at 7 1/2 ips, 0.08% at 3 ips; frequency response 20-28,000 Hz ±3 dB (7 1/2 ips), 20-18,000 Hz ±3 dB (3 ips); S/N 60 (7 1/2 ips), 55 dB (3 ips); 13 kHz/4 kHz/18 kHz/12 kHz. $595

RT-707 Stereo Tape Deck
Auto-reverse playback stereo reel to reel to tape deck; two speed (3 1/4 and 1/2 ips); speed accuracy ±0.5%; three-motor, four-head, 1/4-track, two-channel design; handles 7-in reels; FG servo ac direct motor for capstan drive and two six-pole inner-rotor induction motors for reel drive. Features solenoid operated, directly switchable function buttons and preset function buttons for timer record and playback; tape monitor/store/record/playback, auto reverse input level controls; independent L/R recording mode selectors; two bias and two equalization tape selection; full complement of inputs/outputs. Wow and flutter 0.05% rms (7 1/2 ips), 0.08% rms (3 ips); S/N 56 dB, dist. 1% max. (7 1/2 ips); fast rewind 100 sec (7 1/2 in); frequency response 30,000-5 Hz ±3 dB (7 1/2 ips), 30,000-6 Hz ±3 dB (3 ips); crossover frequency 5000 Hz; play and record selectivity ±6% (playback only); 9 kHz/1 kHz/18kHz/5 kHz X 14 kHz. $595

SONY

TC-76S "Open-Reel" Deck
Half-track stereo recorder/playback with 1/4-track playback option. Features Ferrite-and-Ferrite discrete-4-head design; patented dc head/playback FET amplifier; 3-motor ac servo closed-loop, dual-capstan tape head design; 15 and 7 1/2 ips tape speeds with electronic speed change and tension regulation system; feature-touch IC logic transport controls; punch-in recording; 10% in record capability; RM-50 remote-control unit. 20"x 4" x 8 1/2 " H X 14 1/2 " D. $1899

TC-765 "Open-Reel" Deck
Quarter-track stereo record/playback deck with Ferrite-and-Ferrite tape heads and 3 1/4 ips speeds. Features discrete 3-motor ac servo closed-loop, dual-capstan tape drive system; electronic speed change and tension regulation system; feature-touch IC logic transport controls; punch-in recording; 10% in record capability; RM-30 remote-control unit optional. 20"x 17 1/2 " H X 9 1/4 " D; 58 lb 7 oz. $1250

TC-399 "Open-Reel" Deck
Quarter-track stereo record/playback deck with Ferrite-and-Ferrite heads in three-head design and head/playback amplifier. Features ac induction motor drive; 15 and 7 1/2 ips speeds; servo back-tension device; scrape flutter filter; all-mode automatic stop; 7" reel capacity. 17 1/4" x 16 1/4" W x 7 1/4" D; 27 lb 13 oz. $520

STUDER/REVOX

B67 Mark II Stereo Tape Recorder
Three-speed (choice of 3 1/4, 7 1/2, and 15 ips or 7 1/2, 15, and 30 ips) two-channel tape recorder with three servo-controlled ac motors; designed for professional use. Features integrated drive logic-computer type push-button function keys; built-in tape cutter close to headblock; dual VU meters with peak level indicators; separate left/right record and input level controls; tape monitor switch; provision for remote control of all functions and electric timer operation; connectors for remote control of tape transport functions, remote control of variable tape speed, and slide projector or coordinate unit. Wow and flutter (DIN 45,527/EIEEE 193-1971) 0.06% (15 ips), 0.08% (7 1/2 ips), 0.1% (3 ips), frequency response +2/-3 dB 30-22,000 Hz (15 ips), 30-20,000 Hz at 7 1/2 ips, 30-16,000 Hz at 3 ips; S/N 66 dB at 15 and 7 1/2 ips, 63 dB at 3 ips; case or 19-in. rack mount; 19" W X 17" H X 19 1/2" D. $2035

TANDBERG

TD 20A "Baron" Open-Reel Deck
Features Actilinear recording system; active transconductance circuit for lower intermodulation; built-in Sel Sync; four-motor solenoidless operation; phase linear network; pushbutton operation with LED indicators, including "Free" position for easy tape editing and threading; stand-by position with LED when one or both record buttons are engaged; electronically-governed speed; optional infrared (wireless) remote control or conventional cord remote control; four-line inputs and master control for fading in/out; two-step front panel switch for mic attenuation (25 dB); very wide scale, peak-reading VU meters; front panel accessible bias adjustment; available in three versions: 7 1/2 and 15 ips, 1/4-track and 1/2-track. 15 and 7 1/2 ips; 1/4-track. $1295

Series 15 Open-Reel Recorder
Three-speed (7 1/2, 3 1/4, and 1/2 ips) mono record/play-open reel recorder; wow and flutter 0.15% at 7 1/2 ips; frequency response 40,000 Hz ±2 dB at 7 1/2 ips; S/N 55 dB at max record level; 5 W/channel continuous, both channels driven; $1295

1982 EDITION 69
<table>
<thead>
<tr>
<th>Model</th>
<th>Features</th>
<th>Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>32-2B Studio Series</td>
<td>Half-track 1/4&quot; recorder with 10&quot; reel capacity, capable of playing back 1/4&quot; track tapes with optional speeds; has built-in dbx Type I noise-reduction system. Features DC servo-controlled capstan and induction roll motors; touch-down logic control system with motion-sensing direct mode changes; four high-frequency, five low-frequency heads; 6% range speed pitch control; punch-in recording; cueing and editing functions; flip-up head cover; six-step bias selector and variable EQ control; source/call-out put monitor switch; independent left and right input and output level controls; wide-exursion VU meters with peak LED indicators; separate transport and electronics packages. Tape speeds/accuracy 15 ips/0.05%, 71/2 ips/0.08% peak IECEANS weighted; frequency response 40-20,000 Hz ±3 dB at 15 ips, 0 VU (40-20,000 Hz at 71/2 ips); THD 0.8% at 0 VU, 1 kHz, 185 mWb/m; S/N ratio 92 dB A weighted (DBX) with dbx on at both speeds; record/playback and auto repeat. Features independent pitch control; left/right tape/source monitoring; left and right record mode selectors; dual VU meters; digital counter; integrated DBX noise-reduction unit.</td>
<td>17'1&quot;H X 17/8&quot;W X 117/8&quot;D</td>
<td>$3900</td>
</tr>
<tr>
<td>40-4 Recorder/Reproducer</td>
<td>Four-track, 1/4&quot; in recorder/reproducer; will take up to 10&quot;2-in reels NAB hub only; 15 ips and 71/2 ips tape speed; function select panel; full 1/2&quot; gauge tape transport; memory stop function; digital counter; integrated DBX noise-reduction system; line input; 10 dB (0.3 V) line output; 10 dB (0.3 V) load impedance greater than 20,000 ohms, unbalanced; wow and flutter 0.04% NAB (weighted). 0.06% peak (ANSI-weighted); fast-tuning time 120 sec with 240-ft tape; frequency response 40-18,000 Hz ±3 dB; S/N ratio 65 dB; THD 1.0% at 400 Hz, 0 VU; overall THD 3.0% at 10 dB above 0 VU; crossover shrink greater than 45 dB at 400 Hz; 21&quot; H X 17/4&quot;W X 12&quot;D.</td>
<td>$1900</td>
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<tr>
<td>A-6600 Stereo Tape Deck</td>
<td>Two-Speed (71/2 and 33'1/3) 1/4&quot; track. Two-speed (71/2 and 15) 1/4&quot; track. Features auto-reverse and counter repeat; two capstans, one for each direction; tape guide rollers; cueing facility for both forward and reverse tracks; record mode indicator light,stable headroom better than 23 dB above 0 VU; 181/2&quot;W X 161/8&quot;H X 101/8&quot;D.</td>
<td>$775</td>
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<tr>
<td>A-3300S-2T Tape Deck</td>
<td>Two-speed (15 and 71/2 ips) 1/4&quot; track. Two-speed (15 and 71/2 ips) 1/4&quot; track. Features 1/4&quot; input/output, 1/4&quot; gauge tape transport; memory stop function; digital counter; integrated DBX noise-reduction system; line input; 10 dB (0.3 V) line output; 10 dB (0.3 V) load impedance greater than 20,000 ohms, unbalanced; wow and flutter 0.04% NAB (weighted).</td>
<td>$175</td>
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<tr>
<td>X-10R</td>
<td>Same as X-10 except bi-directional record/playback with six heads (two each era, record, and playback).</td>
<td>$1200</td>
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</tr>
<tr>
<td>X-7 Stereo Tape Deck</td>
<td>Two-speed (71/2 and 33'1/3) 1/4&quot; track-channel tape deck with three DC motors in closed-loop dual-capstan drive and erase, record, and playback heads; 71/2-in reel capacity. Features pitch control; cue lever; pushbutton tape function controls with record/mute; separate mic and line input level controls; output level control; source/tape monitor switch; separate two-position recording and erase switches; tape and source monitor control; output level control; two-position bias and equalization; recording and playback heads; separate bias and equalization selectors; input type: level meters; manual cue lever; separate bias and equalization selectors.</td>
<td>$900</td>
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<tr>
<td>X-3 Stereo Tape Deck</td>
<td>Two-speed (71/2 and 33'1/3) 1/4&quot; track-channel tape recorder with dc servo capstan and two in-deduction reel motors and heads; 7-in reel capacity. Features separate mic and line input controls; output level control; two-position bias and equalization selectors; record/mute with LED; tape/source monitor switch; two-speed (71/2 and 33'1/3) dual-capstan drive; eight heads; 10&quot;2-in reel capacity. 30-28,000 Hz (71/2 ips), 20,000 Hz (33'1/3 ips); S/N ratio 63 dB; 17'1/8&quot;H X 17&quot;W X 101/8&quot;D.</td>
<td>$1300</td>
<td></td>
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<tr>
<td>Audio Specialist Series</td>
<td>Two-speed (71/2 and 33'1/3) 1/4&quot; track-channel tape recorder with record and erase, record, and playback heads; 71/2-in reel capacity. Features pitch control; cue lever; separate transport and output level controls; wide-exursion VU meter;Wow and flutter (NAB weighted) 0.03% (71/2 ips), 0.04% (33'1/3 ips); frequency response 30-28,000 Hz (71/2 ips), 20,000 Hz (33'1/3 ips); S/N ratio 63 dB; 17'1/8&quot;H X 17&quot;W X 101/8&quot;D.</td>
<td>$1050</td>
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</table>
A-2340SX Tape Deck

Two-speed (7 1/2, 3 3/4 ips) 4-track four-channel Simul-sync tape recorder with erase, record, and playback heads and three motors; 7 1/2-real capacity. Features four Sync function select buttons with tape/source output select switches; four mic/line input control levels and output control levels for each channel, four-vectors, micro-control tape function controls; four-digit tape counter; four mic jacks and two phone jacks; provision for optional RC 120 remote control unit. Wow and flutter (NAB weighted): 0.08%, 0.10% (3 3/4 ips); frequency response ± 3 dB 40-18,000 Hz (7 1/2 ips), to 10,000 Hz (3 3/4 ips); S/N 62 dB with 3.0% THD, weighted, input sensitivity/impedance 0.1 V / 100K ohms (line), 0.25 mV/600 ohms (mic); 17"x9"x 13/32"W x 8 1/4"D ................................... $1175

RS-1502US Open-Reel Deck

Compact professional tape deck; 1/2-track, two-channel recording/playback and 1/4-track, two-channel playback, four head system; three speeds (15, 7 1/2, 3 3/4 ips); quartz control phase-locked dc brushless servo direct-drive capstan motor; reel tables; two-tape tension controlled dc brushless direct drive motors; isolated loop direct-drive transport system. Features full IC logic tape transport functions; direct switching from mode-to-mode without tape strain; separate left and right bias and equalization controls; levels left and right control the bias and equalization. Wow and flutter: 0.016% (15 ips), 0.3% wms (7 1/2 ips); fast-forward/rewind time 150 sec with 2500-ft tape; frequency response 30-20,000 Hz ±3 dB (15 ips, 30-20,000 Hz ±3 dB (7 1/2 ips, S/N 60 dB, 0.8% distortion; 50 dB channel separation; mic input sensitivity 0.25 mV (72 dB); microphone impedance 200-1000 ohms; 17"x18"x 10 5/8"D ................................... $2000

RS-1506US. Similar to RS-1502US except 1/4-track, two-channel recording/playback and 1/2-track, two-channel playback .......................................................... $1500

RS-1700US Similar to RS-1506US except autorerecording in both recording and playback modes; 1/4-track, two-channel recording/playback; 1/2-track, two-channel recording/playback with six-head system .................................................... $2100

RS-1505US Open-Reel Deck

Three-speed (15, 7 1/2, 3 3/4 ips) 1/2-track two-channel record, playback, and erase and 1/4-track two-channel playback stereo tape recorder with quartz-controlled PLL dc brushless servo direct drive capstan motor with double pin roller and two tape-tension controlled dc brushless direct drive reel motors and four heads for recording. Three-speed: 15, 7 1/2, 3 3/4 ips; d-c erase; micro-rewind; fast forward/rewind time 150 sec (2500-ft tape). Wow and flutter 0.018% wms (15 ips), 0.03% wms (7 1/2 ips); frequency response ±3 dB 30-30,000 Hz (15 ips), 20-25,000 Hz (7 1/2 ips), 20-16,000 Hz (3 3/4 ips); S/N 80 dB (NAB weighted) 60 Hz (15 ips) and 7 1/2 ips), 58 dB (3 3/4 ips); THD at 400 Hz, 0 VU 0.8%; channel separation 50 dB; input sensitivity/impedance 0.25 mV/4.7K ohms (mic), unbalanced, 60 mV/150K ohms (line, phone jack); rosewood veneer side panels, 17"x12"x3 19/32"W x 10 5/8"D ................................... $1600

RS-1506US. Similar to RS-1500US except 4-track 2-channel playback/record and 2-track 2-channel playback .......................................................... $1600

TELEX

Telex/Magnecord 1400 Series

Three-speed (15, 7 1/2, 3 3/4, 1 11/16 ips) open-reel tape recorder. Accepts reel sizes up to 8" dia. Available with a variety of head configurations for single-, two-, or four-track operation. Features brushless dc servo ball-bearing drive system. Wow and flutter: 0.35% at 3 3/4 ips, 0.24% at 7 1/2 ips, 0.17% at 15 ips, all DIN weighted, 0.25% at 3 3/4 ips, 0.17% at 7 1/2 ips, 0.12% at 15 ips, all unweighted rms; S/N ratio 60 dB NAB weighted; frequency response 30-10,000 Hz ±3 dB at 3 3/4 ips, 18 kHz at 7 1/2 ips; 35-22,000 Hz at 15 ips (two-track); crosstalk 50 dB at kHz (two-track head); inputs 150-ohm microphone, balanced bridge, unbalanced bridge, mixing bridge, aux bridge; outputs 150/600 ohms balanced, -4 dBm aux A and B unbalanced. Features VU meters; separate microphone and line-input controls; master gain control; catenary head block design; hyperbolic heads to ensure intimate tape contact; plus 19" frames. Features transformer-isolated CMOS-logic transport controls; storage cabinet; end-of-tape shut-off. Wow and flutter (DIN 45507): 0.05% (7 1/2 ips), 0.1% (3 3/4 ips), 0.2% (1 11/16 ips); frequency response 20-20,000 Hz (7 1/2 ips), to 15,000 Hz (3 3/4 ips), to 9000 Hz (1 11/16 ips); S/N (weighted, DIN 45500) on two-track 67 dB (7 1/2 ips), 66 dB (3 3/4 ips), 65 dB (1 11/16 ips); on four-track 65 dB (7 1/2 ips), 64 dB (3 3/4 ips), 61 dB (1 11/16 ips); crosstalk = 60 dB (mono), -45 dB (stereo); 13.9"x18"x 7.5"D ................................... $1785

RS-4200 Multi-Track Recorder

Four-speed (7 1/2, 3 3/4, 1 11/16, 4 1/4 ips) two- or four-track stereo record/play deck. Omega-looping system eliminates pinch roller, drive couplings, springs, and function wheels; four-motor drive system includes two dc hub motors, an electronically regulated capstan drive, and a third hub motor that drives the Omega loop. Wow and flutter 0.05%; frequency response 20-25,000 Hz (7 1/2 ips), to 16,000 Hz (3 3/4 ips), to 12,500 Hz (1 11/16 ips); S/N 65 dB (two-track at 7 1/2 ips). Features built-in strobe disc; speed control; peak-reading meter; built-in "Dia-Pilot" for recording signal impulses and automatic slide-projector control; switchable peak-level limiter; separate stereo headphone/phone with volume, bass, and treble controls. Accepts up to 10"2" reels with NAB Type A or B package and choice of speeds and head formats. Features transformer-isolated IC tape transport electronics; 19"x18"x 10 5/8"H; includes two dc hub motors, an electronically regulated capstan drive, and a servomotor to form the Omega loop. Wow and flutter: 0.015% (7 1/2 ips), 0.1% (3 3/4 ips), 0.2% (1 11/16 ips); S/N (weighted, DIN 45500) on two-track 67 dB (7 1/2 ips), 66 dB (3 3/4 ips), 65 dB (1 11/16 ips); on four-track 65 dB (7 1/2 ips), 64 dB (3 3/4 ips), 61 dB (1 11/16 ips); crosstalk = 60 dB (mono), -45 dB (stereo); 13.9"x18"x 7.5"D ................................... $1785

RS-4200 Report Monitor Recorder

Four-speed (7 1/2, 3 3/4, 1 11/16, 4 1/4 ips) two-track three-head stereo record/play deck with Revocap longlife heads and built-in stereo amplifier with mixing facility. In -reel capacity. Features "Synchro-Play" sound-with-sound, "Multi-Play" sound-on-sound, reverbeffect, and echo. "Dia-Pilot" for record/playback of cueing signals for auto slide-projectors. Accepts up to 10"2" reels with NAB Type A or B package and choice of speeds and head formats. Features transformer-isolated IC tape transport electronics; 19"x18"x 10 5/8"H; includes two dc hub motors, an electronically regulated capstan drive, and a servomotor to form the Omega loop. Wow and flutter: 0.015% (7 1/2 ips), 0.1% (3 3/4 ips), 0.2% (1 11/16 ips); frequency response 20-20,000 Hz (7 1/2 ips), to 15,000 Hz (3 3/4 ips), to 9000 Hz (1 11/16 ips); S/N (weighted, DIN 45500) on two-track 67 dB (7 1/2 ips), 66 dB (3 3/4 ips), 65 dB (1 11/16 ips); on four-track 65 dB (7 1/2 ips), 64 dB (3 3/4 ips), 61 dB (1 11/16 ips); crosstalk = 60 dB (mono), -45 dB (stereo); 13.9"x18"x 7.5"D ................................... $1785

4200 Four-track version of 4200; 1361

3400V. Two-track mono version of 4200; has three heads .......................................................... $1190

NOTICE TO READERS

Prices of items described are suggested prices only and are subject to change without notice. Actual selling prices are determined by the dealer.
### AMPLEX

**MPT (Metal Particle Tape) Cassette**
- Pure iron microparticles; metal bias; 70-µsec equalization.
- 367-C60: 60 min $9.99
- 366-C90: 90 min $9.99

**GMII (Grand Master II) Series Cassette**
- Cobalt-modified gamma ferric oxide; high bias; 70-µsec equalization.
- 366-C60: 60 min $4.79
- 366-C90: 90 min $5.89

**GMI (Grand Master I) Series Cassette**
- Premium gamma ferric oxide; normal bias; 120-µsec equalization.
- 365-C60: 60 min $4.29
- 365-C90: 90 min $5.39

**EDR (Extended Dynamic Range) Cassette**
- Premium gamma ferric oxide; normal bias; 120-µsec equalization.
- 377-C45: 45 min $2.69
- 377-C60: 60 min $3.29
- 377-C90: 90 min $4.29

**GM (Grand Master) Series Cartridges**
- 389-45: 45 min $3.99
- 389-90: 90 min $4.79

**ELN (Extra Low Noise) Series Cartridge**
- 385-45: 45 min $2.99
- 385-90: 90 min $4.79

**ELN (Extra Low Noise) Series Cartridges**
- 385-1511JA: 1200 ft, 7 in reel, 1.5 mil $9.99
- 356-1511JA: 1800 ft, 7 in reel, 1.0 mil $11.99
- 356-1731JA: 2400 ft, 10 1/2 in NAB reel, 1.5 mil $26.99
- 357-1731JA: 3600 ft, 10 1/2 in NAB reel, 1.0 mil $29.99

**GM (Grand Master) Open-Reel Tapes**
- 356-1511JA: 1200 ft, 7 in reel, 15 mil $8.99
- 357-1511JA: 1800 ft, 7 in reel, 10 mil $11.99

**Accessories**
- E4226BC: Demagnetizer/head cleaner for cassette players/recorders $5.29

### BASF

**Metal IV Cassette**
- 60 min $9.79

**Professional I Series Cassettes**
- Ferric-oxide formulation matched for Type I/normal/ferric positions.
- 60 min $3.99
- 90 min $5.49

**Professional II Series Cassettes**
- Pure chromium-dioxide formulation for Type II/chrome/high-bias position.
- 60 min $4.49
- 90 min $5.99

**Professional III Series Cassettes**
- Ferrichrome for FeCr/Type III position.
- 60 min $2.79
- 90 min $3.99

**Performance Series Cassettes**
- Normal/Type I/ferric position.
- 60 min $2.79
- 90 min $3.99

**Ferro Series Open-Reel Tape**
- Low-noise/high-output formulation exceeds professional recording studio requirements. Complete with sleeve and dust-proof box.
- 1800 ft, 7 in, reel $12.99
- 2400 ft, 7 in, reel $16.99

**Music Box**
- Black plastic storage cabinet holds up to 40 cassettes; can be mounted on wall or set on shelf $15.00

### AVANTI PRODUCTS

**Hi Energy Alpha Cassettes**
- Normal bias, 120-µsec equalization; packed in hard Philips box; also available on blister display card (HEB designated).
- HEC-60: 60 min $1.49
- HEB-60: 60 min $1.65
- HEC-90: 90 min $1.95
- HEB-90: 90 min $2.10
- Philips box in polybag.
- HEC2/C-90: Two 90 min $3.95
- HEC3/C-60: Three 60 min $4.15
- HEC3/C-90: Three 90 min $5.55

**Ultra Low Noise Cassettes**
- Low-noise cassettes packed in hard Philips box; 5-screw assembled shell; precision pins and lubricated rollers; bronze spring and pressure pad; reversible index card; also available on blister card (LNB designated).
- LNC-40: 40 min $0.90
- LNB-40: 40 min $1.10
- LNC-60: 60 min $1.10
- LNB-60: 60 min $1.25
- LNC-90: 90 min $1.50
- LNB-90: 90 min $1.65
- LNC-120: 120 min $1.89
- LNB-120: 120 min $1.85
- In polybag, no boxes.
- LNC2/C-90: Two 90 min $1.99
- LNC3/C-60: Three 60 min $1.99
- LNC3/C-90: Three 90 min $2.99

**B-Track Cartridges**
- High output, low noise; rubber idler rollers; nonskid guide posts; pressure pad.
- 8T-45: 45 min $1.75
- 8T-90: 90 min $2.49

### CERTRON

**Ferex I Cassettes**
- Premium tape.
- F-60: 60 min $3.00
TDK CREATES SA-X.  
Now you can explore the far reaches of high bias.

TDK has added a new dimension to high bias recording. It's called SA-X.
SA-X emerges from the Super Avilyn technology that has set the reference standard for high bias cassettes. Beyond that, TDK engineers saw new worlds of high bias to explore. By taking two layers of Super Avilyn with different coercivities and optimally matching them, TDK creates a formulation that raises high bias to a higher level. One that approaches the sound quality of metal.
You will hear rock and jazz soar to new heights. Classical, with more of its wide dynamic range. A clarity that even the best bias couldn't give you before. With every kind of music, SA-X brings you closer to the richness of a live performance. And it will keep you there, with its flawless mechanical construction. TDK has given SA-X the Laboratory Standard Mechanism for optimal interfacing with cassette deck heads. You'll hear its consistently superior performance for years to come.
SA-X performs like no other cassette. Expect it to cost a bit more. You can also expect it to take you further into high bias than you've ever been.
BLANK TAPE

F-90 FE: 90 min $3.99

High Energy Gamma Cassettes
Oxide formulation; durable binder system
C-60 HE: 60 min $1.99
C-90 HE: 90 min $2.59
C-120 HE: 120 min $2.99

Low Noise Cassettes
C-30 LN: 30 min $0.99
C-45 LN: 45 min $1.09
C-60 LN: 60 min $1.19
C-90 LN: 90 min $1.59
C-120 LN: 120 min $1.89

High Density Cassettes
C-30 HD: 30 min $1.29
C-45 HD: 45 min $1.39
C-60 HD: 60 min $1.59
C-90 HD: 90 min $2.09
C-120 HD: 120 min $2.49

Memotape for Minicassette
MT-30: 30 min $3.99
MT-40: 40 min $4.99

Micro Cassette
For Lanier, Olympus, and Panasonic capstan-drive machines
M60: 60 min $3.99

Dictation Cassettes
D20: 30 min $1.79
D45: 45 min $1.89
D60: 60 min $1.99
D90: 90 min $2.59
D120: 120 min $2.99

8-Track Cartridges
8T-45: 45 min $1.69
8T-65: 65 min $1.99
8T-90: 90 min $2.49

Tape Accessories
CHC: Cassette head cleaner $0.90
BHC: 8-track head cleaner $1.19

DENON

DXM Metal Cassette
Designed exclusively for music; features improved MOL in low and medium frequency range and SOL in high frequency range, wide dynamic range at high-frequency end, and stable and smooth magnetic coating with low drop-out; high-precision cassette shells and matrix sheets; 70 µsec equalization.
C-60: 60 min $6.80

DX -3 Series Cassettes
Double-coated magnetic FeCr-type tape accommodates all types of cassette decks; normal bias setting; normal position.
NC-60: 60 min $3.99
NC-90: 90 min $5.60

FUJI

Metal Tape
Metal coating with polyester base and pre-stressed polyester backing; very high output, ultra-low noise, 7-12 dB higher MOL than chrome; metal bias; 70 µsec equalization; packaged in hinged plastic box.
C49F: 46 min $8.30
C90F: 90 min $9.10
C90F: 90 min $12.00

FX-1 Premium Cassette Series
Pure Ferric coating with polyester base and backing; normal bias; 120 µsec equalization; packaged in hinged plastic box.
C49FX-L: 46 min $4.25
C90FX-L: 60 min $4.89
C90FX-L: 90 min $5.70

FX-II Premium Cassette Series
Berdiox coating with polyester base and backing; high bias; 70 µsec equalization; packaged in hinged plastic box.
C49FX-II: 46 min $4.40
C90FX-II: 60 min $5.10
C90FX-II: 90 min $6.95

270 Series Tape
Low-noise, high-output, back coated.
276-151: 1200-ft., 7-in reel $12.15
277-151: 1800-ft., 7-in reel $15.25

Videocassette Tape

VHS Format
Fine-grain Beridox; high-impact ABS housing.
T-120: 2-4 hr $29.65
T-90: 1.5-2 hr $26.70
T-60: 1-1.5 hr $21.85
T-30: 0.5-1 hr $19.45

Beta Format
Fine-grain Beridox; high-impact ABS housing.
L-750: 1.5-2 hr $21.60
L-500: 1-2 hr $18.10
L-370: 0.5-1 hr $15.45
L-250: 0.25-0.5 hr $14.00

Video Head-Cleaning Cassettes
Non-abrasive head cleaner cleans heads in 10 seconds
VOL-30: VHS format $25.00
BCL-30: Beta format $18.50

HITACHI

ME Cassettes
Metal-tape bias current for metal-tape position.
ME-46: 46 min $8.45
ME-60: 60 min $9.45
ME-90: 90 min $12.45

UD-ER Cassettes
Epitaxial magnetic substance; high output and energy, low distortion; normal bias; includes replaceable self-index label and leader tape.
90ER: 60 min $4.00
90ER: 90 min $5.50

UD-EX Cassettes
Epitaxial magnetic substance for chrome position.
C-90 EX: 60 min $3.99
C-90 EX: 90 min $5.50

IREISH Professional Series Cassettes
In polybag.
261-C60-3PA-HK: 60 min, 3/bag $3.30
261-C90-3PA-HK: 90 min, 3/bag $4.50
In flip-top plastic box.
2000-C30: 30 min $1.50
2000-C60: 60 min $1.75
2000-C90: 90 min $2.15
In flip-top plastic box and polybag.
2000-C60B: 60 min $1.90
2000-C90B: 90 min $2.30

Low-Noise, Extended-Range Cassettes
Flip-top plastic box.
700 C-60: 60 min $2.10
700 C-90: 90 min $2.70

2 Track Cartridges
in dustcover.
8T45 DC: 45 min $3.40
8T60 DC: 60 min $3.85
8T90 DC: 90 min $4.70

VHS Videocassettes
T-60: 1-2 hr $17.95
T-90: 1.5-2 hr $24.49

ME Metal Tape
Metal-particle formulation cassette designed for the serious amateur recordist requires high bias and 70-µsec EQ and delivers 4500-gauss flux density.
ME-46: 46 min $9.50
ME-60: 60 min $11.00

ME-P Metal Cassette
Metal-particle formulation cassette designed for the advanced audiophile requires high bias and 70-µsec EQ and delivers 4800-gauss flux density.
ME-P-46: 46 min $11.50
ME-P-60: 60 min $13.00

JVC

ME Metal Tape
Metal-particle formulation cassette designed for the serious amateur recordist requires high bias and 70-µsec EQ and delivers 4500-gauss flux density.
ME-46: 46 min $9.50
ME-60: 60 min $11.00

ME-P Metal Cassette
Metal-particle formulation cassette designed for the advanced audiophile requires high bias and 70-µsec EQ and delivers 4800-gauss flux density.
ME-P-46: 46 min $11.50
ME-P-60: 60 min $13.00

Videocassette Tape
VHS Format
T-30: 1-1/2 hr $15.95
L500-1X: 1-2 hr $19.95

VHS Videocassettes
T-60: 1-2 hr $17.95
T-120: 2-4 hr $24.49

JVC

ME Metal Tape
Metal-particle formulation cassette designed for the serious amateur recordist requires high bias and 70-µsec EQ and delivers 4500-gauss flux density.
ME-46: 46 min $9.50
ME-60: 60 min $11.00

ME-P Metal Cassette
Metal-particle formulation cassette designed for the advanced audiophile requires high bias and 70-µsec EQ and delivers 4800-gauss flux density.
ME-P-46: 46 min $11.50
ME-P-60: 60 min $13.00

Videocassette Tape
VHS Format
T-30: 1-1/2 hr $15.00
T-60: 1-2 hr $17.00
T-120: 2-4 hr $26.00

TAPE RECORDING & BUYING GUIDE
**KENWOOD**

**MD Series Cassettes**
- Designed for metal bias / 70-μsec equalization.
  - C-90: 90 min $15.00
  - C-60: 60 min $12.00

**C Series Cassettes**
- Cobalt-absorbed gamma ferric oxide formulation designed for high bias / 70-μsec equalization.
  - C-90: 90 min $7.50
  - C-60: 60 min $5.50

**ND Series Cassettes**
- Premium ferric-oxide formulation designed for normal bias / 120-μsec equalization. Particle shape, size, uniformity, and dispersion are controlled to yield maximum output level and low noise across frequency spectrum. High frequency response is 4 to 7 dB over conventional normal-bias tapes. Recommended for portable and car-stereo tape players.
  - C-90: 90 min $6.50
  - C-60: 60 min $4.50

**N Series Cassettes**
- High-grained ferric-oxide formulation with a high-frequency sensitivity of up to 4 dB over conventional low-noise/high-output tapes; designed for low-noise and low distortion on equipment with or without bias/equalization controls.
  - C-90: 90 min $4.50
  - C-60: 60 min $3.50

**LORANGER**

**Loran Ferric-Oxide Cassettes**
- Designed for normal bias, 120-μsec equalization settings.
  - C-46: 46 min $4.55
  - C-60: 60 min $5.55
  - C-90: 90 min $7.55

**Loran Chrome Cassettes**
- Chromium-dioxide formulation designed for use with CrO₂ settings.
  - C-60: 60 min $5.75
  - C-90: 90 min $7.85

**LUX**

**XM-IV Metal-Particle Tape**
- Premium tape for metal bias, 70-μsec equalization.
  - C-90: 90 min $14.95

**MAXELL**

**MX Metal Cassettes**
- Metal bias/equalization.
  - MX-46: 46 min $11.25
  - MX-60: 60 min $12.50
  - MX-90: 90 min $14.95

**XL II-S Epitaxial Cassettes**
- High-level bias; 70-μsec equalization.
  - XL II-S 60: 60 min $6.40
  - XL II-S 90: 90 min $8.65

**XL I-S Epitaxial Cassettes**
- Normal bias; 120-μsec equalization.
  - XL I-S 60: 60 min $6.40
  - XL I-S 90: 90 min $8.65

**UD-XL-I Epitaxial Cassettes**
- Normal bias; 120-μsec equalization.
  - C-90: 90 min $5.49
  - C-90: 90 min $7.59

**UD-XL-II Epitaxial Cassettes**
- Chrome type; high-level bias; 70-μsec equalization.
  - C-60: 60 min $5.49
  - C-90: 90 min $7.59

---

**WHEN WE WERE BREAKING NEW GROUND IN CASSETTE SOUND, OTHERS WERE STILL BREAKING GLASS.**

With the introduction of Metafine®, the world's first metal tape, Scotch® Cassettes brought cassette recording to the ultimate of true, pure sound.

But then, that's what you get with every Scotch Cassette: true, pure sound.

So if, for any reason, you're not perfectly satisfied with a Scotch Cassette, just send it back to us. We'll replace it free. And that's a lifetime warranty.

---

**SCOTCH® Cassettes. The truth comes out.**

---

1982 EDITION

CIRCLE NO. 13 ON READER SERVICE CARD
## Ultra-Dynamic Cassettes

<table>
<thead>
<tr>
<th>Type</th>
<th>Bias Type</th>
<th>Format</th>
<th>Reel Size</th>
<th>Minutes</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>UD-48-46</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>46 min</td>
<td>$3.89</td>
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</tr>
<tr>
<td>UD-60-60</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>60 min</td>
<td>$4.19</td>
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</tr>
<tr>
<td>NL-90-90</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>90 min</td>
<td>$6.19</td>
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</tr>
<tr>
<td>UD-120-120</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>120 min</td>
<td>$8.29</td>
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## Low-Noise Cassettes

<table>
<thead>
<tr>
<th>Type</th>
<th>Bias Type</th>
<th>Format</th>
<th>Reel Size</th>
<th>Minutes</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>LN-48-48</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>48 min</td>
<td>$2.59</td>
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</tr>
<tr>
<td>LN-60-60</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>60 min</td>
<td>$2.89</td>
<td></td>
</tr>
<tr>
<td>LN-90-90</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>90 min</td>
<td>$4.29</td>
<td></td>
</tr>
<tr>
<td>LN-120-120</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>120 min</td>
<td>$5.59</td>
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## 8-Track Cartridges

<table>
<thead>
<tr>
<th>Type</th>
<th>Bias Type</th>
<th>Format</th>
<th>Reel Size</th>
<th>Minutes</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal bias</td>
<td>Low noise</td>
<td>1/2&quot; tape</td>
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<tr>
<td>LN-BT-46</td>
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<td>46 min</td>
<td>$4.15</td>
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<tr>
<td>LN-BT-60</td>
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<td>60 min</td>
<td>$4.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LN-BT-90</td>
<td></td>
<td>90 min</td>
<td>$5.19</td>
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<td></td>
</tr>
</tbody>
</table>

## Ultra-Dynamic Open-Real Tape

Ultra-dynamic, high-energy type, normal bias.

<table>
<thead>
<tr>
<th>Type</th>
<th>Bias Type</th>
<th>Format</th>
<th>Reel Size</th>
<th>Minutes</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>UD-48-60</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
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<tr>
<td>UD-50-120</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>120 min</td>
<td>$30.55</td>
<td></td>
</tr>
<tr>
<td>1-mil polyester</td>
<td></td>
<td>10½&quot; reel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UD-35-90</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>90 min</td>
<td>$13.45</td>
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<tr>
<td>UD-35-160</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>160 min</td>
<td>$34.45</td>
<td></td>
</tr>
</tbody>
</table>

## Professional Epitaxial Open-Real Tape

Back-coated, ultra-dynamic, high energy, normal bias type.

<table>
<thead>
<tr>
<th>Type</th>
<th>Bias Type</th>
<th>Format</th>
<th>Reel Size</th>
<th>Minutes</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>UD-XL 50-60B</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>60 min</td>
<td>$13.45</td>
<td></td>
</tr>
<tr>
<td>UD-XL 50-120B</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>120 min</td>
<td>$36.45</td>
<td></td>
</tr>
<tr>
<td>1-mil polyester</td>
<td></td>
<td>10½&quot; reel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UD-XL 35-90B</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>90 min</td>
<td>$15.10</td>
<td></td>
</tr>
<tr>
<td>UD-XL 35-160B</td>
<td>Normal bias</td>
<td>1/2&quot; tape</td>
<td>160 min</td>
<td>$41.60</td>
<td></td>
</tr>
</tbody>
</table>

## Microcassettes

MC-60 (three per card) $17.50

## Tape Accessories

- 7-in plastic reel $4.75
- 7-in precision metal reel $10.99
- 10½-in precision metal reel $17.29
- 12 cassette plastic storage box $5.95
- 12 8-track plastic storage box $5.95
- Tape recorder care kit $8.95
- Care kit replacement fluid and pads $3.49
- Wand demagnetizer (WMD-110) $16.95
- Cassette demagnetizer (HE-44) $29.95

## Videocassette Tape

VHS Videocassettes

<table>
<thead>
<tr>
<th>Format</th>
<th>Minutes</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHS-760</td>
<td>1-2-3 hr</td>
<td>$17.95</td>
</tr>
<tr>
<td>VHS-T 760</td>
<td>2-4-6 hr</td>
<td>$24.95</td>
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</tbody>
</table>

## REALISTIC

### NAKAMICHI

<table>
<thead>
<tr>
<th>Type</th>
<th>Bias Type</th>
<th>Format</th>
<th>Reel Size</th>
<th>Minutes</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>ZX Cassette Tape</td>
<td>Metalloy (metal-particle) formulation</td>
<td>High Chroma, high r/f output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BetaMax Premium Videocassettes</td>
<td>High Chroma, high r/f output for brilliant life-like color, excellent picture quality and stability</td>
<td>T-80, 1-2-3 hrs</td>
<td>$16.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-250</td>
<td>$12.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>L-500</td>
<td>$16.95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-750</td>
<td>$20.95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## OSAMU

- MX Metal-Particle Cassettes $41.60
- UD-XL 50-60B, 120 min $15.10
- UD-XL 35-90B, 180 min $10.75

## PANASONIC

- VHS Format VC-T160, 1-2-3 hrs $14.50
- VC-T120, 2-4-6 hrs $19.95

## QUASAR

### Videocassette Tape

- VHS Videocassettes $24.95
- VHS-760, 1-2-3 hr $17.95
- VHS-T 760, 2-4-6 hr $24.95

## Low-Noise Cassettes

- 44-604, 120 min $2.59
- 44-603, 90 min $2.59
- 44-602, 60 min $2.59
- 44-601, 30 min $2.59

## Concertape Cassettes

- 44-605, 60 min $0.88
- 44-620, 90 min $1.25
Professional III.
"The only one for the road."

Today's more sophisticated car tape systems are every bit as good as many home sound systems—until you start your engine. Then engine noise, wind, tire whine and car vibration all begin to compete with the sound of your stereo. Until now, the listening environment was something less than a moving experience. PRO III has changed all that.

There's an "extra" in every cassette.

Since the playback equalization of most car stereos is 120µs, we designed PRO III at 70µs. This gives you an "extra brightness" during playback, and it gives your high frequencies an added boost that stand out dramatically above ambient car noise.

PRO III also features two separate tape layers for peak performance, even under the most difficult listening conditions. The top layer is pure chromium dioxide for unsurpassed highs and low background noise. The bottom layer is ferric oxide for superior lows and great middle frequencies. And it also gives you higher recording levels so you get clearer, louder playback without cranking up your volume control to compensate.

Get the most out of your car's stereo system—get the new PRO III from BASF—it's the only one for the road.

"The guarantee of a lifetime."

All BASF tape cassettes come with a lifetime guarantee. Should any BASF cassette ever fail—except for abuse or mishandling—simply return it to BASF for a free replacement.

For the best recordings you'll ever make.
### TAPE RECORDING & BUYING GUIDE

#### Home Storage
- Ferric formulation; normal bias; 120 µsec equalization.
- Beta -Format Videocassettes
  - 70-µsec metal equalization.
  - Chromium dioxide formulation; chrome (high) bias; 120 µsec equalization.
- Ultrachrome Cassettes
  - Low-noise, ferric-oxide tape.
  - L-228. 7-in reel, 60 min at 7 1/2 ips, 1.5 mil $5.49
- Concertape
  - L-229. 7-in reel, 90 min at 7 1/2 ips, 1.0 mil $7.59
- Betacord videocassettes
  - L-230. 7-in reel, 120 min at 7 1/2 ips, 1.0 mil $9.99
- Sanyo Videocassette Tape
  - FeCr-48. 45 min $2.49
  - FeCr-60. 60 min $4.75
  - FeCr-90. 90 min $6.10

#### Broadcast I Cassettes
- Features premium grade, low-noise ferric oxide; for use with recorders operating in the CrO₂ or 70 µsec equalization position; improved cassette shell for critical mechanical performance and three-head recording equipment; 3-DB S/N improvement over current CrO₂ cassettes; album or "C-Box" packaging (40 cents additional for "C-Box")
- Master I Cassettes
  - 45 min (album only) $4.39
  - 60 min $4.79
  - 90 min $5.99
- Master II Cassettes
  - Features chrome-compatible modified ferric oxide for use with recorders in the normal or 120 µsec equalization position; album or "C-Box" packaging; improved S/N.
  - 45 min $4.39
  - 60 min $4.79
  - 90 min $5.99
- Master III Cassettes
  - Features improved FeCr dual-layer construction which provides 3-DB improvement in output at low frequencies, 2-DB boost at high frequencies over existing tapes; improved cassette shell for critical mechanical performance and three-head recording equipment; album or "C-Box" packaging (40 cents additional for "C-Box")
  - 45 min (album only) $4.99
  - 60 min $4.79
  - 90 min $5.99
- Dynarange Betacord Cassettes
  - High-output, low-noise ferric oxide cassette featuring full dynamic range throughout the audible sound spectrum; special back treatment for improved mechanical performance; album package.
  - 45 min $2.79
  - 60 min $3.29
  - 90 min $4.59
  - 120 min $6.39

#### VHS-Format Videocassettes
- Low-noise oxide formulation for all-purpose cassette use; polyester base.
- Highlander Cassettes
  - Low-noise oxide formulation for all-purpose cassette use; polyester base.
  - 45 min $1.69
  - 60 min $1.99
  - 90 min $2.99
  - 120 min $4.39
- Master 8-Track Cartridges
  - Features high-output low-noise ferric-oxide coating for high-frequency sensitivity of 8 dB higher and S/N at low frequencies 8 dB higher than standard cartridges; fully compatible, oxide coating heavy-duty lubricated polyester backing.
  - M-8TR-40. 40 min $4.29
  - M-8TR-90. 90 min $4.99

#### Dynarange 8-Track Cartridges
- Features low-noise ferric oxide; fidelity uniform throughout audible frequency range; heavy-duty binder; lubricant system; precise tape-to-head alignment.
- S-8TR-45. 45 min $3.19
- S-8TR-90. 90 min $3.99

#### Master X$ (Extra Sensitive) Open-Reel Tapes
- Features mastering quality tape for critical music applications; excellent print and max. output properties; biased to be compatible with most retail open-reel decks.
- 7-in reel, 60 min at 7 1/2 ips, 1 mil $13.39
- 10½-in metal reel, 120 min at 7 1/2 ips, 1 mil $36.89

#### 206-207 Open-Reel Tapes
- Polyester base, "Posi-Trak" backing, leader, and trailer.
  - 7-in reel, 60 min at 7 1/2 ips, 1.5 mil $7.99
  - 7-in reel, 90 min at 7 1/2 ips, 1.0 mil $9.99

#### Dynarange Open-Reel Tapes
- Provides high-fidelity recording even at 3½ ips; multi-purpose tape providing full dynamic range throughout audible spectrum; S/N is 4 to 6 dB better than standard tapes.
  - 211. Polyester backing, white yellow trailers, 5-in reel, 70 min at 7 1/2 ips, 1.5 mil $4.09
  - 212. 5-in reel, 45 min at 7 1/2 ips, 1.0 mil $4.89
  - 213. 7-in reel, 120 min at 7 3/4 ips, 0.5 mil tinselized $12.59
  - 214. 5-in reel, 90 min at 7 1/2 ips, 0.5 mil tinselized $16.59

#### Highlander Open-Reel Tapes
- All-purpose economy tape for vocals as well as speech.
  - 228. 7-in reel, 60 min at 7 1/2 ips, 1.5 mil $5.49
  - 229. 7-in reel, 90 min at 7 1/2 ips, 1.0 mil $7.59

#### Video Cassette Tape
- VHS-Format Videocassettes
  - L-225. 1 1/2 hr $18.95
  - L-226. 2 1/2 hr $21.75
  - L-227. 3 hr $27.95
- Beta-Format Videocassettes
  - L-250. 1-1 1/2 hrs $21.75
  - L-251. 2-1 1/2 hrs $27.95
- Sanyo Videocassette Tape
  - RKC-90. 90 min $8.00
  - RKC-91. 90 min $8.00

#### ColorChrome Videocassettes
- Beta and VHS formats; packaging features dust-protector sleeve and color-coded filing system for home storage.
- L-250. 1½-1 1/2 hrs $12.95
- L-500. 3-1 1/2 hrs $18.95

#### RCA Cassettes
- Low-noise, ferric-oxide tape.
  - RC5-60. 60 min, five pack $3.99
  - RC5-90. 90 min, five pack $5.79
  - RU4-60. 60 min, four pack $5.39
  - RU4-90. 90 min, four pack $6.79

#### RKO Tape
- Ultrachrome Cassettes
  - Chromium dioxide formulation; chrome (high) bias; 70 µsec equalization; housed in five-screw poly-styrene shell with chrome notch.
  - C-60. 60 min $4.49
  - C-90. 90 min $5.99
- Broadcast I Cassettes
  - Ferric formulation; normal bias; 120 µsec equalization; housed in five-screw poly-styrene shell.
  - C-60. 60 min $3.99
  - C-90. 90 min $5.49
- Xtra Dynamic Cassettes
  - Ferric bias; for home recording.
  - C-45. 45 min $2.49
  - C-60. 60 min $2.99
  - C-90. 90 min $3.99

#### Videocassette Tape
- ColorChrome Videocassettes
  - Beta and VHS formats; packaging features dust-protector sleeve and color-coded filing system for home storage.
  - L-250. 1½-1 1/2 hrs $12.95
  - L-500. 3-1 1/2 hrs $18.95

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This page provides detailed information on various types of recording media, including their specifications, applications, and pricing. It covers a range of formats such as Beta, VHS, and 8-Track, with a focus on high-quality sound recording and playback. The text includes descriptions of different tape types, such as Ultrachrome and Dynarange, and provides information on their use and benefits. The page also lists prices for various tapes, including models from RKO, RCA, and Sanyo, among others.
Whether you are about to buy your first high-fidelity component or your fifteenth, you need to have all the facts you can get your hands on if you want to insure your complete satisfaction. Yes, the audio field is a complicated one, but Stereo Review has been running a kind of monthly seminar on the subject for almost two decades now, furnishing the kind of basic buying, installation, and operating guidance you can get nowhere else. Today, over 525,000 readers use it monthly as the first, best textbook in their on-going audio educations. If you have come a little late to class, here's your chance to catch up. Any questions you may have about How to Buy, How to Set Up, How to Use, or How to Understand audio equipment are probably answered in one or more of the current reprints listed below. Reprints are $2.00 each. Minimum order $6.00.

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- 40897 GUIDELINES TO SPEAKER SHOPPING 8/69
- 40898 RECORD DEFECTS (Their Causes & Cures) 6/71
- 40900 HOW IMPORTANT IS AUDIO-COMPONENT COMPATIBILITY? 1/74
- 40901 GUIDE TO UPGRADING YOUR COMPONENTS 6/76
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<th>Quan.</th>
<th>Reprint #</th>
<th>Quan.</th>
</tr>
</thead>
</table>

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Residents of CA, CO, DC, FL, IL, MA, MI, MO, NY STATE, UT, and VT add applicable sales tax.
TAPE RECORDING & BUYING GUIDE

New Revox tape with improved maximum output level at low frequencies. For 3% distortion, flux on tape reaches 1200 nWb/m, representing an S/N of 78 dB. Bias adjustment compatible with 621 tape.

**TAPE 5**

**Wide-Latitude Cassettes**
Small-particle highly-polished gamma ferric oxide master recording formulation; high MOL and wide dynamic range; extended frequency response and low noise figure for critical music recording in metal-compatible microcassette recorders.

**MA-R** (Metal Alloy-reference) Cassettes
Metal bias; 70-µsec equalization; housed in standard diecast metal shell and laboratory standard mechanism.

**MA** (Metal Alloy) Cassettes
Metal bias; 70-µsec equalization; housed in precision molded plastic shell housing and laboratory standard mechanism.

**“SA”** (Super Avilyn) Cassettes
Cobalt-ferric formulation; high bias; 70-µsec equalization; high output and wide dynamic range; high MOL and high coercivity for improved sensitivity and extra recording headroom.

**“SA-X”** (Super Avilyn-Extended) Cassettes
Double-coated Super Avilyn-particle tape; high bias; 70-µsec equalization; high output and wide dynamic range; housed in precision metal shell and laboratory standard mechanism.

**“OD”** (Optimum Dynamic) Cassettes
Optima Ferric magnetic particle formulation; for mastering and critical recording needs; normal bias; 120-µsec equalization; high MOL and wide dynamic range; super precision mechanism.

**“AD”** (Acoustic Dynamic) Cassettes
Linear ferric oxide particle formulation for normal bias; 120-µsec equalization; high output and low distortion tape for mastering and all critical recording applications. Back treated for smooth running and stable winding. Available in 35- and 50-micron thicknesses.

**HX** Open-Reel Tape

**LX** Open-Reel Tape
High output level, extended range, low noise, low distortion tape for professional and all critical recording applications. Back treated for smooth running and stable winding. Available in 35- and 50-micron thicknesses.

**ECLIPSE** Microcassettes
Same metal-alloy-particle formulation as standard-size cassettes. Same high-MOL, high-coercivity tape for critical music recording in metal-compatible microcassette recorders.

**MC60B3 Microcassettes**
Same dynamic formulation as standard-size cassettes. Has flat response and low noise figure for speech recording. Packed in threes.

**MC60BS3 Microcassettes**
Same dynamic formulation as standard-size cassettes. Has flat response and low noise figure for speech recording. Packed in threes.

**Microcassettes**

**Video cassette**

**Betamax I, II, and IIIF formats; available in blister pack or standard package.**

<table>
<thead>
<tr>
<th>Betamax</th>
<th>L-125</th>
<th>L-250</th>
<th>L-500</th>
<th>L-750</th>
<th>L-830</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/30/45 min</td>
<td>$10.95</td>
<td>$12.45</td>
<td>$16.95</td>
<td>$20.95</td>
<td>$23.95</td>
</tr>
</tbody>
</table>

**Super Avilyn HG VHS**
High-grade formulation for higher output than standard videocassettes, 3-dB better color S/N level, and improved performance at all speeds, especially in 6-9 hr mode.

<table>
<thead>
<tr>
<th>AD-C60</th>
<th>AD-C90</th>
<th>D-C60</th>
<th>D-C90</th>
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<tbody>
<tr>
<td>60 min</td>
<td>90 min</td>
<td>60 min</td>
<td>90 min</td>
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<tr>
<td>$3.99</td>
<td>$3.99</td>
<td>$4.49</td>
<td>$4.49</td>
</tr>
</tbody>
</table>

**Super Avilyn Beta Videocassettes**
Special formula designed to give crisp, clear picture and brilliant color.

<table>
<thead>
<tr>
<th>AD-C60</th>
<th>AD-C90</th>
<th>D-C60</th>
<th>D-C90</th>
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<tr>
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<tr>
<td>$19.00</td>
<td>$22.00</td>
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<td>$29.00</td>
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</table>

**Videocassette Tapes**

**Super Avilyn VHS Videocassettes**
Super Avilyn VHS videocassettes for home and car decks.

<table>
<thead>
<tr>
<th>AD-C60</th>
<th>AD-C90</th>
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<th>D-C90</th>
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<tbody>
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<td>60 min</td>
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<td>90 min</td>
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<tr>
<td>$3.99</td>
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<td>$4.49</td>
<td>$4.49</td>
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</table>

**Super Avilyn VHS VHS Videocassettes**

<table>
<thead>
<tr>
<th>AD-C60</th>
<th>AD-C90</th>
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<tbody>
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**Super Avilyn Beta Videocassettes**

<table>
<thead>
<tr>
<th>AD-C60</th>
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<tr>
<td>$3.99</td>
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<td>$4.49</td>
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</tbody>
</table>

**SUDER/REVOX**

**621 Magnetic Tape**
Low-noise high-output mastering tape; highly compliant; 3600 ft on silver or black NAB metal reel; packaged in Novodur library box.

<table>
<thead>
<tr>
<th>L-250</th>
<th>L-500</th>
<th>L-750</th>
<th>L-830</th>
</tr>
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<tbody>
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<td>30/60/90 min</td>
<td>120/180 min</td>
<td>180/270 min</td>
<td>200/300 min</td>
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<tr>
<td>$36.00</td>
<td>$36.00</td>
<td>$36.00</td>
<td>$36.00</td>
</tr>
</tbody>
</table>

**631 Magnetic Tape**
New Revox tape with improved maximum output level at low frequencies. For 3% distortion, flux on tape reaches 1200 nWb/m, representing an S/N of 78 dB. Bias adjustment compatible with 621 tape.

**NEED MORE INFORMATION?**
Write directly to the manufacturer or distributor. A list of names and addresses starts on page 4.

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GENERAL ELECTRIC

IVCVR2014W Videocassette Recorder
VHS Six-hour computer-programmable color video cassette recorder. Features electronic memory bank with eight program select buttons with LED indicators, auto start, stop, and channel change, repeat program button, and four sequence indicator lights; built-in digital clock/timer display with memory recall (displays pre-programmed schedule of shows); 1-channel pushbutton electronic tuning for any combination of VHF/UHF channels; three-digit tape counter with memory and program search; 12-function infrared wireless remote control; pause control; standard/long extended-play tape speed selector; special video effect including slow and quick motion, freeze frame, frame advance, tracking control; includes 75-ohm coaxial cable, two 300-ohm headphones, 300-75 ohm transformer, 75/300 ohm antenna converter and 300/75 ohm antenna converters; 13.5 lbs (VCR), 10.4 lbs (tuner); 48.6"H X 11.5"W X 11.9"D $1695

JVC

Vidstar HR-6700U VCR
Programmable six-hour two-speed VHS color video cassette recorder with rotary slant azimuth two-head helical scan system and separate SP and EP video heads. Features microcomputer-controlled programmable timer (allows unattended recording of six programs at specific time and day for any recording time) with LED digital clock/timer/program/recording length displays play auto shut off at end of program, and memory storage of three programs; auto SP EP playback switching freeze frame; low motion speed or normal playback; four-digit tape counter with cue/counter auto search; 12-channel VHF/UHF electronic tuner with digital indicators; edit start control; audio dubbing; freeze frame; slow motion or normal playback, and LED digital clock/timer/program/recording length display. Features include built-in rechargeable battery for 1 hour of recording before recharging, includes 75-ohm coaxial cable, 300-ohm cable, 75/300-ohm matching box, 300/75 ohm antenna adapter, line adapter, battery connection cord, 12" W X 41/2" H X 91/2" D. Tuner: 117" W X 51/2" H X 13" D. $1399

AKAI

VPF-7350 ActiVideo VCR/Tuner-Recorder
Portable two-color video cassette recorder with detachable color TV tuner/adapter/timer. Video recorder: has rotary slant azimuth two-head scan system and NTSC color video signal system; features infrared remote control; still and single-frame advancement; variable speed playback; still and single-frame advance/variable speed playback (still through four times normal speed control); front-panel remote pause control jack; three-digit tape-frame advance, tracking control, LED flashing dew warning, battery warning, and tape motion indicators; video horizontal resolution 240 lines; input 0.5-2 V, 75 ohms unbalanced (video), -65 dB, 600 ohms (mic); output 1 V, 75 ohms unbalanced (video); -- 20 dB, 1000 ohms (audio); S/N 45 dB (video), 40 dB (audio); audio frequency response 50-10000 Hz. Supplied with remote control unit with 16-ft cord, videocassette, dustcover, channel number film, antenna cable, two matching transformers, and power cord; 51/2"W X 18 1/2"H X 13"D...$1350

VF-C509U Electronic Viewerfinder
Electronic viewerfinder with black-and-white screen and monitoring capability; attaches to right side of camera and can be positioned at 180-degree angle; 1.5-in high-definition picture tube, 6"X"H X 2 1/8"W X 4"D...$110

HR-2200U Videocassette Recorder
Portable VCR microprocessor that provides full logic control over tape operations and solenoid-operated pushbuttons for the transport. Features ESC (Electronic Start Control) that automatically aligns start of segment being recorded with end of previous recorded segment; Shuttle Search (X 10) in forward and reverse; slow-motion playback (variable from 1/4 to 1/100 normal speed); freeze capability; single-frame advance; quartz-controlled brushless direct-drive drum motor; servo-controlled cap-
**Video Cassette Recorders**

**SC-P2U. Shoulder cart for HR-2200... $160**

**AP-P2U. Car battery cord for HR-2200... $13**

**Video Cameras**

**GX-88U Color Camera**

- Color video/2nd camera features 1/4" CRT electronic viewfinder; TTL (through-the-lens) viewfinder; 1-hr recording with NT-891 rechargeable battery pack; 6X power-zoom lens that can be controlled manually or via 2 zoom buttons; close-up and wide-angle shooting as near as 4.3 ft; macro capability; built-in color-conversion filter; automatic iris control; shoulder-rest attachment; jacks for earphone and microphone; accessory shoe for flash or lighting device. Power consumption 5.8 W when used with HR-2200 and HR-760U VRs. 11/4" x 5/8" x 1/4"W; 14.7 lb. $1050

**GX-86U Color Camera**

- Vidstar color/monochrome camera with 8 x zoom lens. Features 5" color vidicon with built-in color-stripe filter; 2:1 interlace capability; NTSC frequency (3.58 MHz) multiplex color system; automatic iris control; through-the-lens (TTL) optical viewfinder; under- and over-exposure indicators in viewfinder; three-position switch for adjusting white balance; condenser microphone with wind-screen; 10-ft cable. Scanning system 525 lines; 2:1 interfaced NTSC output; viewfinder TTL optical with split-image focusing and dioptr adjustment; low light level sensitivity 1250 lux; low light level sensitivity 1.6 lux; electronic focus; S/N ratio 45 dB; minimum illumination 100 lux; X: 4.7" x 3.9" W; without handgrip; 2.6 lb. $650

**GS-100AU B&W Camera**

- Black-and-white camera with 2.1 zoom lens; TTL optical viewfinder; built-in microphone; F-stop adjustment; automatic flash; 3.5" hand grip; 16"2"W x 93'4"D X 4 v2"H; 10 lb. $1349

**MITSUBISHI**

**HS-3000 Video Cassette Recorder**

Programmable six-hour two-speed VHS color video cassette recorder with five computer-controlled direct-drive motors. Features programmable timer (recording up to six hours over one-week period) with LED digital 24-hour clock/timer readout; freeze frame and single frame advance in EP mode (6 hr tape); slow motion in EP mode with 1/5 and 1/8-speed selector buttons; picture search in forward or reverse (EP mode); electronic touch tuning; electronic tape function controls; audio dubbing; three-digit tape counter with memory; auto rewind; TV/VTR switch; camera/TV input; optional 15-function wireless remote control available. Video horizontal resolution 240 lines (SP), 220 lines (EP); input 0.5-2.0 V p-p/75 ohms unbalanced (video), 20 dB/50 ohms unbalanced (line) +65 dB/10k ohms unbalanced (mic); audio frequency response -10 dB 50-10,000 Hz (SP), to 7000 Hz (EP); S/N ratio 45 dB; video output 150 ohm UHF; audio output 300 ohm UHF connector cable, and dust cover; 8 lb 1/4" x 19" W x 13"D... $1350 Remote control unit for HS-3000... $100

**PHILCO/GTE**

**V1011 Videocassette Recorder**

Table-model VHS-formatted video cassette recorder with 2-knob vhf/uhf tuner; Features electronic functions; limited on-only timer, wired remote-control pause switch; TV/VTR switch; camera/TV input; optional 15-function wireless remote control available. Video horizontal resolution 240 lines (SP), 220 lines (EP); input 0.5-2.0 V p-p/75 ohms unbalanced (video), 20 dB/50 ohms unbalanced (line) +65 dB/10k ohms unbalanced (mic); audio frequency response -10 dB 50-10,000 Hz (SP), to 7000 Hz (EP); S/N ratio 45 dB; video output 150 ohm UHF; audio output 300 ohm UHF connector cable, and dust cover; 8 lb 1/4" x 19" W x 13"D... $1350 Remote control unit for HS-3000... $100

**V1441 Videocassette Recorder**

Table-model VHS-formatted video cassette recorder with 24 hour timer. Features all-electronic functions; scan 4/6 hr; 6-hour record capability; wired remote control; TV/VTR switch; camera/TV input; Video output: VHS videotape; 75/300-ohm balanced antenna connectors. Comes with T-60 videocassette and wired 4-mode remote controller. 15" W x 14" D x 5/8"H; 26.5 lb... $1495

**V1551 Videocassette Recorder**

Table-model VHS-formatted video cassette recorder with 14-day timer. Features all-electronic operation; scan 4/6 hr; 6-hour record capability; rechargeable still; wired remote still/record-change/scan/mid and super band controller; 75/300-ohm balun antenna connectors. Comes with T-80 videocassette and 4-mode remote controller. 19"2" W x 5/8"H; 26 lb... $1190

**V1720 Videocassette Recorder**

Two-piece portable VHS-formatted video cassette recorder with 24-hour timer. Features all-electronic operation; scan 6 hr; still 6 hr; frame advance 6 hr; wired still/frame advance/scan remote controller; 75/300-ohm balun antenna connectors; earphone, shoulder strap, battery: connectors for ac adapter, microphone plug, and battery cable. Comes with T-80 videocassette and wired remote controller. VCR deck 12" W x 9/4" D x 4 1/4"H; 14 lb. Timer 11 1/2" W x 9/4" D x 4 1/4"H; 10 lb... $1349

**VCA105 Color Camera**

Color video/audio camera with 2-speed 6.1 power-zoom lens. Features side-mounted electronic viewfinder; automatic/manual iris; automatic white balance control; 1:1.6 lens with macro capability; tally lamp; fade in/out; 6-dB sensitivity switch; hand grip; shoulder rest; viewfinder extension cable; 16 1/2" W x 6 1/2" D x 8 1/2"H; 8.75 lb... $995

**QUASAR**

**VH5610 Videocassette Recorder**

6 hr tape-mode video cassette recorder with 105-channel vhf/uhf tuning capability. Features 13-
VHS501 Videocassette Recorder
VHS-format videocassette recorder with mechani-
cal tuner. Features synchro-touch controls and 1-
program/24-hour programmable timer

Color Cameras

VK731. Color-video/sound camera with 2-speed
motor; camera mount 14" X 20

VFT450 SelectaVision VCR
Six-hour, three-speed portable VHS VCR with di-
rect-drive capstan and head-wheel motors; pow-
ered by built-in battery for 11/2 hrs recording time,
cigarette lighter socket with optional dc power
cord, or ac power line. Includes microprocessor-
trolled timer module that can be pro-
grammed to record up to 5 different programs on
different channels over 7-day period. Features
soft-touch controls; automatic recording; three-
digit tape counter with memory; easy battery
monitoring; power saver that switches recorder au-
tomatically to standby after 5 min power-off; air-damped
cassette ipen/ WINDOW; track translation control. Tune/r tape
module features LED digital timer/clock display;
electronic touch button for channels 2-83;
built-in ac powered battery and battery charger.
VCR output 1.0 V p-p ± 0.2 V, input 1.0 V p-p ± 0.5 V; r-f
output level 1.5 3 mV. Module output 1 V p-p ±
0.5 V. VCR measures 11x"D X 10"W X 4"H, weighs 15 lb.

VFC450 SelectaVision VCR
Programmable six-hour three-speed VHS color
video cassette recorder with direct-drive capstan and
headwheel motors and two-head helical scan sys-
tem. Features microprocessor-controlled electronic
tuner (programmed up to eight different pro-
grams on different channels over 2-week period) with
LED digital timer/clock readout; picture
search (9X normal speed) in forward or
rewind (LP or SP modes); electronic touch button
VHF/UHF channels 14-82; can be pro-
grammed for up to 35 CATV channels; auto-
tape rewind in all modes except timer; four-digit tape
counter with memory; track control; soft-touch
electronic tape transport controls; audio dubbing;
avt VFC/VCR switch; dew moisture control. In-
cludes remote control playback/pause/cue/picture
search control with 20-ft cord and three-head
videocassette; 5x"H X 18"W X 14"D. $1000

VCR4200 Videocassette Recorder
Beta-format table-model VCR with 3-day program-
mabile recording capability and remote
control. Features 3-motor quartz-locked tape
drive; fluorescent display that gives time of
day when VCR is not being programmed; advanced
noise-cancellation circuitry; miniaturized all-electron-
ic Varactor tuner; 12-channel selector buttons for
any combination of vhf and uhf stations; LED
tuned-channel display; automatic rewind at conclu-
sion of automatic recording; sleep switch; 1-touch
operation; auto rewind at end of tape; four-digit tape
counter with memory; includes six-function
remote control (pause, picture search, special ef-
fects, channel change); touch-button electronic
tuner with memory switch; soft-touch transport controls;
14-
day electronic program/24-hour timer module that can
be programmed for up to 35 CATV channels; auto tape

VFT450 SelectaVision VCR
Six-hour, three-speed portable VHS VCR with di-
rect-drive capstan and head-wheel motors; pow-
ered by built-in battery for 11/2 hrs recording time,
omnidirectional microphone; LED record indicator; detachable pistol grip; remote stop/start trigger switch; standard video and audio connectors; ac adapter and 20-ft cable. Scanning system EIA standard; imaging system 2/3" separate mesh vidicon; horizontal resolution 600 lines; scene brightness 1:10,000 FC with automatic compensation; video S/N ratio 42 dB; power consumption 7 W at 117 V ac, 60 Hz; 17.9" X 5.9" X 2.5" W; 2 lb. $200

14743" D $1350

PC-180U. Similar to PC-180U color camera except has 3.6X 14.5-52-mm f/1.8 manual zoom lens, no rear microphone. $795

5360 Portable VCR
Portable 4-head Beta-format videocassette recorder with 5-hr Beta II/III record capability, 91-channel VHF/UHF tuner, and 8-program/14-day programmable timer. Features micro-touch controls; soft eject; automatic input selector; tuning LED; 1-programmatic input selector; tuning LED; audio and video outputs; audio dub; 2-speed BetaScan; time on/off preset; fluorescent timer display; LED-type channel display, includes wired 11-function remote-control unit for BetaScan forward/reverse at 5X normal speed; slow-motion playback at 1/20 new speed; frame-by-frame advance; pause/still functions. Power consumption 13.2 W at 117 V ac; 10.9" X 10.4" X 4.5" H. $1195

VC-2250 2-Hour Portable Videocassette Recorder
One-piece ac/dc home portable VHS videocassette recorder with built-in timer/tuner and self-contained ac pack power. Features visual search at 5X normal speed forward; still-frame stop actions; tape counter; tape remaining LED indicator; four-digit illuminated channel indicators, and switchable VHF/UHF tuner with 12-position tuner/timer; MPU-controlled solenoid soft-touch transport; 2-hour record/play capability on battery; conventional 10-pin camera jack; built-in carrying handle and shoulder strap included; audio dubbing; 3-digit tape counter; dew warning light; dew prevention heater. Video signal system EIA standard, NTSC color; tape speed 1.31 ips; record/play time 120 min with T-120 tape; rewind/fast-forward time less than 5 minutes with T-120 tape; output channel 3 or 4; 75 -ohm balanced, 1023'32" D X 813/1,5" H X 311/1,8" V; 19.8 lb. with tape. $1000

VQ-3200. Optional rechargeable battery pack for VC-2250 VCR. $43

SL-5800 Video Cassette Recorder
Five-hour programmable Betamax color video cassette recorder with double-zimuth video head. Features built-in programmable timer (preset recording of four programs over two-week period) with LED digital clock/timer readout; variable BetaxScan (searches in forward or reverse from 5:20 times normal speed with remote commander control unit); 3X normal speed; VTR/TB switch; 8-hour, 8-hour record/play, variable slow motion, freeze-frame, frame-by-frame viewing, and cue/watch in fast forward and rewind. $1400

AG-300 BetaStack. Programmable videocassette autochanger providing up to 20 hrs of recording time on battery; tape transport time of four different programs on different channels over two-week period, each on separate cassettes. approx. $350

SL-5600 Video Cassette Recorder
Programmable Betamax color video cassette recorder features built-in programmer (preset recording of five hours of programs automatically over two-week period or recording of four different programs on different stations at various times) with LED digital timer/clock display and memory back-up system (automatically advances clock and keeps programming instructions for 10 minutes during power outage); BetaScan (searches in forward or reverse up to 13X normal speed); tab-marker electronic signal on beginning of each recorded program on tape) with memory; 14 push-button VHF/UHF tuning; logic-controlled transport controls; audio dubbing; VTR/TB/T1 switch; 8-hour, 8-hour record/play, variable slow motion, freeze-frame, frame-by-frame viewing, and cue/watch in fast forward and rewind. $1400

VC-7400 Videocassette Recorder
Front-loading programmable six-hour two-speed VHS color video cassette recorder programs one show over 24-hour period. Features built-in clock/timer with LED digital readout; built-in electronic VHF/UHF tuner with 12-pushbutton electronic tuning, illuminated channel indicators, and switchable automatic fine tuning; soft-touch solenoid function controls; tape remaining LED indicator, four-digit tape counter; one-touch recording; includes built-in 24-hour one event programmable timer; vertical front-loaded air-damped cassette system; built-in VHF/UHF 12-position tuner/timer; MPU-controlled solenoid soft-touch transport; 2-hour record/play capability on battery; conventional 10-pin camera jack; built-in carrying handle and shoulder strap included; audio dubbing; 3-digit tape counter; dew warning light; dew prevention heater. Video signal system EIA standard, NTSC color; tape speed 1.31 ips; record/play time 120 min with T-120 tape; rewind/fast-forward time less than 5 minutes with T-120 tape; output channel 3 or 4; 75 -ohm balanced, 1023'32" D X 813/1,5" H X 311/1,8" V; 19.8 lb. with tape. $1000

BT-3200. Optional rechargeable battery pack for VC-2250 VCR. $43

VC-7400 Videocassette Recorder
Front-loading programmable six-hour two-speed VHS color video cassette recorder programs one show over 24-hour period. Features built-in clock/timer with LED digital readout; built-in electronic VHF/UHF tuner with 12-pushbutton electronic tuning, illuminated channel indicators, and switchable automatic fine tuning; soft-touch solenoid function controls; tape remaining LED indicator, four-digit tape counter; one-touch recording; includes built-in 24-hour one event programmable timer; vertical front-loaded air-damped cassette system; built-in VHF/UHF 12-position tuner/timer; MPU-controlled solenoid soft-touch transport; 2-hour record/play capability on battery; conventional 10-pin camera jack; built-in carrying handle and shoulder strap included; audio dubbing; 3-digit tape counter; dew warning light; dew prevention heater. Video signal system EIA standard, NTSC color; tape speed 1.31 ips; record/play time 120 min with T-120 tape; rewind/fast-forward time less than 5 minutes with T-120 tape; output channel 3 or 4; 75 -ohm balanced, 1023'32" D X 813/1,5" H X 311/1,8" V; 19.8 lb. with tape. $1000

BT-3200. Optional rechargeable battery pack for VC-2250 VCR. $43

VC-7400 Videocassette Recorder
Front-loading programmable six-hour two-speed VHS color video cassette recorder programs one show over 24-hour period. Features built-in clock/timer with LED digital readout; built-in electronic VHF/UHF tuner with 12-pushbutton electronic tuning, illuminated channel indicators, and switchable automatic fine tuning; soft-touch solenoid function controls; tape remaining LED indicator, four-digit tape counter; one-touch recording; includes built-in 24-hour one event programmable timer; vertical front-loaded air-damped cassette system; built-in VHF/UHF 12-position tuner/timer; MPU-controlled solenoid soft-touch transport; 2-hour record/play capability on battery; conventional 10-pin camera jack; built-in carrying handle and shoulder strap included; audio dubbing; 3-digit tape counter; dew warning light; dew prevention heater. Video signal system EIA standard, NTSC color; tape speed 1.31 ips; record/play time 120 min with T-120 tape; rewind/fast-forward time less than 5 minutes with T-120 tape; output channel 3 or 4; 75 -ohm balanced, 1023'32" D X 813/1,5" H X 311/1,8" V; 19.8 lb. with tape. $1000

BT-3200. Optional rechargeable battery pack for VC-2250 VCR. $43
SL-3000 Portable VCR
Protatable one-hour Betamax color video cassette recorder with rotary two-head helical scanning system and EIA standard NTSC color video signal system. Features one-button recording; audio dubbing; cue function; pause control; logic-controlled tape functions; dew sensor; battery indicator; three-way power supply (ac, dc, or battery operation); four-digit; S/N 45 dB; input 1.0 V p-p, 75 ohms unbalanced; output 1.0 V p-p, 75 ohms; resolution 240 lines; Audio; S/N 45 dB; frequency response 50-7000 Hz. Includes 26 dB earphone, antenna switch and 2-m cable, and shoulder strap. 8.5 kg with tape and battery; 127 mm H X 296 mm W X 345 mm D.$1300

TT-3000. Tuner-timer for SL-3000; features built-in clock, seven-day timer override of auto focusing; electronic viewfinder and auto iris; built-in microphone; \( \pi \) \( \psi \) univicon-2 vidicon tube; magnesium body. $1395
IK 185AFS. Same as IK 1850AF but with high-performance external microphone. $1433
IK 1850. Same as IK 1850AF but with built-in zoom lens instead of auto-focus lens. $1450

SL-5400 Video Cassette Recorder
Five-hour Betamax color video cassette recorder with direct-drive dc head and servo capstan motor in rotary two-head helical scan system and NTSC color video signal. Features BetaScan system for instant forward/reverse search and scan; built-in clock, seven-day timer; fourteen-function pushbutton tuning; four-digit programmable recording capability with access to 14 VHF/12 UHF channels; three-hour recording capacity, express tuning, and auto shut-off and fine tuning; 16 lbs, 9 oz.

$500

Color Cameras
For Betamax video cassette recorders.
HVC-2000. Video camera with Canon 6:1 motor-driven zoom and macro-lenses, electronic viewfinder with 1.5-in picture tube, automatic fade-in/out, and remote control capability. $800

HVC-2010. Video camera with 2:1 two-position lens (normal and telephoto settings) and direct optical viewfinder. $600

HVC-2100. Color video camera with built-in record-review function that automatically rewinds the last 2 seconds of the recorded tape in certain Sony VCRs to eliminate “jump cuts.” Features electronic viewfinder and a selector that allows the viewer to review exactly what the camera lens sees; new timing phase circuit that assures clean picture without noise or distortion. $1300

TOSHIBA
V-9035 Beta Videocassette Recorder
5-hour portable VCR. Features dual-speed recording for up to 5 hours recording time; quad track-4 head for super, still, variable slow motion forward and reverse; frame-by-frame slow motion with no electronic noise; programmability for up to 8 programs over a 2-week period; touch reference scoliod logic controls; wired remote control; Compu-R-Tune electronic tuning; visual cue and review page function; and 2 X scan and 2 X scan. 

$1545

V8500 Video Cassette Recorder
Programmable 5-hour Beta-form VCR. Features dual-speed recording; quad track-4 head for super still, variable slow motion, frame-by-frame slow motion with no electronic noise; programmability for eight programs over a two-week period; scoliod logic controls; audio dubbing; wired remote control; Comput-R-Tune electronic touch tuning; visual cue and review; put on search with Beta scan; super scan; 2 X scanning. $1495

VBO35 Portable VCR
Two-speed portable Beta-format VCR offers up to 5 hours of recording time. Features visual cue and review Betach scan; touch reference control; audio dubbing; remote pause; memory counter; direct hookup for Toshiba color cameras; tuner/timer with charge function and programmable one program per day. $1345

Color Cameras
IK 1850AF. Portable auto-focus color video camera with F/1.4 zoom lens with a range of 11-70 mm; remote override of auto focusing; electronic viewfinder and auto iris; built-in microphone; \( \pi \) \( \psi \) univicon-2 vidicon tube; magnesium body. $1395
IK 185AFS. Same as IK 1850AF but with high-performance external microphone. $1433
IK 1850. Same as IK 1850AF but with built-in zoom lens instead of auto-focus lens. $1450

VBR750J Video Director VCR
Beta-format videocassette recorder offers noise-free and jiter-free frame and variable-speed slow motion. An extra tape head repeats half of the picture image to eliminate jitter. Features speed search in forward and reverse at 10X normal speed; pause/stop action (still frame); two speeds to provide up to five hours of recording and playing time; audio dub; electronic timer that can be set to record up to four programs on four different channels over a 14-day period; daily or weekly repeat; automatic rewind at end of tape; frame-by-frame advance. Remote Video Action control. $1350

Video Cameras
KC1250. Color video camera with 25-mm “C” mount lens, optical pop-up viewfinder, and built-in electromicrophone; includes power supply adaptor. $1395

KC1000. Color video camera with 25-mm “C” mount lens, optical pop-up viewfinder, and built-in electromicrophone; includes power supply adaptor. $995

VC1600. Color video/sound camera with combined zoom lens (f/1.4, 11-70 mm f) and macro lens; automatic/manual iris control; \( \pi \) \( \psi \) single color tube; signal system EIA standards, NTSC color, maximum illumination 40 lux (4 ft) at f/1.4; automatic light control range 40-100,000 lux (4-10,000 ft); K-type 14-pin VCR connector; mini-jack microphone input suitable for low-impedance microphones (–60 dB); electronic viewfinder (supplied) with 1/2” monochrome picture tube; power requirements 12 V dc at 8.3 W for both camera and viewfinder (supplied from portable VCR or optional ac adapter); 13/8”D X 8”W X 7/8”H, including zoom lens, viewfinder, and grip. $1150

NEED MORE INFORMATION?
Write directly to the manufacturer or distributor. A list of names and addresses starts on page 4.
ALPINE

7308 AM/FM-Stereo Receiver/Cassette Player
In-dash unit combines AM/FM stereo FM radio with digital PLL, frequency synthesizer, tuner, metal-compatible stereo cassette deck with Dolby noise-reduction system and hard permalloy head, and LED digital frequency/tape counter readout with tape memory and clear buttons; designed to fit most domestic and imported cars; hooks up with company's components through DIN jack. Cassette deck features music sensor system (scans tape for beginning of desired selection); cassette glide electronic lock-insertion of cassette and electronic glide eject (hands tape to listener outside window); FeCr/CrO2/metal tape selector; locking fast forward and rewind; auto eject at end of tape and fast forward; auto replay at end of rewind. Radio features electronic feathertouch five-station AM/FM memory preset with auto scan and seek, scan sense, FM tuner, and noise-eliminator switches; built-in muting; sliding bass, treble, balance, and four-way fader controls; output 8 watts per channel continuous. 2" H X 7.75" W X 6.4" D. $800

7138 AM/FM-Stereo Receiver/Cassette Player
In-dash unit with PLL frequency synthesizer, digital tuned-frequency display, 10-station preset capability, and auto-reverse cassette deck. Features SCC tape head; auto reverse at end of play, fast forward, or rewind; ignition-key-off eject; metal/stereo dual-function switch; balance control; local/distant switch; preamp fader control; Tone Tenor control; automatic loudness adjustment; Dolby noise-reduction system; built-in engine noise suppressor; locking fast forward/rewind; power antenna lead; tape-direction indicators. Amplifier output 6 watts at 1 kHz, 6% THD; speaker impedance 4 ohms. Wow and flutter 0.1% w rms; frequency response ±3 dB 40-16,000 Hz metal, FeCr, and CrO2 to 13 kHz normal tape; S/N ratio 65 dB Dolby on, 55 dB Dolby off; separation 40 dB FM usable sensitivity 16.3 dB, alternate-channel selectivity 80 dB, S/N ratio 70 dB Dolby on, 60 dB Dolby off; capture ratio 2 dB; 61/4" W X 5 1/2" D X 21/4" H. $450

7307 Preamp/Tuner/Cassette Player
In-dash AM/FM stereo FM tuner/preamp/stereo cassette deck. Cassette deck features Dolby noise-reduction system, CrO2/FeCr selector button; ignition-key-off and cassette glide eject; auto replay at end of rewind; auto eject at end of play; fast forward; and auto suppressor in fast forward; wow and flutter 0.09%; tape frequency response 40-16,000 Hz; S/N ratio 65 dB (Dolby on). Radio features Tone Tenor control; automatic loudness adjust; built-in engine noise suppressor; local/distant switch; digital clock; manual up/down tuning; lock fast forward/rewind; Dolby noise-reduction system; tape-direction indicators; program switch; power antenna lead. Amplifier output 6 watts at 1 kHz, 6% THD; speaker impedance 4 ohms. Wow and flutter 0.1% w rms; frequency response ±3 dB 40-16,000 Hz metal; FeCr, CrO2, and to 13 kHz normal tape; S/N ratio 65 dB Dolby on, 55 dB Dolby off; separation 40 dB FM usable sensitivity 16.3 dB, alternate-channel selectivity 80 dB, capture ratio 2 dB; 7" W X 5 1/2" D X 2 1/4" H. $350

7202 AM/FM-Stereo Receiver/Cassette Player
In-dash unit with Dolby noise-reduction system. Features electronic glide cassette eject; automatic replay at end of rewind; auto eject at end of play/fast forward; separate bass and treble controls; mute switch; loudness contour. Amplifier output 8 watts continuous; speaker impedance 4 ohms. Wow and flutter 0.13% w rms; frequency response 40-12,000 Hz; S/N ratio 65 dB Dolby on; FM usable sensitivity 1.4 µV; S/N ratio 72 dB Dolby on; capture ratio 1.5 dB. $330

7201. Similar to 7202 but without Dolby noise-reduction and four-way variable fader/balance control... $260

7123 AM/FM-Stereo Receiver/Cassette Player
In-dash unit combines AM/FM stereo FM radio and metal-compatible stereo cassette deck with Dolby noise-reduction system and hard permalloy head. Cassette deck features music sensor system (scans for desired tape selection on tape); cassette glide lock-in and electronic glide eject system; FeCr/CrO2/metal tape selector; locking fast forward and rewind; auto eject at end of play and fast forward; auto replay at end of rewind. Radio features five-station memory preset; separate bass and treble controls; muting; auto local/distant switch; built-in afc; balance control; 6 W ch continuous; preamp fader capability through DIN jack; 21/2" H X 7 1/4" W X 5 3/4" D. $330

7128 AM/FM-Stereo Receiver/Cassette Player
In-dash unit combines AM/FM stereo FM radio with PLL, digital frequency synthesizer tuner, metal-compatible stereo cassette deck with hard permalloy head, and LED digital clock/station frequency display. Cassette features cassette glide lock-in insert, auto reverse at end of play, fast forward, or rewind; metal/chrome/ferro bias switch; locking fast forward and rewind; wow and flutter 0.1% w rms; frequency response 40-15,000 Hz ±3 dB (all tapes); S/N 50 dB. Radio features five-station AM/FM preset with memory; auto local/distant; built-in afc; manual up/down tuning (200-Hz increments on FM, 10-kHz on AM); adjustable Tone Tenor control (+10 dB at 10,000 Hz); max output 2.2 W/ch continuous into 4 ohms from 70-20,000 Hz with 0.8% THD; FM usable sensitivity 2.2 µV/75 ohms, selectivity 50 dB, and S/N 65 dB; accepts variety of 3000 Series components through DIN jack connection; 21/2" H X 7 1/4" W X 5 3/4" D. $300

7327 AM/FM-Stereo Tuner/Cassette Player
In-dash unit combines AM/FM stereo tuner/preamp and metal-compatible stereo cassette deck with Dolby noise-reduction system and sensor head designed to fit X-body cars. Cassette deck features automatic music sensor (scans to next selection in fast forward, replays same song in rewind); metal/chrome/ferro bias switch; auto-cassette glide lock-in insert mechanism; auto eject at end of play and fast forward; key-off eject; locking fast forward and rewind; LED tape indicator; wow and flutter 0.06% w rms; frequency response 40-18,000 Hz ±3 dB with metal; S/N 65 dB without Dolby. Tuner features separate bass and treble controls, feathertouch loudness, mute, and AM/FM switches, auto local distant, built-in afc, and LED stereo indicator; FM usable sensitivity 1.8 µV/75
7121 AM/FM-Stereo Receiver/ Cassette Player
In-dash unit incorporates AM-stereo FM radio and metal-compatible stereo cassette deck with Dolby noise-reduction system and hard permalloy head; can add any of company's 3000 Series components through DIN jack connector. Cassette deck features auto reverse at end-of-play, fast forward, and rewind; bias switch for metal, chrome, and tape; auto cassette glide lock-in insert system; fast forward and rewind; tape direction indicators; key-off eject; wow and flutter 0.1% rms; frequency response 40-15,000 Hz ±3 dB with metal; S/N 65 dB with Dolby. Radio features pushbutton loudness, stereo, mute, and AM/FM; auto local/distinct switch; adjustable Tone Tenor (± 10 dB at 10,000 Hz); built-in a/fc; FM S/N 62 dB; auto antenna and preamp output. $300

7120. Similar to 7121 without cassette Dolby noise-reduction system and key-off eject; tape S/N 55 dB. $270

7100 AM/FM-Stereo Tuner/ Cassette Player
In-dash AM/FM stereo radio and cassette player with cassette glide, locking fast forward and rewind, and auto stop at end of play or fast forward; radio has five-station preset, local/distinct switch, and tone control; wow and flutter 0.099%; tape S/N 55 dB; FM sensitivity 1.6 µV; FM selectivity 70 dB; FM S/N 62 dB; auto a/fc and preamp output. $200

5400 Cassette Player/Power Amplifier/Equalizer
Under-dash system with auto-reverse cassette deck and power amplifier/ crossover; includes 5-band graphic equalizer, and Dolby noise-reduction system. Features 12-b, 5-band graphic equalizer with slider controls, SCA tape head; locking fast forward/rewind; metal-CrO2 switch; output power level indicators; Automatic Cassette Glide (automatically loads cassette into transport); auto reverse at end of play, fast forward, and rewind; ignition-key-off eject; loudness controls; noise-reduction system; program counter; four-way balance control; volume control-detent. Amplifier output 8 W/channel at 0.1% THD; frequency response 40-20,000 Hz; EQ center frequencies 60, 250, 1k, 2.5k, 8k; EQ settings can be adjusted; frequency response ±3 dB 10-12,000 Hz normal, to 16 kHz metal, FeCr, and CrO2 tape; S/N ratio 65 dB Dolby on, 55 dB Dolby off; separation 40 dB; 6"W X 5"H X 2"D. $300

IM-SPC AM/FM-Stereo Receiver/ Cassette Player
Pushbutton control AM/FM-Stereo radio with auto-reverse cassette deck and built-in power amplifier. Features DIN-specified size for imported cars; Audiolok FM tuning circuit; locking fast forward/rewind; pushbutton eject; FM muting; separate bass and treble controls. $350

AVX-680 AM/FM-Stereo Receiver/ Cassette Player
In-dash unit incorporates AM-stereo FM radio, stereo cassette player with Dolby noise-reduction system, and built-in 40-W power amplifier. Features locking fast-forward/rewind, auto/manual cassette eject, bass, treble, tone, local/distinct, four-way balance, and output power booster on/off controls and LED tape and stereo FM indicators. $320

IM-CXP AM/FM-Cassette Deck
In-dash DIN-specified pushbutton AM-stereo FM radio with new Audiolok FM tuner and cassette player. Unit features locking fast forward and rewind, stereo/mono, and four-way balancing. $290

AVX-605 AM/FM-Stereo Receiver/ Cassette Player/Equalizer
In-dash unit combines AM-stereo FM radio with new Audiolok FM tuner and stereo cassette deck with five-band graphic equalizer. Cassette features locking fast forward/rewind; 2"W X 7"H X 5.25"D. $230

AVX-605 AM/FM-Stereo Receiver/ Cassette Player
Digital AM/FM-stereo radio with quartz lock and AM/FM and local/distant switches; cassette player designed for import X-body, Citation, and other cars, including X-body models; no built-in a/fc; 2"H X 6.25"W X 4.5"D. $230

AVX-605 AM/FM-Stereo Receiver/ Cassette Player
In-dash unit combines AM-stereo FM radio and stereo cassette deck designed for imported X-body, Citation, and extended range tone controls and low-distortion preamp output jacks; output 6 W/ch continuous into 4 ohms. $240

HCC-006 AM/FM-Stereo Radio/ Cassette Player
In-dash unit combines AM-stereo FM radio and stereo cassette deck; designed for import, X-body, Citation, and other cars, including X-body models; no built-in a/fc; 2"H X 6.25"W X 4.5"D. $164

Hi-COMP Line
HCM-003 AM/FM-Stereo Radio/Cassette Player
In-dash DIN specification AM-stereo FM radio and auto reverse, metal-compatible cassette deck with Dolby noise-reduction system. Unit features locking fast forward/rewind; auto/manual cassette eject, bass, treble, tone, local/distinct, four-way balance, and separate bass and treble controls. $390

HCM-565 AM/FM-Stereo Radio/ Cassette Player
In-dash unit specification AM-stereo FM radio and auto reverse cassette deck features locking fast forward/rewind, auto/manual cassette eject, bass, treble, tone, local/distinct, four-way balance, and separate bass and treble controls. $370

HCC-1200 AM/FM-Stereo Radio/ Cassette Player
In-dash unit combines AM-stereo FM radio, stereo cassette deck, and LED digital quartz clock/radio frequency display with dimmer. Cassette deck features sliding fast forward/rewind control; radio features 12-station pushbutton preset with memory, auto station seek control, four-way balance control, mono/stereo, local/distinct, and AM/FM controls, and preamp output jacks; frequency response 50-12,000 Hz; speaker impedance 4 ohms. $690

BLAUPUNKT
"Berlin" 8000 AM/FM Stereo/ Cassette Player
In-dash unit incorporates AM-FM stereo radio receiver, stereo cassette deck, and LED digital quartz clock/radio frequency display with dimmer. Cassette deck features sliding fast forward/rewind control; radio features 12-station pushbutton preset with memory, auto station seek control, four-way balance control, mono/stereo, local/distinct, and AM/FM controls, and preamp output jacks; frequency response 50-12,000 Hz; speaker impedance 4 ohms. $650
metal-compatible stereo cassette deck and LED digital clock/radio frequency display; requires separate power amplifier. Cassette deck features equalization selector for metal and CrO2 tapes, auto reverse, locking fast forward and rew ind, and pushbutton eject. Programmable tuner features five-station AM/FM pushbutton memory preset with electronic scanning; signal actuated stereo control circuit (SASS); Dolby B circuit (FM and cassette) with button local/distant; separate electronically controlled bass and treble controls; stereo/mono; loudness and program cancel switches; electronic balance control; designed to fit in dash; pushbutton eject; optional hi-power fader; 2"H X 7"W X 5"D. ..................................... $900

PE955A AM/FM-Stereo Radio/ Cassette Player
In-dash unit combines AM-PLL stereo FM tuner, metal-compatible stereo cassette deck, and LED digital clock/radio frequency display; requires separate power amplifier. Cassette deck features super perfomancy heads, equalization selector for metal and CrO2 tapes, auto reverse, locking fast forward and rew ind, and pushbutton eject; wow and flutter 0.13% w rms; radio frequency response 30-15,000 Hz. Tuner features five-station AM/FM pushbutton tuning with seek and scan, Dolby B with LED, pushbutton local/distant, and separate bass and treble controls; 2.75"H X 6"W X 5.5"D. ..................................... $460

PE955B AM/FM-Stereo Radio/ Cassette Player
In-dash unit combines AM-PLL stereo FM radio, stereo cassette deck, and LED digital quartz clock/ frequency display; DIN nosepiece for imported cars. Cassette features auto reverse, locking fast forward and rew ind, separate bass and treble controls; 12 W/ch continuous; front-to-rear fader; left-to-right balance control; FET front end; cassette eject button; stereo indicator light; cassette program change button; Dolby indicator lights, small format chassis fits over 90% of U.S. cars. Tape wow and flutter 0.13% w rms and frequency response 30-15,000 Hz; 2"H X 7"W X 6.25"D. ..................................... $350

PE575C AM/FM-Stereo Receiver/ Cassette Deck
In-dash Hi-Way Fidelity Series high-power AM/FM stereo pushbutton receiver and auto-reverse cassette deck. Features 5 station pushbuttons; adjustable shaft; 10 W output power at less than 1% THD per channel; Dolby noise-reduction system on FM and cassette; Magi-Tune FM; stereo and Dolby indicator lights; Sendust tape heads; local/distant switch; locking fast forward/rew ind; CrO2 equalization switch; bass, treble, left/right balance, front/rear fader controls; tape jamming protection system; DIN connector; 12-Volt power antenna lead; 7"W X 6"D X 2"H; 6 lb. $350

PE683 AM/FM-Stereo Receiver/ Cassette Player
In-dash cassette player with AM/FM-stereo receiver. Features auto-stop at end of play; adjustable shafts; 4 watts rms/channel output power; FET front end; stereo indicator light; end loading; fast forward/rew ind; tone and left/right balance controls; front-to-rear fader; bass-boost circuitry; 7"W X 5"D X 2"H; 4.4 lb. ..................................... $120

PE624A AM/FM-Stereo Receiver/ 8-Track Cartridge Player
In-dash 8-track player with AM/FM-stereo receiver. Features adjustable shafts; FET front end; vertical head tracking; 4-program indicator lights; automatic stereo/mono switching; stereo light; tone and balance controls; local/distant switch; dial-in-door; AM/FM slide switch; amplifier output 4 W rms/channel; 7"W X 5"D X 2"H; 3 lb. ..................................... $120

PE572A AM/FM-Stereo Receiver/ Cassette Player
Deluxe auto-reverse cassette deck with pushbutton-tun e AM/FM stereo receiver. Features 5-button tuning; Magic-Tune, 4 W rms/channel; FET front end; program indicator lights; local/distant; program selector; and CrO2 switches; stereo indicator light; line output; 4-way balance control; locking fast forward/rew ind; eject button; program indicator light; 1.75"H X 1.25"W X 5"D. ..................................... $127

PE768A AM/FM-Stereo Receiver/ Cassette Player
Deluxe auto-reverse cassette deck with pushbutton-tune AM/FM stereo receiver. Features 5-button tuning; Magic-Tune, 4 W rms/channel; FET front end; program indicator lights; local/distant; program selector; and CrO2 switches; stereo indicator light; line output; 4-way balance control; locking fast forward/rew ind; eject button; program indicator light; 1.75"H X 1.25"W X 5"D. ..................................... $273

PE751A AM/FM-Stereo Receiver/ Cassette Player
In-dash unit combines AM-PLL stereo FM radio and stereo cassette deck; DIN nosepiece for imported cars. Cassette features auto reverse, locking fast forward and rew ind, pushbutton eject, and tape direction indicators. Radio features five-station pushbutton tuning; IC circuitry, FET front end; in tuner section, pushbutton AM/FM and local/distant selectors, LED stereo indicator, and power antenna lead; 4 W/ch continuous; 1.75"H X 6"W X 7"D. ..................................... $273

PE751B AM/FM-Stereo Receiver/ Cassette Player
In-dash unit combines AM-PLL stereo FM radio and stereo cassette deck; DIN nosepiece for imported cars. Cassette features auto reverse, locking fast forward and rew ind, pushbutton eject, and tape direction indicators. Radio features five-station pushbutton tuning; IC circuitry, FET front end; in tuner section, pushbutton AM/FM and local/distant selectors, LED stereo indicator, and power antenna lead; 4 W/ch continuous; 1.75"H X 6"W X 7"D. ..................................... $273

CR-3001 AM/FM-Stereo/ Cassette Player
In-dash receiver with frequency-synthesizeded and digitally displayed tuning and metal-compatible autom atic-reversing cassette player with Dolby noise reduction. Features 12 station presets; ASU circuitry to suppress FM noise; switchable EQ for ferric, CrO2 metal tapes. Power output 15 watts/ch.; tape response 63-14,000 Hz; wow and flutter 0.15%; FM sensitivity 2.5 µV. ..................................... $630

CR-2001 AM/FM-Stereo/ Cassette Player
In-dash receiver with five AM/FM pushbutton tun ing presets and auto-reverse deck with Dolby noise-reduction system. Features ASU circuitry to suppress FM noise; switchable loudness contour. Power output 5 watts/ch.; tape response 35- 14,000 Hz; wow and flutter 0.15%; FM sensitivity 1.6 µV. ..................................... $350

CR-5100 AM/FM-Stereo/ Cassette Player
In-dash receiver with digital clock, five AM/FM pre set buttons, and Dolbyized metal-compatible auto matic-reversing cassette deck. Features ASU circuitry to suppress FM noise; switchable EQ for ferric and CrO2 metal tapes; separate bass and treble controls; switchable loudness compensation; local/ distant switch; automatic night illumination of controls. Power output 5 watts/ch.; tape response 40- 14,000 Hz; wow and flutter 0.15%; FM sensitivity 2.5 µV. ..................................... $344

PE840A Stereo Cassette Deck
Under-dash auto-reverse cassette deck with 4 W/ch amplifier. Features tone control; program indicator light; end loading; eject button; end-of-tape stop; tone control; slide-type balance control; 5"W X 5"D X 1.75"H; 3 lb. ..................................... $95

PE838A Stereo Cassette Player
Under-dash auto-reverse cassette player with 4 W/ch amplifier. Features tone control; program in dicator light; end loading; eject button; left/right balance control; locking fast forward/rew ind; 5"W X 5"D X 2"H; 6 lb. ..................................... $130

CR-2000 AM/FM-Stereo/ Cassette Player
In-dash receiver with ASU circuitry to suppress FM noise and automatic-reversing cassette deck. Features locating fast-forward/rew ind; powered cassette eject; variable tone and balance controls; local/ distant switch. Output power 5 watts/ch.; tape frequency response 35-10,000 Hz; wow and flutter 0.15%; FM sensitivity 1.6 µV. ..................................... $275

CLARION

PE955A AM/FM-Stereo Radio/ Cassette Player
In-dash unit combines AM-PLL stereo FM tuner, unique remote control and metal-compatible automatic reversing cassette player and Dolby noise reduction system. Features electronic scan tuning with seven station presets; Sound Ambient Level Sensor (SALS) automatic adjustment of volume relative to ambient noise; ASU circuitry to suppress FM noise Power output 20 watts/ch.; frequency response on tape 30-15,000 Hz ± 3 dB; S/N 56 dB with Dolby on; FM sensitivity 1.5 µV. ..................................... $1395
**PE560A AM/FM-Stereo Receivers**

Cassette Player

- Features Sendust-alloy tape head; metal/CrO₂ tape; separate bass, treble, balance and faders; electronic tuning and tuning presets for up to 5 AM and 7 FM stations; automatic power antenna switching; front-to-rear fader; balance controls; power output 4 W/ch into 4 ohms 100-20,000 Hz at 5% THD; wow and flutter 0.15% rms; FM usable sensitivity 19.9 dBf; FM alternate-channel selectivity 60 dB; capture ratio 1.5 dB.

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**PE554A AM/FM-Stereo Receiver/ Cassette Player**

- Features Sendust-alloy tape head; metal/CrO₂ tape; separate local/distant and stereo/mono switches; automatic power antenna switching; front-to-rear fader; balance controls; power output 4 W/ch into 4 ohms 100-20,000 Hz at 5% THD; wow and flutter 0.15% rms; FM usable sensitivity 19.9 dBf; FM alternate-channel selectivity 60 dB; capture ratio 1.5 dB.

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**PE550A AM/FM-Stereo Receiver/ Cassette Player**

- Features Sendust-alloy tape head; metal/CrO₂ tape; separate local/distant and stereo/mono switches; automatic power antenna switching; front-to-rear fader; balance controls; power output 4 W/ch into 4 ohms 100-20,000 Hz at 5% THD; wow and flutter 0.15% rms; FM usable sensitivity 19.9 dBf; FM alternate-channel selectivity 60 dB; capture ratio 1.5 dB.

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**PE549A AM/FM-Stereo Receiver/ Cassette Player**

- Features Sendust-alloy tape head; metal/CrO₂ tape; separate local/distant and stereo/mono switches; automatic power antenna switching; front-to-rear fader; balance controls; power output 4 W/ch into 4 ohms 100-20,000 Hz at 5% THD; wow and flutter 0.15% rms; FM usable sensitivity 19.9 dBf; FM alternate-channel selectivity 60 dB; capture ratio 1.5 dB.

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**T641 AM/FM-Stereo Receiver/ Cassette Player**

- In-dash unit with 5 preset tuning pushbuttons; auto-reverse tape deck; power-off eject; features separate bass and treble and faders; Loudness control; power output 4 W/ch into 4 ohms 100-20,000 Hz at 1% THD; wow and flutter 0.15% rms; FM usable sensitivity 18.8 dBf; FM alternate-channel selectivity 65 dB; capture ratio 2.0 dB...

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**T640 AM/FM-Stereo Receiver/ Cassette Player**

- In-dash system with auto-reverse tape deck, preset tuning, and auto-reverse pushbutton. Features locking fast forward/rewind; separate bass and treble and faders; separate local/distant and stereo/mono switches; power-off eject; frequency response 40-14,000 Hz ±3 dB; S/N ratio 50 dB.

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**T617 AM/FM-Stereo Receiver/ Cassette Player**

- In-dash player with auto-reverse tape deck, precision power loading for cassettes, and reverse pushbutton. Features locking fast forward/rewind; separate bass and treble and faders; separate local/distant and stereo/mono switches; power-off eject; frequency response 40-14,000 Hz ±3 dB; S/N ratio 50 dB.

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**T610 AM/FM-Stereo Receiver/ Cassette Player**

- Similar to T617 except no reversing tape deck; FM usable sensitivity 20.8 dBf; FM alternate-channel selectivity 60 dB; capture ratio 0.12 ms.

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**T600 AM/FM-Stereo Receiver/ Cassette Player**

- In-dash receiver/player with five station presets; auto-reverse tape deck, and Dolby noise reduction. Features Sendust-alloy tape head; metal/CrO₂ EG switch; locking fast forward/rewind; local/distant and stereo/mono pushbutton; loudness control; automatic antenna switching; front-to-rear fader; channel selection. Power output 12.5 W/ch into 4 ohms 100-20,000 Hz at 1% THD; wow and flutter 0.2% rms; FM usable sensitivity 20.9 dBf; FM alternate-channel selectivity 60 dB; capture ratio 2.4 dB...

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**T690 AM/FM-Stereo Receiver/ Cassette Player**

- In-dash receiver/player with five station presets; auto-reverse tape deck, and Dolby noise reduction. Features Sendust-alloy tape head; metal/CrO₂ EG switch; locking fast forward/rewind; local/distant and stereo/mono pushbutton; loudness control; automatic antenna switching; front-to-rear fader; channel selection. Power output 12.5 W/ch into 4 ohms 100-20,000 Hz at 1% THD; wow and flutter 0.2% rms; FM usable sensitivity 20.9 dBf; FM alternate-channel selectivity 60 dB; capture ratio 2.4 dB...

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**T692**

- Similar to T690 except no station presets; auto-reverse tape deck; power-off eject; features separate bass and treble and faders; local/distant and stereo/mono switches; locking fast forward/rewind; loudness control; power-off eject; automatic antenna switching; line-level output jacks. Power output 4 W/ch into 4 ohms 100-20,000 Hz at 1% THD; wow and flutter 0.15% rms; FM usable sensitivity 23.2 dBf; FM alternate-channel selectivity 60 dB; capture ratio 1.2 ms.

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**T560 AM/FM-Stereo Receiver/ Cassette Player**

- Designed for most import and X-body cars; unit has auto-reverse tape deck, Dolby noise reduction, and Electronic Search and Play (ESP); separate bass and treble and faders; FM usable sensitivity 17.6 dBf; FM alternate-channel selectivity 65 dB; capture ratio 1.7 dB...

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**T560**

- Similar to T560 except no ESP; has separate bass and treble and faders; FM usable sensitivity 17.6 dBf; FM alternate-channel selectivity 65 dB; capture ratio 1.7 dB...

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**T530**

- Similar to T560 except no ESP; has separate bass and treble and faders; FM usable sensitivity 17.6 dBf; FM alternate-channel selectivity 65 dB; capture ratio 1.7 dB...

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**T510**

- Designed especially for most import and X-body cars; features auto-reverse tape deck; locking fast forward/rewind; local/distant and stereo/mono switches; AFC (automatic frequency control) and LED stereo indicator; power-off eject. Power output 4 W/ch into 4 ohms 200-10,000 Hz at 5% THD; wow and flutter 0.17% rms; FM usable sensitivity 19.9 dBf; FM alternate-channel selectivity 60 dB; capture ratio 1.5 dB.

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**T500**

- Similar to T501 except no auto-reverse tape deck; mono/stereo switch; power output 3.5 W/ch; wow and flutter 0.20% rms; FM sensitivity 24.3 dBf; FM selectivity 45 kHz; capture ratio 2.6 dB...
In-dash AM-FM radio and cassette player designed for small imported and domestic cars. Features include:
- Fast forward/rewind
- FM muting
- Auto-tone correction
- Front-end with AGC action
- Ceramic filters for FM
- Syntox ceramic tape heads
- Locking fast forward/rewind
- AM/FM stereo
- Auto-mute, built-in noise blanker
- Cassette features auto reverse; key-off eject; chrome tape compatibility; and power-off memory.

**Component Systems**

**SP-711** Cassette deck features automatic reverse and Dolby noise-reduction system; slide-bar bass and treble-tone controls; and AM/FM automatic-stereo FM with 30-16,000 Hz; FM usable sensitivity 14.8 dBf; FM noise blanking; AM/FM automatic stereo/mono and local/distant.

**JP-1010 AM/FM-Stereo Receiver/Cassette Player**

- LED stereo indicator light
- AM/FM stereo
- FM muting
- Auto-mute, built-in noise blanker
- Cassette deck features auto bi-directional tape advance; cassette features auto reverse; key-off eject; chrome tape compatibility; and power-off memory.

**Kenwood**

**KRC-711 AM/FM Stereo-Tuner/Cassette Deck**

- In-dash unit combines AM-FM tuner with FM Dolby noise reduction. Cassette deck features auto bi-directional tape advance; and key-off eject.

**KRC-311 AM/FM-Cassette Deck**

- In-dash unit combines AM-FM stereo receiver and cassette deck. Receiver features analog tuning with 10-station preset; backlit, and FM Stereo; LED stereo indicator, auto mono/stereo; and key-off eject; key-off eject; chrome tape compatibility; and power-off memory.

**Jensen**

**RE518 AM/FM-Stereo Receiver/Cassette Player**

- Car system with digital electronic scanning tuner, PLL (phase-locked loop) frequency synthesizer, and auto-reverse cassette deck with Dolby noise-reduction system. Features 5 each AM and FM station preset tuning; quartz synthesizer for clock and frequency display.

These are just a few examples from the document. The full text contains detailed specifications and features for various audio equipment options, each with different specifications and capabilities. For a complete list, please refer to the document itself.
KRC-312 AM/FM-Stereo Receiver/Cassette Deck
In-dash 20-watt/channel (into 4 ohms) AM/FM stereo receiver with auto-reversing cassette deck. Features 5-channel preset and manual tuning; local/distance switch; MFR; hard Permalloy tape head; bass/treble controls; balance control; AM/FM switch; fader control. FM tuner sensitivity 15.8 dB; S/N 68 dB mono. Cassette deck wow and flutter 0.15% wrms; frequency response ±33 dB 63-12,500 Hz; stereo separation 35 dB; S/N 60 dB A-weighted with Dolby on ...............$279

KTC-757 Cassette Deck
Underdash metal-compact stereo cassette deck with Dolby noise-reduction system and Sendust heads for metal tape playback. Features cassette standby (in operation with KTC-757 tuner); auto reverse; fast forward and rewind with LEDs; separate bass and treble controls; cassette deck illumination; auto eject; direct-to-tape options; 70-ohm impedance equalization (accepts chrome and metal tapes); headphone jack; Wow and flutter 0.12% wrms; frequency response 30-16,000 Hz (normal); S/N 60 dB with Dolby; 2½"H X 6½"W X 6½"D ..............................................$269

KID-587 AM-FM/Cassette Player
In-dash underdash AM-FM radio/stereo cassette player with LED digital clock/radio frequency display with selector switch and clock hr/min adjustment. Features fast forward and eject; LED tape play indicator. Radio features manual tuning and AM/FM indicators; manual tuning ..............................................$240

KID-587 AM-FM/Stereo FM/Cassette Player
In-dash underdash AM-FM radio/stereo cassette player. Features automatic high blend (high-end signal boost); Sendust tape head; separate bass and treble controls; mute; locking fast forward and rewind; custom designer kit that includes four reversible face plates ..............................................$91

KID-575 AM-Stereo FM/8-Track Player
In-dash underdash unit combines AM-stereo FM radio and stereo 8-track player. Unit features channel selector; AM; FM, and channel indicator.LEDS: sliding balance; AM/FM, local/distant; variable fader; five pushbutton AM/FM preset tuning; rotary volume and tone ..............................................$390

KID-400 CompuTuner/Cassette Player
In-dash unit combines stereo CompuTuner, built-in stereo amplifier, and cassette deck with digital quartz clock/radio frequency display. Cassette features Dolby noise-reduction system, auto eject, and locking fast forward and rewind. Radio features quartz-locked synthesized tuning with 12-sta-
CAR-340 AM/FM-Stereo Receiver/Cassette Player
In-dash unit with tape Dolby noise-reduction system; stereo AM/FM radiation, fixed and rearward; Sendust head; auto reverse; cassette deck;ErrorCode designed to fit Most domestic or foreign cars. Features auto reverse cassette deck; has compact dual chassis designed to fit almost any domestic or foreign car. Cassette deck: features Dolby noise-reduction system, super hard pearing tape head, auto eject, and fast forward and rewind; Sendust head; automatic power input; dial illumination; five pushbutton AM/FM electronic tuning with memory; separate bass and treble controls; FM S/N 60 dB; selectivity 35 dB at 10 kHz; capture ratio 2 dB; FM separation 35 dB at 10 kHz. AM S/N ratio 53 dB.$500

CAR-302 AM/FM-Stereo Receiver/Cassette Player
In-dash unit combines AM-FM stereo tuner and stereo cassette deck: Cassette features Dolby noise-reduction system, super hard pearing tape head, auto eject, and fast forward and rewind; Dolby tape indicator; five pushbutton AM/FM tuning; bass and treble controls; fader and balance controls; center detented bass and treble controls; loudness control; FM ignition noise killer; tape wow and flutter 0.15% wrms. Tape wow and flutter 0.15%. Frequency response range 30-15,000 Hz at 3 dB; stereo separation 35 dB at 1 kHz; capture ratio 2 dB; AM S/N ratio 53 dB.$300

CAR-301 AM/FM-Stereo Tuner/Ampifier/Cassette Player
In-dash unit combines AM-FM stereo tuner/preamp/cassette deck. Cassette deck features Dolby noise-reduction system, super hard pearing tape head, auto eject, and fast forward and rewind. Radio features five-station preset; atmospheric interference rejection; separate bass and treble controls; LED FM stereo indicator; preamp front-to-rear speaker fader...$270

MITSUBISHI CAR AUDIO

CAR-330 AM/FM-Stereo Tuner/Ampifier/Cassette Player
In-dash unit combines power amp, AM-stereo FM tuner, and stereo cassette deck. Cassette deck: wide and flutter 0.15% wrms; frequency response range 40-13,000 Hz ±3 dB; S/N 60 dB; selectivity 70 dB; stereo separation 34 dB at 1 kHz, selectivity 70 dB. FM tuner section: FM ignition noise killer; FM stereo indicator...$250

CAR-322 AM/FM-Stereo Receiver/Cassette Player
In-dash unit with Dolby noise-reduction system and auto reverse cassette deck. Features Sendust tape head; I.M.S. (See CAR-330 above); AM/FM band; separate bass and treble controls; metal tape capability; speaker fader control; locking fast-forward and rewind buttons; automatic antenna power and dial input. Amplifier output 4 W/Ch at 0.1% THD; FM sensitivity 1.6 dB; frequency response 40-14,000 Hz ±3 dB; S/N ratio 60 dB; selectivity 30 dB; stereo separation 30 dB at 1 kHz; capture ratio 2 dB. Tape wow and flutter 0.15% wrms; frequency response 40-13,000 Hz ±3 dB; S/N ratio 60 dB...$250

CAR-310 AM/FM-Stereo Receiver/Cassette Player
In-dash unit with installation preset tuning and C.M.S. (See CAR-330 above); Features FM noise suppressor (stereo/mono method); FM muting; separate bass and treble controls; automatic antenna power input and dial input. Amplifier output 4 W/Ch at 0.1% THD; FM sensitivity 1.67 dB; frequency response 40-14,000 Hz ±3 dB; S/N ratio 60 dB. FM features: FM ignition noise killer; two-color AM/FM dial illumination; Stereo Reception Control (SRC); adjustable shafts and power antenna lead. Tape wow and flutter 0.15% wrms; frequency range 50-12,500 Hz; S/N ratio 57 dB with Dolby on; 35 dB stereo separation; FM Stereo at 80 dB; frequency response 35-15,000 Hz at 3 dB; stereo separation 35 dB at 1 kHz; capture ratio 2 dB. AM S/N 47 dB. 6.9µV at 4% D^x 13dB...$270

RX-2 AM Stereo/FM Cassette Deck
In-dash unit combines AM/FM stereo radio and auto reverse stereo cassette deck. Cassette deck: features five-station preset; locking fast-forward and rewind; auto eject and auto power off. Radio features six-pushbutton AM/FM electronic tuning with memory; auto electronic tuning and manual electronic tuning; M.D digital frequency display; mono/stereo/local/distant, and AM/FM stereo modes; tone and fader controls; built-in B-W amp...$400

RX-791 AM/FM-Cassette Deck
In-dash High-power unit with 10 watts/Ch output at 0.08% THD, DIN chassis, compact dual chassis with auto reverse stereo cassette deck; has compact dual chassis designed to fit almost any domestic or foreign car. Cassette deck: features Dolby noise-reduction system, super hard pearl...$290

RX-752 AM/FM Cassette Deck
In-dash DIN unit designed to fit most imported cars. Features auto reverse cassette deck; locking fast-forward and rewind; eject button; program selector; pinch-off tape lever; auto power off; five-station AM/FM pushbutton turning; FM ignition noise killer; two-color AM/FM dial illumination; stereo reception control (SRC); adjustable shafts and power antenna lead. Tape wow and flutter 0.15% wrms; frequency range 50-12,500 Hz; selectivity 86 dB; frequency range 30-15,000 Hz; stereo separation 35 dB at 1 kHz; capture ratio 3 dB. AM S/N 54 dB. 7.7µV at 4% D^x 13dB...$250

RX-723 AM/FM Cassette Deck
Super-compact in-dash unit with loudness control and built-in 7-watt /AM/FM amplifier. Features autostop tape-end indicator; locking fast forward; eject button; manual radio band; line output; volume control; remote switch; mono/speaker switch; fader and balance controls; noise piece for vertical installation; adjustable shafts; power antenna lead. Tape wow and flutter 0.15% wrms; frequency response 30-15,000 Hz; S/N ratio 50 dB. FM S/N ratio 62 dB; selectivity 68 dB; frequency response 30-15,000 Hz...$250

TAPE RECORDING & BUYING GUIDE
tape end or power off; wow and flutter 0.15% wrms; program selector, and pinch-off tape mechanism at features locking fast forward and rewind, eject, Cassette Deck dB. 6.4" W X 4.9" D X 1.75" H $160

RX-91 AM-Stereo FM Cassette Deck In-dash unit combines AM-stereo FM radio and auto reverse stereo cassette deck. Cassette deck: features locking fast forward and rewind, eject, program selector, and pinch-off tape mechanism at tape end or power off; wow and flutter 0.15% wrms; program selector, and pinch-off tape mechanism at features locking fast forward and rewind, eject, Cassette Deck dB. 6.4" W X 4.9" D X 1.75" H $160

RX-79 AM-FM/Cassette Player In-dash AM-stereo FM radio/cassette player with auto reverse, features locking fast forward and rewind; four-speaker capable; separate bass and treble controls; tuning, balance, and fader controls with five-position pushbutton preset; stereo mono switch; pushbutton program selector; AM/FM LEDs; 16 W/ch $290

RX-103 Stereo FM/Cassette Deck Underdash unit combines stereo FM radio and stereo cassette player. Cassette deck features hard permalloy head; eject, fast forward, and play selector switch; rear fader control that stops on strong frequencies, seek control that stops on strong frequencies, and bi-amp switches; equalizer center frequencies set at 60, 250, 1000, 3500, 12,500 Hz ±3 dB: S/N 63 dB (Dolby on); adjust-able trim plate. Output power 4 W/channel at 5% THD $240

RX-102 Cassette Deck Underdash auto-reverse cassette deck features locking fast forward and rewind; tape program selector switch; front-mounted antenna trimmer; adjustable shafts and trimplates. $270

GX-102 Cassette Deck In-dash auto-reverse cassette deck features locking fast forward and rewind; tape program selection; front-mounted antenna trimmer; adjustable shafts and trimplates. $270

GX-101, Similar to GX-102 except without separate bass and treble or automatic reverse $100

Car Stereo Components CV-21: 20 W/ch power amplifier with balanced transformerless circuit; loudness control; separate bass and treble controls; fader and balance controls; attenuation switch; dimmer control connection $140

CX-20, AM-stereo FM tuner with noise-killer circuit, local/distant switch, tuning circuit, and illuminated tuning meter $140

CX-31, Same as CX-20 except has noise-reduction switch, locking fast forward/rewind, program selector switch, and auto reverse $140

CQ-7600 AM/FM-Stereo Radio/ Cassette Player In-dash preamplifier/AM-stereo FM tuner, Repeat-track cassette player with Dolby noise-reduction system, and built-in five-band graphic equalizer; requires separate power amp. Features locking fast forward/rewind, eject button; bi-amp, Dolby, and local/distant switches; FM muting; quartz-controlled PLL frequency synthesizer; stereo indicators; built-in ING circuit; carrier/center frequencies set at 60, 250, 1000, 3500, 10,000 Hz ±12 dB. Wow and flutter 0.02% rms; tape frequency response 30-12,500 Hz ±3 dB; S/N 60 dB; THD 0.2%; adjustable shafts and trimplates. $650

CQ-7400. Similar to CQ-7600 except without Dolby noise-reduction, quartz-controlled PLL frequency synthesizer, and bi-amp switch; has equal-izer center frequencies set at 80, 250, 1000, 3500, 10,000 Hz at ±12 dB $300

CQ-4600 AM/FM-Stereo Radio/ Built-In Cartridge Player Compact in-dash 6-track player with pushbutton AM/FM stereo tuning. Features compact noise-piece and chassis; switchable ING circuit for noise reduction; front/rear fader control, program and stereo indicators; local/distant switch; balance control; automatic frequency control (afc) on FM; front-mounted antenna trimmer; adjustable shafts; dimmable trim plate. Output power 8 W/channel at 5% THD $240

Supreme Series CQ-S900 AM/FM-Stereo Radio/ Cassette Player Compact in-dash pushbutton AM/FM stereo radio and metal compatible auto reverse stereo cassette deck with Dolby noise reduction system and hard permalloy heads. Cassette deck features locking fast forward and rewind; metal/CrO2 tape selector; wow and flutter 0.18% rms; frequency response 30-12,500 Hz; S/N 50 dB; FM image-rejection ratio 70 dB; image-rejection ratio 55 dB; FM selectivity 45 dB; FM stereo separation 30 dB $150

CQ-546 AM/FM-Stereo Receiver/ Cassette Player In-dash unit with auto-reverse cassette player. Features FM muting, local/distant, and stereo: FM stereo indicators; built-in ING circuit; carrier/center frequencies set at 60, 250, 1000, 3500, 12,500 Hz ±3 dB; S/N 63 dB (Dolby on); adjusts shafts and trimplates. $270

CQ-564 AM/FM-Stereo Receiver/ Cassette Player In-dash unit with auto-reverse cassette player. Features FM muting, local/distant, and stereo: FM stereo indicators; built-in ING circuit; carrier/center frequencies set at 60, 250, 1000, 3500, 12,500 Hz ±3 dB; S/N 63 dB (Dolby on); adjusts shafts and trimplates. $270

CQ-545 AM/FM-Stereo Receiver/ Cassette Player In-dash unit with auto-reverse cassette deck. Cassette deck features locking fast forward/rewind; local/distant switch; FM tuning/fader control with five-station pushbutton preset; locking fast forward and eject; left and right balance controls; built-in ING circuit; FM usable sensitivity 5 µV; FM S/N ratio 40 dB; FM i-f rejection ratio 70 dB; image-rejection ratio 55 dB; FM selectivity 45 dB; FM stereo separation 30 dB $150

CQ-546 AM/FM-Stereo Receiver/ Cassette Player In-dash unit with auto-stop stereo cassette deck. Cassette deck features locking fast reverse; tape program selector switch; front-mounted antenna trimmer; adjustable shafts and trimplates. $270

CQ-547 AM/FM-Stereo Receiver/ Cassette Player In-dash unit with auto-stop stereo cassette deck. Cassette deck features locking fast forward/rewind; manual eject; and LED tape direction indicator. Tuner features five-memo- ry buttons for five AM and five FM station selections, seek control that stops on strong frequencies, and manual frequency scan. Features FM muting, local/distant, and stereo indicators; built-in ING circuit; FM usable sensitivity 6 µV; FM S/N ratio 65 dB; FM i-f rejection ratio 65 dB; image-rejection ratio 70 dB; FM selectivity 45 dB; FM stereo separation 30 dB $120

CQ-8700 AM/FM-Stereo Radio/ Cassette Player In-dash AM/FM stereo radio/cassette player with pushbutton AM/FM tuning/fader control with five-station pushbutton preset; locking fast forward and eject; peak track instead of auto reverse; seek only; five station present electronic tuning; single tone control. $350

CQ-8700 AM/FM-Stereo Radio/ Cassette Player In-dash AM/FM stereo radio/cassette player with pushbutton AM/FM tuning/fader control with five-station pushbutton preset; locking fast forward and eject; peak track instead of auto reverse; seek only; five station present electronic tuning; single tone control. $350

CQ-S780 AM/FM-Stereo Radio/ Cassette Player In-dash pushbutton AM-stereo FM radio/metal compatible auto reverse stereo cassette deck with Dolby noise reduction system and magnet- ic head. Cassette deck has metal/CrO2 tape selector with LED, fast forward/rewind buttons with push program and LED indicators, and Dolby LED. Radio: features MDS-FET tuner, four AM/FM push- button tuning, separate bass and treble controls, four-way balance control, preamp out, FM optimizer switch, and motor antenna relay control lead. Supplied with universal nosepiece and adjustable shaft to fit most domestic and imported cars $310

CQ-S740. Similar to CQ-S780 minus Sendust alloy head and LED metal/CrO2 indicator $270

CQ-S710. Similar to CQ-S740 minus pushbutton tuning $240

CQ-S700. Similar to CQ-S710 except Repeat-track cassette player with Dolby and metal compatible; unit has impulse noise quieting circuit, LED output level display and separate bass and treble controls $220

CQ-S680. Similar to CQ-S700 minus LED output level display and separate bass and treble controls; has LED stereo and tape indicators and tone control $200

CQ-S585 AM/FM-Stereo Radio/ Cassette Player In-dash Repeat track cassette player with pushbutton 1982 EDITION
CAR STEREO EQUIPMENT

AM/FM-stereo radio. Features locking fast forward/rewind; hard permalloy head; FM optimizer switch; impulse-noise quieting switch; balance and fader controls; loudness-compensated tone controls; antenna relay control lead; compact chassis. $200

CO-661 AM/FM-Stereo Radio/ Cassette Player
Repeattrack cassette player with manual AM/FM-stereo radio. Features locking fast forward/rewind; Dolby noise-reduction system and X (headroom extender); metal/CrO2/nominal switch; radio monitor; hard permalloy tape head; FM optimizer switch; impulse-noise quieting switch; balance control; motor antenna relay control lead; compact chassis. $200

CO-S646 AM/FM-Stereo Radio/ Cassette Player
Repeattrack cassette player with manual AM/FM-stereo radio. Features locking fast forward/rewind; radio monitor; hard permalloy tape head; FM optimizer switch; impulse-noise quieting switch; balance control; motor antenna relay control lead; compact chassis. $170

Overhead Cockpit Series

RM-610 AM/FM-Stereo Receiver/ Cassette Player
Ceiling-mounted modular control unit incorporates stereo cassette deck, FM stereo tuner, and preamplifier with plug-in power amplifier. Tape deck has switchable Dolby noise-reduction system; auto reverse; locking fast forward and rewind; auto eject; tape selector for normal or CrO2 tapes; LED tape direction indicator; volume control; wow and flutter 0.2% wms; frequency response 15-20,000 Hz; S/N 60 dB with Dolby; crosstalk -57 dB; stereo separation 40 dB at 1000 Hz; FM tuner: automatic muting, bass, treble, and loudness controls; parallel fader control; equalizer; three-throw crossover switch; r-f amplifier; automatic muting; S/N ratio 82 dB. Output: 2 x 60 W per channel. Dimensions: 7"t x 6"d x 2"h. $120

RM-310 AM/FM-Stereo Receiver/ Cassette Player
Ceiling-mount car hi-fi system with Repeattrack cassette player. Features locking fast forward/rewind; key-off eject; front-end auto/mono switch; FM stereo auto/mono switch; FM stereo indicator; LED dial frequency display; FM aux input; 1st order automatic tape slack canceller. Features auto replay/eject; remote control. Radio features 1W/1W, local/distant switch. $140

KE-5000 AM/FM-Stereo Receiver/ Cassette Player
In-dash unit combines AM/FM-stereo Supertuner with stereo cassette player. Features auto replay/eject; locking fast forward/rewind; MOSETF tuner front end; preset for up to 5 each AM and FM stations; automatic muting, bass, treble, and loudness controls; automatic tape slack canceller. Radio features frequency response 20-50,000 Hz ± 3 dB; THD 0.02% at 1 kHz. Wow and flutter 0.3% wms; frequency response 30-14,000 Hz ± 3 dB; S/N ratio Dolby on 71 dB, Dolby off 63 dB; Dolby noise reduction 40 dB. FM usable sensitivity 16 dB; THD 0.1%; S/N ratio 72 dB; image rejection 65 dB; frequency response 20-15,000 Hz ± 3 dB; stereo separation 40 dB at 1 kHz. $300

KE-2100. Similar to KE-3000 but without PNS noise suppression, PLL synthesize, and scan tuning; has electronic pointer display and AM/local/ distant switch. $250

KE-20 AM/FM-Stereo Tuner/ Cassette Player
In-dash AM-stereo FM/cassette deck with Dolby noise reduction. Features locking fast forward/rewind and auto eject at end of tape; auto replay at end of rewind; metal/chrome/selector. Supertuner II electronic tuner features 15 station (5 AM, 10 FM) electronic feather-touch preset tuning; LED station indicator; loudness; PNS noise suppressor; automatic stereo/mono; auto muting on FM stereo; separate bass and treble; balance; parallel fader, built-in PNS; muting switch; 2-Watt/2-Watt stereo; 5 station preset tuning. Dimensions: 7"t x 6"d x 2"h. $250

KEX-2 AM-FM-Stereo Tuner/ Cassette Player
In-dash AM-stereo FM/cassette deck with Dolby noise reduction. Features locking fast forward/rewind and auto eject at end of tape; auto replay at end of rewind; metal/chrome/selector. Supertuner II electronic tuner features 15 station (5 AM, 10 FM) electronic feather-touch preset tuning; LED station indicator; loudness; PNS noise suppressor; automatic stereo/mono; auto muting on FM stereo; separate bass and treble; balance; parallel fader, built-in PNS; muting switch; 2-Watt/2-Watt stereo; 5 station preset tuning. Dimensions: 7"t x 6"d x 2"h. $250

PIONEER

KE-5100 AM/FM-Stereo Receiver/ Cassette Player
In-dash unit with electronically tuned AM/FM-stereo Supertuner II, digital time/frequency display, and PNS noise suppression. Features auto scan/seek; preset of up to 5 AM and 10 FM stations; quarter PLL synthesize, stereo/mono switch; auto replay/eject; locking fast forward/rewind; loudness control; automatic muting; selects any automatic power antenna. Amplifier output 2.9 W/ch into 4 ohms 50-15,000 Hz at 5% THD. Wow and flutter 0.15 wms; S/N ratio 52 dB; tape frequency response 50-12,000 Hz ± 3 dB; FM usable sensitivity 14.3 dBf for 50 dB quieting. Dimensions: 12"t x 8"d x 9"w. $220

KE-3000. Similar to KE-5000 except without Dolby and auto reverse; five-station preset tuning; auto eject and replay. $300

KE-2500. Similar to KE-3000 except without auto eject, automatic muting, and built-in PNS; muting switch; tape frequency response 50-12,000 Hz ± 3 dB; FM usable sensitivity 14.3 dBf for 50 dB quieting. Dimensions: 7"t x 6"d x 2"h. $160

KE-2500. Similar to KE-4500 less automatic tape slack canceller, loudness, auto reverse, and auto muting; has auto eject and stereo/mono. $140

KP-1500. Similar to KP-2500 except designed for Japanese imports and X-body cars; mini chassis; FM muting; locking fast forward; 2.5 W/ch continuous; FM sensitivity 19.2 dBf for 50 dB quieting; FM selectivity 47 dB; FM stereo 71 dB; FM Dolby 7.9 dB; FM muting input 74 dB. $250

UKP-6500 AM/FM-Stereo Receiver/ Cassette Player
Mini receiver/cassette system designed for subcompact and imported cars. Features mini cassette deck: AM/FM-stereo Supertuner II; music scanner; auto preselect; separate bass, treble, and loudness controls; PNS noise suppression; 5-station preset tuning; FM auto/mono switch; auto replay/eject; locking fast forward/rewind; hard permalloy tape head; key-off pinchroller release; activates fully automatic power antenna. Amplifier output 3.2 W/ch into 4 ohms 50- 15,000 Hz at 5% THD. Wow and flutter 0.15 wms; S/N ratio 52 dB; tape frequency response 50-12,000 Hz ± 3 dB; FM usable sensitivity 16.8 dBf (mono); selectivity 70 dB; 7/8" W × 3/4"D × 2"H. $250

UKP-7200. Similar to UKP-6500 except adds separate bass and treble, and PNS noise suppression; auto replay/eject. Wow and flutter 0.13 wms; FM sensitivity 20.6 dB. $240

KXP-9500 AM-FM Stereo/FM Cassette
In-dash AM-stereo FM PLL Supertuner and electronically governed stereo cassette player with Dolby noise reduction system and X (headroom extender); metal/CrO2/nominal switch; FM stereo front-end auto/mono switch; auto replay/eject; locking fast forward/rewind; PNS noise suppression. Features auto scan/seek; preset of up to 5 AM and 10 FM stations; quarter PLL synthesize, stereo/mono switch; auto replay/eject; locking fast forward/rewind; loudness control; PNS noise suppressor that allows control over two booster amps; activates any automatic power antenna. Amplifier output 2.9 W/ch into 4 ohms 50-15,000 Hz at 5% THD. Wow and flutter 0.15 wms; S/N ratio 52 dB; tape frequency response 50-12,000 Hz ± 3 dB; FM usable sensitivity 14.3 dBf (mono); selectivity 70 dB; 7/8" W × 6"D × 2"H. $300

TAPE RECORDING & BUYING GUIDE
30-15,000 Hz; -3 dB; S/N 60 dB (Dolby on); FM usable sensitivity 1.1 µV at 75 ohms (12 dBf); mono; FM 50-DB quieting sensitivity 1.4 µV at 75 ohms; FM noise 4 dB; S/N ratio 60 dB; FM frequency response 30-15,000 Hz; ± 3 dB; S/N ratio 60 dB; max. output 15 Watts; S/N ratio 60 dB; max. output 15 W. **$190**

**TP-727.** Similar to TP-900 except without FM section; automatic and manual program change. **$105**

**TP-6006 AM-Stereo/FM/Track Player**
In-dash AM-stereo FM radio and cassette player with dual-Dolby noise reduction system features auto-eject, lock and manual program change. Features automatic replay and eject buttons. Radio features FET front end circuitry; FM stereo/mono; auto FM muting; separate bass, treble, and balance controls; wow and flutter 0.3% rms; tape frequency response 50-10,000 Hz; max. output 12 W continuous; S/N ratio 52 dB. **$130**

**REALISTIC**

**12-1889 AM-Stereo FM/Cassette Player**
In underdash unit combines AM-stereo FM radio, stereo cassette player, and LED digital radio frequency/clock display with LED dimmer switch. Cassette features key-off eject and locking fast forward and rewind; radio has stereo/mono switch; includes speaker and speaker cables; 7 W/ch, 12 V dc negative ground. **$180**

**12-1889 Stereo Cassette Player**
In-dash stereo cassette player designed for X body and import cars; has locking fast forward and auto stop in play mode; includes speaker cables; 4 W/ch, 12 V dc negative ground. **$100**

**SANYO**

**FT2200 AM/FM-Stereo Tuner/Cassette Player**
In-underdash unit combines AM-stereo FM tuner/preamp and metal-compatible cassette deck with Dolby noise-reduction system for X body and import cars; digital quartz clock; designed for small foreign and American subcompact cars; separate power amplifier required. Cassette features Sendust Alloy record/
null
player with digital clock. Features elapsed timer and reset controls; electronic loudness, muting, local/distant, and mono/stereo switches; LED indicators; automatic end-of-tape and pushbutton eject; locking fast-forward and rewind; bass, treble, balance, and fader controls; LED indicator. Wow and flutter 0.3% rms; S/N 36 dB; separation 40 dB. 68µV X 4 V/m = 1 kHz... $120

SR-300 AM/FM-Stereo Receiver
Cassette Player
In dash unit with cassette end loading. Features separate volume, tone, balance, and tuning controls; AM/FM local and distant switches; stereo and tape-end indicators. Amplifier output 7.5 W rms at 1% THD, 75-10,000 Hz. FM sensitivity 6V/m for 50 dB S/N; separation 24 dB at 1 kHz; HF image rejection 50/45 dB. Wow and flutter 0.3% rms; S/N ratio 36 dB; separation 40 dB... $90

SS-200 Cassette Player/Amph
Under dash end-load cassette player with built-in amplifier. Features left and right slide-type controls; fast-forward/eject and tone high-low switches; tape play light: automatic stop at end of play. Amplifier output 3 W at 1% THD, 100-8000 Hz. Wow and flutter 0.35% rms; S/N ratio 30 dB; separation 35 dB. 6V/m X 4 V/m = 1 kHz... $35

SOUND WORKSHOP
1234 Motor Parkway, Hauppauge, NY 11787

SOUND AIDS
701 Heinz Ave, Berkeley, CA 94710

SOUND CONCEPTS INC.
395 Riverside Or New York, NY 10025

SOUND MANUFACTURERS
(Continued from page 4.)

SOUND WORKSHOP
1234 Motor Parkway, Hauppauge, NY 11787

SPARKOMATIC CORP.
Metford, PA 18337

SPECTRO ACOUSTICS, INC.
4350 150th Ave N E Redmond, WA 98052

STANTON MAGNETICS, INC.
Terminal Dr. Plainview, NY 11803

STUDIO/REVOX AMERICA, INC.
1623 Elm St Pac, Nuneaton, Warks, 47210

SUPER ELECTRONICS CORP.
151 Ludlow St., Yorkville, NY 10006

SUPERSCOPE
20025 Nordhoff St Chatsworth, CA 91311

TANDEM OF AMERICA INC.
Lakota Court, Amstic, NY 10504

TAPE S INC.
111 3rd Ave, New York 10003

TAPCO
3810 148th Ave N E Redwood, NY 11520

TASCAM SERIES by TEAC
Teac Corporation of America 7723 Telegraph Rd. Montebello, CA 90640

TDK ELECTRONICS CORP.
755 Eastgate Blvd. Garden City, NY 11530

TEAC CORP. OF AMERICA
17723 Telegraph Rd. Montebello, CA 90640

TECHNICS by PANASONIC, Div of Matsushita
142 W 26 St. New York, NY 10019

TEC ELECTRONICS CORP.
755 Eastgate Blvd. Garden City, NY 11530

TECHNICS by PANASONIC, Div of Matsushita
142 W 26 St. New York, NY 10019

TELECOM communicates INC
1400 One Tandy Center, Fort Worth, TX 76102

TENBURY AMERICA INC.
1623 Elm St Pac, Nuneaton, Warks, 47210

THEROS ELECTRONICS INC.
1200 W Artesia Blvd. Compton, CA 90220

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**HEADPHONES**

### AKG

**K-340 Stereo Headphones**
- Two-way electrostatic/dynamic headphones incorporating fixed-charge electrostatic transducer/dynamic moving-coil transducer with passive diaphragm in each earcup; connects directly to headphone jack of receiver or amplifier across speaker output terminals.
- Frequency response: 16-20,000 Hz; SPL 104 dB from 200-2000 Hz with 1% THD; nominal impedance: 400 ohms each channel; max. continuous input 200 mV/ch at 117 dB SPL.
- Includes three 8.8 ft four-conductor cables with three-conductor 1/4-in stereo phone plug; 13.5 oz less cable.
- Price: $195

**K-240 Free-Field Headphones**
- Free-field stereo headphones; dynamic moving-coil transducer and six passive radiators in each circumaural cup; frequency response: 16-20,000 Hz; 600 ohms ± 20% impedance over 16-20,000 Hz; max. SPL 125 dB; supplied with 9.8-ft four-conductor cable and 1/4-in phone plug; 10 oz.
- Price: $145

**K-141 Monitor Headphones**
- Supra-aural stereo professional monitor headphones with dynamic moving-coil transducers; frequency response: 20-20,000 Hz; max. SPL 119 dB; 600 ohms ± 20% impedance over 16-20,000 Hz; supplied with 9.8-ft-four-conductor cable and standard three-conductor stereo phone plug; 9 oz.
- Price: $75

**K-145S Stereo Headphones**
- Supra-aural stereo headphones with dynamic moving-coil transducers; frequency response: 20-20,000 Hz; max. SPL 119 dB; 600 ohms ± 20% impedance over 16-20,000 Hz; supplied with 9.8-ft four-conductor cable and 1/4-in phone plug; 8 oz.
- Price: $65

**K-40 Stereo Headphones**
- Ultra-lightweight supra-aural stereo headphones with dynamic moving-coil transducers; frequency response: 30-18,000 Hz; max. SPL 117 dB; matches 4-200 ohm outputs; 9.8-ft four-conductor cable; three-conductor stereo phone plug; 4 oz.
- Price: $29

### ARISTA

**301 Stereo Headphones**
- Hi-velocity Mylar diaphragm stereophones; frequency response: 20-22,000 Hz; 8-ohm impedance; 10-ft coiled cord.
- Price: $33

**300 Stereo Headphones**
- Headphones feature slide volume controls and stereo/mono switch; frequency response: 25-17,500 Hz; 8-ohm impedance; 10-ft coiled cord.
- Price: $30

### BANG & OLUFSEN

**U-70 Headphones**
- Orthodynamic stereo headphones; frequency response: 16-20,000 Hz; sensitivity: 8 mW for 94-db SPL; continuous load: 2 w; dist. 1% max.; 140-ohm impedance; 10-ft straight cord with three-conductor phone jack; 10.6 oz.
- Price: $95

### BEYER DYNAMIC, INC.

**ET-1000-S Electrostatic Headphones**
- Electrostatic headphones; frequency response: 10-25,000 Hz; sensitivity: 100 dB SPL with 2 mV input; 48 ohm impedance; max. power: 115 mV; comes with sintered bronze cover plates, 8-ft cord, and power supply capable of driving two sets of ET-1000 headphones.
- Price: $249

**DT-444S Wireless Infrared Headphones**
- Battery-powered headphones with ISS 76 infrared transmitter; frequency response: 20-20,000 Hz; has separate volume controls/cup and stereo/mono switch; rechargeable NiCd batteries.
- Price: $225

**DT-48 Dynamic Headphones**
- Moving-coil dynamic headphones; frequency response: 16-20,000 Hz ± 2 db; supplied with 10-ft straight cord.
- Price: $190

**DT-48K**
- Same as DT-48 but with coiled cord.
- Price: $195

**DT-480 Dynamic Headphones**
- Moving-coil dynamic headphones; frequency response: 20-18,000 Hz; sensitivity: 1 mW at 400 Hz for 115-db SPL; impedance: 5, 100, and 2000 ohms; max input: 1 W/phone.
- Price: $115

**DT-100 Dynamic Headphones**
- Moving-coil, dynamic headphones; frequency response: 30-18,000 Hz; sensitivity: 1 mW at 400 Hz for 110-db SPL; impedance: 5, 100, and 2000 ohms; max input: 1 W/phone.
- Price: $90

**DT-96 Dynamic Headphones**
- Moving-coil dynamic headphones; frequency response: 30-17,000 Hz; sensitivity: 1 mW at 400 Hz for 110-db SPL; impedance: 5-200 ohms; max input: 100 mW/phone; 5-ft cord; 8 oz.
- Price: $75
DT-440 Dynamic Headphones
Open high-velocity dynamic headphones with polyvinyl chloride diaphragm in Novodur housing; frequency response 20-20,000 Hz; sensitivity 1 mW for 100-dB SPL; impedance 600 ohms; chrometmin $65

DT-220 Dynamic Headphones
Closed-ear dynamic headphones; frequency response 20-20,000 Hz; sensitivity 1 mW for 100-dB SPL; 600-ohm impedance; max. input 42 mW (for 116-dB SPL); 260 g (without cable) $60

DT-220ST, Professional model with left and right earcups marked $65

DT-302 Lightweight Headphones
Open-air high-velocity dynamic headphones connect directly to high- or low-impedance outputs; frequency response 20-20,000 Hz; rated power 7 mW (2.1 V) for 600 ohms; sponge ear cushions; stereo phone jack plug; 2.3 oz (without cord) $33

DT-109 Moving-Coil Mic/Headphone
Lightweight moving-coil stereo headphones with cardioid broadcast-quality moving-coil microphone; SPL 120 dB; left and right channels may be independently wired; removable ear cushions; high-impact plastic and stainless steel construction, field serviceable $106

DT-108 Moving-Coil Mic/Headphone
Moving-coil stereo headphones with noise-canceling microphone; frequency response 40-12,000 Hz; SPL 120 dB; mic rotates 180 degrees; foam-filled ear cushions and padded headband; field serviceable $90

DT-880 Dynamic Headphones
Open high-velocity dynamic headphones with polyvinyl chloride diaphragm in Novodur housing; frequency response 20-20,000 Hz; sensitivity 1 mW for 100-dB SPL; impedance 600 ohms; chrometmin $65

PMB 8 Orthodynamic Headphones
Around-the-ear style with leatherette foam ear cushions; max. SPL 114 dB (1 kHz); 400-ohm impedance; max. input 0.1 W; sensitivity 3 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 20-20,000 Hz; 10-ft cord; 7.5 oz $115

PMB 6 Orthodynamic Headphones
On-the-ear style with leatherette foam ear cushions; max. SPL 121 dB (1 kHz); 140-ohm impedance; max. input 2 W; sensitivity 7 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 16-23,000 Hz; has 10-ft cord; 9 oz $95

PMB 4 Dynamic Headphones
Around-the-ear style with leatherette foam ear cushions; max. SPL 114 dB (1 kHz); 400-ohm impedance; max. input 0.1 W; sensitivity 4 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 20-20,000 Hz; has 10-ft cord; 7.5 oz $85

PMB 40 Dynamic Headphones
On-the-ear style with reticulated foam ear cushions; max. SPL 128 dB (1 kHz); 400-ohm impedance; max. input 0.1 W; sensitivity 0.2 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 20-20,000 Hz; has 10-ft cord; 7.5 oz $70

PMB 20 Dynamic Headphones
On-the-ear style with reticulated foam ear cushions; max. SPL 118 dB (1 kHz); 400-ohm impedance; max. input 0.1 W; sensitivity 2 mW for 100-dB SPL (1 kHz); 0.3% THD at 100-dB SPL (1 kHz); frequency response 20-20,000 Hz; has 10-ft cord; 3.9 oz $50

PML by ERCONA
D-42 Headphones
Dynamic stereo/mono headphones, supplied with

AKG
To fully appreciate the design advantages of our headphones simply put on a pair and listen. The AKG K340 is truly unique. Each earpiece contains an electrostatic high frequency transducer, shown here, a moving-coil, dynamic low frequency transducer, and AKG patented passive diaphragms. This combination of components allows the full spectrum of sound to be reproduced with unequaled detail, clarity and realism.

Every AKG headphone has been designed for comfort as well as performance...and there are more than 5 models to choose from. Your AKG dealer is ready to give you a demonstration of all the design advantages inherent in what many professionals consider to be the best sounding headphones in the world...and the most comfortable.

AKG Acoustics Inc.
A North American Philips Company
77 Selleck Street, Stamford, CT 06902
(203) 348-2121

AKG, Akustische und Kino Geräte GmbH, Austria
HEADPHONES

KENWOOD

RDF-224 Dynamic Headphones
Dynamic stereo/mono headphones; removable soft-foam-padded vinyl ear cushions; supplied with 6-ft coiled cable and three-conductor phone plug; frequency response 20-18,000 Hz; output impedance 6 ohms ± 20% (1 kHz); output level 100 dB; weight 0.5 oz.

H-505. Similar to H-707 except 8-ohm impedance; sensitivity 96 dB; 9.8-ft cord; 1.8 oz (exclusive of cord)...

H-707 Moving-Coil Headphones
Moving-coil design weighs only 5.6 oz and features pressure-molded polyester diaphragms, rare-earth magnets, and tiny voice coil leads from extremely pure copper; Supra-aural types but are acoustically vented. Includes 39-in voice coil; hard-wired cord...

H-707. Frequency range 20-23,000 Hz; max. power 100 Hz; sensitivity 100 dB SPL 0.38%; radiating surface area of each earcup permit fine tuning of shape of response curve; frequency response 10-22,000 Hz; THD 0.3% at 1 kHz (100 dB SPL); sensitivity for 100-dB SPL 0.6 V rms sine wave at 1000 Hz; 0.275 V rms noise; nominal impedance 100 ohms at 1 kHz; features Pneumatic ear cushions to exclude outside sounds; wide vinyl headband with self-adjusting yoke; black and chrome; equipped with boom microphone mount for professional applications; four-conductor coiled cord.

HM-100E. Binaural headphone/microphone combination...

JVC

HP-1100 Stereo Headphones
Moving-coil type stereo headphones. Sensitivity 102 dB/mW; power-handling capacity 200 mW; THD less than 0.2%; frequency range 20-20,000 Hz; nominal impedance 100 ohms...

90-108 Stereo Headphones
Lightweight open-air stereo headphones with combined condenser/dynamic element traits; has 39-mm Mylar diaphragm; frequency response 20-20,000 Hz; sensitivity 98 dB/1 mW; impedance 4-16 ohms; 6-ft straight; 7.5 oz...

90-106 Stereo Headphones
Open-air stereo headphones with ultra-thin, high-velocity 37.5-mm Mylar diaphragm; frequency response 20-20,000 Hz; sensitivity 100 dB/1 V; impedance 4-16 ohms; lightweight double headband; 6-ft straight cord...

90-104 Stereo Headphones
Dynamic stereo headphones with 3-in element; frequency response 30-15,000 Hz; impedance 8 ohms; separate tone and volume slide controls/cup; adjustable padded headset; 10-ft coiled cord with 7/8-in phone plug...

90-102. Similar to 90-104 except lightweight version minus tone controls; has stereo/mono switch...

HIGH-VOLTAGE HEADPHONES

VC/VFR Stereophones
Electrostatic circumaural design with energizer. Headset bandpass response 20-22,000 Hz ± 2 dB; sensitivity for 100-dB SPL 1.9 V rms at 1 kHz into E10/energer, 2.0 Vrms pink noise; THD at 1 kHz and 100 dB SPL 0.38%; radiating surface area of electrostatic element 25 cm²/ear; black with silver accents; includes 10-ft cord...

ESP/10 Electrostatic Stereophones
Electrostatic circumaural design with energizer. Headset bandpass response 20-22,000 Hz ± 2 dB; sensitivity for 100-dB SPL 1.9 V rms at 1 kHz into E10/energer, 2.0 Vrms pink noise; THD at 1 kHz and 100 dB SPL 0.38%; radiating surface area of electrostatic element 25 cm²/ear; black with silver accents; includes 10-ft cord...

PRO/4AAA Dynamic Stereophones
Frequency response 10-22,000 Hz; dist. less than 0.5% at 1 kHz, 100 dB SPL; sensitivity 0.7 V rms sine wave at 1000 Hz, 0.24 Vrms pink noise; impedance 220 ohms at 1 kHz; features Pneumatic ear cushions for noise isolation; 157-ohm impedance for 14-dB SPL transient peaks; 157-ohm impedance; acoustical sponge ear cushions; extendable headband with self-adjusting, pivoting yokes and soft padded vinyl cover; 3-conductor coiled cord (10 ft extended)...

KOSST/EXC Stereo Headphones
Lightweight high-voltage stereophones; frequency response 15-35,000 Hz; sensitivity for 100-dB SPL 0.7 V rms sine wave at 1 kHz; THD 0.3% at 1 kHz, 100 dB SPL; sensitivity 0.7 V rms pink noise; THD 0.3% at 1 kHz, 100 dB SPL; adjustable cushioned vinyl headband with adjustable stainless-steel yokes and sliders and Pneumatic ear cushions; includes 10-ft coiled cord; 15.9 oz less cord...

K/6A/L Dynamic Stereophones
Frequency response 10-16,000 Hz; THD less than 1% at 1 kHz, 100 dB SPL; sensitivity 0.14 V rms for 100-dB SPL; impedance 100 ohms at 1 kHz; individual volume controls; supplied with 10-ft coiled cord, 14 oz, 1.8 oz (exclusive of cord)...

K/6A. Same as K/6ALC but with volume controls; sensitivity 0.15 V rms for 100-dB SPL...

K/6ALC Dynamic Stereophones
Semi-peak-reading VU meters; LED overload indicators; automatic overload detector; wood-grain trim...

HV-230 Stereo Headphones
Vented high-velocity stereo headphones with lightweight polymer film diaphragms; individual volume controls; frequency range 20-20,000 Hz; impedance 8 ohms; lightweight 10-ft coiled cord with plug...

HV-190 Stereo Headphones
Stereo headphones with miniature magnet speaker box mountable in microphone system; frequency range 20-20,000 Hz; impedance matching 8-70 ohms; maximum input...
<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Features/Specifications</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAH-T70 Headphones</td>
<td>High-efficiency high-velocity lightweight headphones with adjustable cushioned handband with click stop control; 3-conductor plug</td>
<td>Frequency range 20-20,000 Hz; sensitivity 100 dB at 1 mW;</td>
<td>$55</td>
</tr>
<tr>
<td>EAH-T5</td>
<td>Similar to EAH-T70 without click stop control</td>
<td></td>
<td>$35</td>
</tr>
<tr>
<td>EAH-S3 Stereo Headphones</td>
<td>High-efficiency, high-velocity stereo headphones with form-fitting ear cushions. Features 7-ft straight cord with mini jack; stereo jack adapter; Y adapter for dual listening</td>
<td>1.2 oz</td>
<td>$45</td>
</tr>
<tr>
<td>SP-294 Headphones</td>
<td>Stereo headphones with 2 1/4&quot; dynamic drivers; individual volume controls; 10-ft coiled cord</td>
<td></td>
<td>$25</td>
</tr>
<tr>
<td>SP-94 Headphones</td>
<td>Lightweight dynamic stereo headphones with 2 1/4&quot; drivers. Frequency range 40-15,000 Hz</td>
<td></td>
<td>$11</td>
</tr>
<tr>
<td>HS Stereo Headphones</td>
<td>Lightweight stereo headphone with samarium-cobalt magnets and anoxic copper wire designed to reduce signal attenuation. Frequency range 20-20,000 Hz; sensitivity 96 dB at 1 kHz; maximum input 0.2 W; matching impedance 4-10 ohms; frequency response 20-20,000 Hz</td>
<td></td>
<td>$15</td>
</tr>
<tr>
<td>Red Set II Stereo phones</td>
<td>Ultralightweight stereo headphones with folding headband and cable that ends in 3.5-mm mini plug and comes with 4/4&quot; plug adaptor. Frequency range 20-20,000 Hz; sensitivity 100 dB at 1 mW; maximum input 0.1 W; matching impedance 4-35 ohms; frequency response 20-20,000 Hz; dist. 0.5% at 100-dB SPL; supplied with flat 10-ft cord; 6 oz</td>
<td>$70</td>
<td></td>
</tr>
<tr>
<td>OA-5A Headphones</td>
<td>Lightweight open-air stereo headphones with 1.5-in samarium cobalt dynamic drivers; input impedance 100 ohms 10% at 1 kHz; maximum input 0.25 W/ch continuous; sensitivity 110 dB SPL at 0.2 V in; frequency response 20-22,000 Hz</td>
<td></td>
<td>$30</td>
</tr>
<tr>
<td>OA-4 Headphones</td>
<td>Lightweight stereo headphones with 3/4-in. dynamic high-velocity drivers with synthetic film diaphragms and samarium cobalt magnets. Frequency response 10-20,000 Hz;</td>
<td></td>
<td>$50</td>
</tr>
<tr>
<td>Red Set III Stereo Phones</td>
<td>High-velocity stereo headphones with Mylar diaphragms and ultra-lightweight samarium-cobalt magnets and anoxic copper wire designed to reduce signal attenuation. Frequency range 20-20,000 Hz; sensitivity 96 dB at 1 kHz; maximum input 0.2 W; matching impedance 4-35 ohms; frequency response 20-20,000 Hz; dist. 0.5% at 100-dB SPL; supplied with flat 10-ft cord; 6 oz</td>
<td></td>
<td>$25</td>
</tr>
<tr>
<td>OA-7 Headphones</td>
<td>Lightweight open-air design; REE used in permanent magnet compound; foam-cushioned headband earpiece yokes incorporate pivoting system enabling snug fit; nominal input impedance 100 ohms; frequency response 20-22,000 Hz; 5 dB; sensitivity 110-dB SPL at 0.2 W; max. input 0.1 W continuous; dist. 0.5% at 110-dB SPL; supplied with flat 10-ft cord; 6 oz</td>
<td>$70</td>
<td></td>
</tr>
<tr>
<td>OA-3A Headphones</td>
<td>Lightweight open-air design; 15 ohms 10% at 1 kHz; input 0.2 W/channel continuous; sensitivity</td>
<td></td>
<td>$50</td>
</tr>
</tbody>
</table>

**LIGHTWEIGHT HEADPHONES.**

**HEAVYWEIGHT TECHNOLOGY.**

**PICKERING**

**DT 550**

Imagine headphones so light you hardly know they're there, with a frequency range so wide you never miss a note. And imagine what it took to create such headphones — lightweight technology that distinguishes Beyer from the rest.

A copper coil .9mm thick and one-third the weight of conventional headphone coils. A polycarbonate plastic diaphragm so light, rigid and rare it is found only in the world's best mics. It is viscous damped and statistically embossed so it is absolutely perfect for transmitting sound. Imagine using rare samarium cobalt magnets, the strongest material known.

And imagine headphones that will simply over-whelm you with bass response and transparency of sound unheard of except in the finest transducers.

But you don't have to imagine. Just visit your Beyer dealer and try on our new heavyweight line of lightweight headphones. There is something better from Beyer.

**BEYER DYNAMIC, INC.**

5-05 Burns Avenue, Hicksville, NY 11801 • (516)935-8000 in Canada, H. Roy Gray, Ltd.
**SE-50 Stereo Headphones**
Around-the-ear stereo headphones with simulated-leather vinyl headband and ear cushions. Frequency response 20-20,000 Hz; max. input power 1 W; 9-ft 5-in. cord; 8.6 oz without cord. $75

**SE-550**
Similar to SE-660 but weighs 8.1 oz. $55

**SE-450**
Similar to SE-550 but weighs 9.9 oz. $45

**SE-4 Stereo Headphones**
Open-type stereo headphones with simulated-leather vinyl headband and ear cushions. Frequency range 20-20,000 Hz; max. input power 200 mW; 8-ft 2-in. cord; 7.3 oz without cord. $50

**SE-205 Stereo Headphones**
Around-the-ear stereo headphones with simulated-leather vinyl headband and ear cushions. Frequency range 20-20,000 Hz; max. input power 500 mW; 8-ft 2-in. cord; 15 oz without cord. $30

**JC-51 Y-Type Extension Cord**
Two-headphone capability when plugged into standard headphone jack. $10

**PIONEER**

**Master-1S Lightweight Phones**
Lightweight headset with a sensitivity of 103 dB/mW and frequency range of 16-22,000 Hz. Features gold-plated plug; oxygen-free copper litz cord; 10-ft connection cord; click-stop adjustable headband. Max. input 200 mW; 5.2 oz without cord. $130

**SE-L50 Headphones**
Dynamic open-air super lightweight headphones. Features oxygen-free copper litz cord and 10-ft connection cord. Sensitivity 101 dB/mW; frequency range 20-22,000 Hz; max. input power 200 mW; 2.5 oz without cord. $50

**SE-L7 Headphones**
Variable Chamber® open-type stereo headphones with simulated-leather vinyl headband and earpads. Frequency range 20-20,000 Hz; max. input power 200 mW; 9-ft 5-in. cord; 8 oz without cord. $37

**SE-L3 Lite-Phones**
Lightweight stereo headphones. Frequency range 18-22,000 Hz; max. input power 100 mW; 9-ft 5-in. 1.8 oz without cord. $35

**SE-650 Stereo Headphones**
Around-the-ear stereo headphones with simulated-leather vinyl headband and ear cushions. Frequency response 20-20,000 Hz; max. input power 1 W; 9-ft 5-in. cord; 8.6 oz without cord. $75

**NOVA-10 Stereo Headphones**
High-efficiency 2-in speakers; adjustable vinyl headband with cushioned earpads; frequency response 50-15,000 Hz; has 10-ft cord and 4-in plug. $15

**NOVA-16**
Similar to NOVA-10 except has separate Glide Path® level controls. $20

**REALISTIC**

**PRO-IIA Stereo Headphones**
Professional headphones with 12 sq in mylar diaphragm speakers and 1-in voice coils; adjustable padded headband with anointed ear cushions; frequency response 10-20,000 Hz; comes with 10-ft coiled cord and standard 1/4-in plug; 4-16 ohm impedances; 19 oz. $50

**LV-10 Stereo Headphones**
High-velocity vented back headphones with 2-in dynamic elements; frequency response 20-20,000 Hz; 4-16 ohm impedance; acoustic foam earpieces and soft vinyl-covered headband with self-adjusting yokes; 10-ft coiled cord and plug. $42

**PRO-30 Stereo Headphones**
Lightweight single-phase stereo headphones with low-mass planar driver and rare-earth magnets; lightweight coiled cord. $40

**ST66 Ultralightweight Headphones**
High-efficiency 2-in dynamic drivers; frequency response 20-20,000 Hz; 4-16 ohm impedance; cushioned earcups; padded adjustable headband; 10-ft coiled cord and 4-in plug. $25

**ST69 High-Performance Stereo Headphones**
Stereo headphones with variable controls. Features lightweight "high-velocity" samarium-cobalt magnets; stereo/mono switch; volume and tone controls. Frequency range 20-22,000 Hz; sensitivity 102 dB at 1 kHz; impedance 30 ohms; maximum input 0.5 watt. Comes with 10-ft cable with stereo phone plug. $20

**NOVA-PRO Stereo Headphones**
High-acoustic-isolation stereo headphones with low-mass polyester drivers; volume controls on each earcup; frequency response 20-20,000 Hz; 4-16 ohm impedance; cushioned headband; 10-ft coiled cord. $37

**NOVA-40 Stereo Headphones**
3½-in dynamic drivers; frequency response 30-18,000 Hz; 4- to 16-ohm impedance; soft cushion earcups; padded adjustable headband; 10-ft coiled cord and 4-in plug. $25

**HD430 Headphones**
"Open-air" design dynamic headphones; frequency response 16-20,000 Hz; SPL 94 dB at 1 mW; THD 1.0%; 200-ohm nominal impedance; double-walled circumaural foam earpads cover entire ear; includes steel-stranded detachable 3000-mm cable; 252 g. $144

**SANSUI**

**SS-40 Headphones**
Thin polyester 2½-in wide dynamic drivers; frequency response 20-20,000 Hz; 25-ohm impedance; max. input 500 mW; sensitivity 108 dB/mW; 6-ft cord; 13.1 oz. $42

**SS-30 Headphones**
Thin polyester 2¼-in wide dynamic cones; frequency response 20-20,000 Hz; max. input 500 mW; 8-ohm impedance; 1.15 oz. $30

**SENNHEISER**

**HD224 Headphones**
Dynamic stereo headphones; frequency response 16-20,000 Hz; SPL 94 dB at 1 mW; THD 1.0%; 200-ohm nominal impedance; double-walled circumaural foam earpads cover entire ear; includes steel-stranded detachable 3000-mm cable; 252 g. $144

**TDK**

**RECOTON**

**ST-22 Stereo Headphones**
Dynamic stereo headphones; all aluminum ear cases; leathery-soft ear cushions and headband; volume control for each channel; frequency response 20-22,000 Hz; 8-ohm impedance; 4-16 ohms matching impedance; sensitivity 110 dB at 1000 Hz; 1-mW max. input 0.5 W; 3-in dynamic speakers; 10-ft coiled cord. $30

**ST-16 Stereo Headphones**
Volume control for each channel; stereo-mono slide switch; frequency response 18,000 Hz; 8-ohm impedance; soft adjustable padded headband; soft ear cushions; 10-ft coiled cord with stereo phone plug. $20

**Power Drive® Series**

**ST68 High-Velocity Stereo Headphones**
Stereo headphones with volume controls. Features lightweight "high-velocity" samarium-cobalt magnets; stereo/mono switch; volume and tone controls. Frequency range 15-22,000 Hz; sensitivity 102 dB at 1 kHz; impedance 30 ohms; maximum input power 0.5 watt. Comes with 10-ft cable with stereo phone plug. $43

**ST77 Ultralightweight Stereo Phones**
Designed for all mini recorders and players and includes an adaptor for standard receivers. Weight is only 1.85 oz, less cable. Sensitivity 98 dB at 1 kHz; frequency range 20-25,000 Hz; impedance 25 ohms; maximum input 0.3 watt. Comes with 10-ft cable with mini plug and "4" stereo adapter. $38

**ST66 Ultralightweight Headphones**
Designed for all mini recorders and players; stereo headphones weigh only 2.47 oz exclusive of cable. Sensitivity 98 dB at 1 kHz; frequency range 20-25,000 Hz; input impedance 25 ohms; maximum input 0.4 watt. Comes with 10-ft cable with mini plug and "4" stereo adapter. $43

**CETON**

**HD-300 Headphones**
"Open-air" design dynamic headphones; frequency range 16-20,000 Hz; 8-ohm impedance; 1.7 oz; 10-ft coiled cord; 4-in plug. $45
1982 EDITION

2 microns thick; suede-finish inner headband construction and pivoting porous vinyl ear pads. Passive impedance matching transformer adapter features stereoheadphone/speaker operation and hi/lo stereo headphone sensitivity switches; two dual-color LED arrays in groups of six, first indicating medium-to-loud normal reproduction and last two indicating high level peaks; no external power required; can accommodate two headsets. Frequency response 20-20,000 Hz ± 2 dB; sensitivity 100 dB at 1 V, 1000 Hz; THD 0.1% at 110-dB SPL; matching impedance 4-16 ohms; includes 8.2-h cord with special plug and 3.9-ft adapter cable with four-conductor plug. Stereoheadphone 9.7 oz with cord; adapter 4 lbs; adapter 5.5" H X 2.4" W X 8.7" D ... $275

TK33S. Additional stereoheadphone only for TK33 ... $115

MDR-5A. Frequency response 16-22,000 Hz; sensitivity 101 dB/mW; impedance 55 ohms; 55 g less cable ... $80

MDR-3. Frequency response 20-20,000 Hz; sensitivity 96 dB/mW; impedance 32 ohms; 40 g less ... $50

MDR-2. Similar to MDR-3 ... $40

DR-5S. Volume and tone control; 385 g ... $45

DR-4. Volume control; 375 g ... $40

STANTON
Stereo/Wafers XXI Headphones
Ultra-lightweight professional-type stereo headphones; input impedance 4-16 ohms; sensitivity 2 V for 100 dB SPL; max. input power 0.1 W continuous; dist. 0.5% at 200-dB SPL; 100-ohm impedance at 1 kHz; brushed blue denim finish; supplied with 10-ft flat cord with heavy-duty plug; 5.9 oz. ... $70

Dynaphase 55 Headphones
Lightweight open-air stereo headphones with 1.5-h samarium cobalt dynamic drivers; input impedance 100 ohms ± 10% at 1 kHz; max. Input 0.25 W/ch continuous; sensitivity 110 dB SPL at 0.2 V in, 1000 Hz/ch; frequency response 20-22,000 Hz; dist. 0.25% at 110-dB SPL at 1000 Hz; adjustable padded-vinyl headband with pivot yokes and nylon tricot-covered foam ear cushions; 10-ft 4-conductor cord with no-break connector; in

103
Micro/Wafer XII Headphones
Super-lightweight open-ear stereo headphones with 24-in. dynamic high-velocity drivers with synthetic film diaphragms and samarium cobalt magnets; frequency response: 20-20,000 Hz; distortion: 0.5% at 100 dB SPL at 1 kHz; impedance: 105 dB SPL at 1000 Hz/c; input impedance: 40 ohms at 1 kHz; max. input: 0.2 W/ch continuous; adjustable lightweight headband with multi-density polyurethane foam earcushions; includes adapter plug for use with portable radios, TV sets, and tape recorders; 7-ft Y-type straight cord with plug; 2 oz less cord. $50

Dynaphase 35 Headphones
Dynamic headphones with open-ear construction and 23-in. Mylar diaphragm; 15-ohm impedance; frequency response 20,000 Hz; sensitivity 0.1 V for 100-dB SPL at 1 kHz; 0.5% at 110-dB SPL; max. input: 0.2 W/ch continuous; extend-adjustable headband with pivot yokes, padded vinyl cover, and vinyl-covered foam cushions; supplied with 10-ft cord and molded connector; 7 oz. $45

Dynaphase 25 Headphones
Lightweight open-ear stereo headphones with dynamic high-velocity drivers with 1-in polyester diaphragms; frequency response: 10-20,000 Hz; max. input: 0.2 W/ch continuous; adjustable padded vinyl headband with soft vinyl-covered foam cushions; includes adapter plug for use with portable radios, TV sets, and tape recorders; 7-ft Y-type straight cord with plug; 3 oz less cord. $30

STUDER/REVOX
RH 310 Stereo Headphones
Open-ear headphones designed for amplifiers rated for 4-600 ohm load impedances; frequency response 20-20,000 Hz. $80

SUPEREX
PEP-81 Electrostatic System
Consists of PEP-81 headphones and CC-81 control console; headphone frequency response: 15-18,000 Hz ± 2 dB, 10-22,000 Hz ± 5 dB; dist. 0.2%; impedance-matched to CC-81 for 4-16 ohms; isolation-type headphones with fully adjustable vinyl-covered headband and foam cushions and 15-ft coiled cord; control console has level controls for both channels (20-db range); speaker phone rocker, on/off switch; can accommodate two sets of headphones; requires 5 W per channel min. drive; console size 11" x 3 1/4" x 6 1/2". $150

PEP-79E Electrostatic System
Consists of PEP-79 headphones and CC-79E control console; headphone frequency response: 15-18,000 Hz ± 2 dB, 10-22,000 Hz ± 5 dB, negligible dist.; impedance-matched to CC-79E for 4-16 ohms; trans-air lightweight headphones with fully adjustable vinyl-covered headband and foam cushions and 15-ft coiled cord; control console is designed for use with main amp level controls, has self-protecting circuits; 2 1/2"H X 7"W X 4 1/2". $90

SM-700 Headphones
Dynamic headphones with 24-in Mylar diaphragm; 35-ohm impedance; frequency response: 10-20,000 Hz ± 3 dB; sensitivity 10 mW (0.6V) for 110 dB at 400 Hz; 0.25% at 400 Hz, 110-dB SPL; padded, fully adjustable steel and aluminum headband with foam-filled vinyl cushions; supplied with 15-ft cable,clipping clip, and molded stereo plug. $70

PRO B VI Stereophones
Each earcup features dynamic woofer, ceramic tweeter, and LC/C crossovers; input impedance: 4.16 ohms; frequency response: 15-22,000 Hz; fully adjustable, vinyl-covered and padded spring steel headband with vinyl covered urethane foam cushions; includes 10-ft coiled cord and plug. $60

Classic CL-1 Headphones
Lightweight, isolating-type headphones; frequency response: 10-22,000 Hz; 0.4% dist. at 110-dB SPL (400 Hz); sensitivity: 50 mV (0.6V) for 110-dB SPL at 400 Hz; padded fully adjustable steel and aluminum headband with foam-filled vinyl cushions; 15-ft (extended) retractable cable with clipping clip; and molded stereo plug; 10.6 oz (without cable). $60

TRL-99 Headphones
Dynamic headphones with 2 x 24-in Mylar diaphragm; 35-ohm impedance; frequency response: 15-20,000 Hz at 4 dB; sensitivity 6 mV for 100-dB SPL; 0.4% dist. at 400 Hz, 110-dB SPL; padded, fully adjustable aluminum and steel headband; urethane foam, snap-on cushions; 15-ft (extended) retractable cable with clipping clip; and molded stereo plug; $70

TRL-88 Trans-Lineal Headphones
 Featherweight open-air stereo headphones with 1.75-in micro-Mylar transducers; frequency response: 18-24,000 Hz; dist. 0.5%; 7-ft Y cord with molded plug; 4.25 oz. $50

TRL-3 Trans-Lineal Headphones
Open design headphones; frequency response: 20-20,000 Hz ± 2 dB; 5-7 dB bass boost between 70 and 200 Hz; 80-ohm impedance; 0.6% dist. at 110 dB (400 Hz); sensitivity 6 mV for 100-dB SPL; max. input 5 V; padded, fully adjustable aluminum and steel headband; urethane foam, snap-on cushions; 15-ft (extended) retractable cable with clipping clip, molded plug, and strain relief; 8.5 oz. $45

DP-903 Monitor Phone
Single hand-held earphone with swivel grip; blends left and right channels into single earphone; frequency response: 20-19,000 Hz; 180-ohm impedance; 400 Hz; 0.25% dist. at 400 Hz, 110-dB SPL; padded, max. input 10 W; HD -50 dB at 90-dB SPL, 20,000 Hz; output 103 dB/mW SPL; impedance 100 ohms; urethane foam-padded earcups, leather finish head strap, universal ball-join, lightweight adjustable headband and fully adjustable height-adjusting sliders; includes 9-ft cord with stereo plug; 19 oz with cord. $220

YAMAHA
YH-1000 Stereo Headphones
Orthodynamic-design headphones with 12.7-micro-iron 30-mg polyester film diaphragm between cerrium cobalt disc magnets; frequency response 20-20,000 Hz; output 105 dB/mW SPL; 3.5 dB rated input, max. input: 10 W; HD -50 dB at 90-dB SPL, -30 dB at 120-dB SPL; impedance 100 ohms; urethane foam-padded earcups, leather finish head strap, universal ball-join, lightweight adjustable adjustable headband and fully adjustable height-adjusting sliders; includes 9-ft stereo cord with stereo plug; 19 oz with cord. $220

YH-1 Stereo Headphones
Lightweight orthodynamic design featuring sintered ferrite disc magnets with combination voice-coil diaphragm between; frequency response 20-20,000 Hz; max. input power: 1000 mW; 53-ohm impedance; 0.5% dist. at 100 dB; 3-meter cord; Supra-Aural ear pads; precision fit, soft, wide-contact leather head pads; 230 g. $40

EAH-1810 Linear-Drive Headphones
Open-ear environment wavefront response at eardrum; frequency range: 20-25,000 Hz; max. input power: 1000 mW; 53-ohm impedance; 0.5% dist. at 100 dB; 3-meter cord; Supra-Aural ear pads; precision fit, soft, wide-contact leather head pads; 230 g. $40

TOSHIBA
HR-811 Headphones
Complimentary back electret push-pull, full-face drive system; 2.5-micron diaphragm; frequency response: 20-30,000 Hz; 8.4 oz; adapter. $75

HR-X1 Headphones
Complimentary back electret push-pull, full-face drive system; 2.5-micron diaphragm; frequency response 20-20,000 Hz; 5.6 oz; adapter. $65

HR-F1 Headphones
Complimentary back electret push-pull, full-face drive system; 2.5-micron diaphragm; frequency response 20-20,000 Hz. $50

YAMAHA

UHER by WALTER ODEMER

W675 Featherweight Headphones
Lightweight (2.2 oz) mono/stereo headphones with 8-ft coiled cord; frequency response: 20-20,000 Hz; 200-ohm impedance (1 kHz); has lightweight adjustable headband and yellow foam-cushioned earpieces. With five-pin plug for Uher cassette recorders. $84

W 775 Stereo Headphones
Dynamic stereo headphones with one active and six aux. membranes per system; half-open design; frequency response: 16-20,000 Hz; SPL 94 dB; max. input: 200 mW; HD =100 dB at 106-dB SPL, 1000 mW; 63-ohm impedance; 0.5% dist. at 100 dB; 3-meter cord; Supra-Aural ear pads; precision fit, soft, wide-contact leather head pads; 340 g less cord. $184

YAMAHA
MICROPHONES

AKG

D-40 Stereo-Pair Microphones
Package contains two D-40 low-impedance cardioid dynamic microphones, stand adapters, cab-... $99

D-125E Cardioid Microphone
Cardioid dynamic microphone, stand adapters, case; 2.5" dia. X 7" L; nickel-plated zinc alloy diecast housing; includes SA-31 stand adapter and case; 7.5" dia. X 12 oz. $150

D-300B Hyper Cardioid Microphone
Hyper cardioid dynamic microphone with elastomer shock-suspended plug-in field-replaceable transducer designed for professional vocalists; frequency range 20-20,000 Hz; sensitivity -60 dBm; impedance 200 ohms; dual windscreen/pop filter; nickel-plated zinc alloy diecast housing; includes SA-31 stand adapter and case; 2" dia. X 7.5" L; 12 oz. $150

D-1000E Cardioid Microphone
Cardioid dynamic microphone with elastomer shock-mounted transducer; doubles as studio microphone in home, studio, or on stage; frequency response 40-20,000 Hz; sensitivity -58 dBm; 200-ohm impedance; supplied with SA-30 stand adapter and case; 1.75" dia. X 7" L; 8 oz. $110

D-160E Omnidirectional Microphone
Omnidirectional dynamic microphone designed for newsmen and ENG applications; frequency range 50-15,000 Hz; sensitivity -54.5 dBm; impedance 200 ohms; supplied with SA-30 stand adapter and case; 1.75" dia. X 7" L; 9 oz. $100

D-310. Similar to D-310S without integral on/off switch ........................................... $115

D-320B Hyper Cardioid Microphone
Hyper cardioid dynamic microphone with elastomer shock-suspended field-replaceable transducer designed for professional entertainers; features three-position EQ switch and hum rejecter; frequency range 20-20,000 Hz; sensitivity -57 dBm; impedance 200 ohms; dual windscreen/pop filter; nickel-plated zinc alloy diecast housing; includes SA-31 stand adapter and case; 2" dia. X 7.5" L; 10.5 oz. $150

D-330BT Hyper Cardioid Microphone
Hyper cardioid dynamic microphone with elastomer shock-suspended plug-in field-replaceable transducer designed for professional vocalists; features dual windscreen, pop filter, nickel-plated zinc alloy diecast housing; includes SA-31 stand adapter and case; 2" dia. X 7.5" L; 12 oz. $185

D-310S Cardioid Microphone
Cardioid dynamic microphone with elastomer shock-suspended transducer; designed for vocal music coverage in the home, studio, or on stage; frequency response 50-20,000 Hz; sensitivity -56 dBm; impedance 200 ohms; features integral on/off switch, windscreen/pop filter, and hum rejecter; nickel-plated zinc alloy diecast housing; includes SA-30 stand adapter and case; 1.75" dia. X 7.5" L; 8.5 oz. $130

D-310. Similar to D-310S without integral on/off switch ........................................... $115

D-320B Hyper Cardioid Microphone
Hyper cardioid dynamic microphone with elastomer shock-suspended field-replaceable transducer designed for professional entertainers; features three-position EQ switch and hum rejecter; frequency range 20-20,000 Hz; sensitivity -57 dBm; impedance 200 ohms; dual windscreen/pop filter; nickel-plated zinc alloy diecast housing; includes SA-31 stand adapter and case; 2" dia. X 7.5" L; 10.5 oz. $150

D-330BT Hyper Cardioid Microphone
Hyper cardioid dynamic microphone with elastomer shock-suspended plug-in field-replaceable transducer designed for professional vocalists; features dual windscreen, pop filter, nickel-plated zinc alloy diecast housing; includes SA-31 stand adapter and case; 2" dia. X 7.5" L; 12 oz. $185

D-1000E Cardioid Microphone
Cardioid dynamic microphone with elastomer shock-mounted transducer; doubles as studio microphone in home, studio, or on stage; frequency response 40-20,000 Hz; sensitivity -58 dBm; 200-ohm impedance; supplied with SA-30 stand adapter and case; 1.75" dia. X 7" L; 8 oz. $110

D-190E Cardioid Microphone
Cardioid dynamic microphone for speech or music performing and recording; frequency range 30-15,000 Hz; sensitivity -52 dBm; 200-ohm impedance; supplied with SA-23/2 stand adapter and case; 1.5" dia. X 5 1/2" L; 4.5 oz. $110

D-190E. Same as D-190E with integral on/off switch ........................................... $110

D-200E Two-Way Cardioid Microphone
Cardioid dynamic two-way microphone for the semi-professional recordist and musician; frequency range 25-16,000 Hz ± 3 dB; sensitivity -56 dB/1000 dynes/cm²; 50,000 ohm impedances; mike stand adapter; 20-ft cable; 10 1/4"x2 1/8" dia. $205

D-1000E Cardioid Microphone
Cardioid dynamic microphone with elastomer shock-mounted transducer; doubles as studio microphone in home, studio, or on stage; frequency response 40-20,000 Hz; sensitivity -58 dBm; impedance 200 ohms; supplied with SA-30 stand adapter and case; 1.75" dia. X 7" L; 8 oz. $150

D-310S Cardioid Microphone
Cardioid dynamic microphone with elastomer shock-suspended transducer; designed for vocal music coverage in the home, studio, or on stage; frequency response 50-18,000 Hz; sensitivity -56 dBm; impedance 200 ohms; features integral on/off switch, windscreen/pop filter, and hum rejecter; nickel-plated zinc alloy diecast housing; includes SA-30 stand adapter and case; 1.75" dia. X 7.5" L; 8 oz. $110

D-310S Cardioid Microphone
Cardioid dynamic microphone with elastomer shock-suspended transducer; designed for vocal music coverage in the home, studio, or on stage; frequency response 50-18,000 Hz; sensitivity -56 dBm; impedance 200 ohms; features integral on/off switch, windscreen/pop filter, and hum rejecter; nickel-plated zinc alloy diecast housing; includes SA-30 stand adapter and case; 1.75" dia. X 7.5" L; 8 oz. $110

D-310. Similar to D-310S without integral on/off switch ........................................... $115

C-414B Polycylindrical Condenser Microphone
FET condenser microphone with large-diaphragm capsule; features selectable omni, cardioid, hypercardioid, or figure-eight pattern, three-position (flat/75 Hz/150 Hz) bass roll-off switch, and 0/-10/-20 dB attenuation switch; frequency response 20-20,000 Hz (all patterns); sensitivity -43.5 dBm; max. SPL 138 dB with 0.4% THD; impedance 200 ohms; 12/48 V phantom powered; supplied with SA-18/3 stand adapter, W-26 windscreen, and case ........................................... $730

C-414E1. Same as C-414B except has nine selectable polar patterns via phantom-powered remote control; remote control unit can operate two microphones independently; includes one microphone, 5-42E1 remote control, MK-23/2066 ft cable, W-26 windscreen, SA-18/3 stand adapter, and case ........................................... $1400

C-450 Modular Condenser Microphone System
Modular system consists of three interchangeable preamps, seven interchangeable small-diaphragm capsules, and associated accessories. All C-450 FET preamps have 5-30,000 Hz frequency range, 200-ohm source impedance, and 500-ohm load impedance; C-451E preamp has 9-52 V power; C-451EB and C-452EB have two-position bass roll-off, choice of matte-nickel or satin-black finish. All capsules are condenser-designed and have frequency range of 20-20,000 Hz. Capsules available are CK-1 cardioid, CK-1S cardioid with rising response, CK-4 figure-eight, CK-5 cardioid with shock-suspended transducer and integrated windscreen/pop filter, CK-8 short shotgun, CK-9 long shotgun, and CK-22 omnidirectional with built-in pop filter. Preamp and capsule combinations available either separately or in combinations:

C-451E preamp ........................................... $340
C-451EB preamp ........................................... $360
C-452EB preamp ........................................... $384
CK-1 cardioid ........................................... $112
CK-1S cardioid ........................................... $106
CK-4 figure-eight ........................................... $290
CK-5 cardioid ........................................... $315
CK-8 short shotgun ........................................... $205
CK-9 long shotgun ........................................... $245
CK-22 omnidirectional ........................................... $119

ARISTA

Cardioid Microphones
663. Cardioid electret microphone; frequency response 40-15,000 Hz; attachable windscreen; stand adapter; 20-ft cable; 10 1/4"x7 1/4" dia. ........................................... $47
605. Dual impedance cardioid dynamic microphone; frequency response 40-15,000 Hz; 600 and 50,000 ohm impedances; mike stand adapter; 20-ft black shielded cable; triple mesh windscreen $39

Omnidirectional Microphones
666. Ultra-miniature lavalier electret microphone; frequency response 30-16,000 Hz; 600-ohm impedance; plug assembly houses FET pre-amp; 20-ft cord ........................................... $44
651. Dynamic "night club" effect omnidirectional reverberation microphone features variable echo; frequency response 55-10,000 Hz, -74 dB output; 20 ft cord; stand included ........................................... $55

AUDIO-TECHNICA U.S.

AT814 Unidirectional Microphone
Moving-coil dynamic cardioid microphone designed for newsmen and ENG applications; frequency range 50-16,000 Hz; sensitivity -56 dB (0 dB -1 mW / 10 dynes/cm²); EIA sensitivity -150 dB; 250-ohm nominal impedance; features high-efficiency windscreen and balanced low-impedance output; includes 16.5-ft cable with XLR/A3M professional connector with 1/4" in phone plug, tapered slip-in stand clamp, and carrying case ........................................... $125
AT814/XLR. AT814 with XLR / A3M connector on output end of cable ........................................... $130
**MICROPHONES**

**AT813 Unidirectional Microphone**
Incorporates electret condenser permanently polarized element; 6-micron polymer diaphragm; frequency response 20-20,000 Hz; sensitivity -56 dB; 600-ohm nominal impedance; input SPL 250 dB; S/N ratio 1 kHz, 1 µbar; AA penlight battery powered; supplied with 18.5-ft cable with professional XLR/3-pin connector with XLR, slip-in stand clamp, battery, carrying case...$110

**AT813/XLR. AT813 with XLR/3M connector on output end of cable**...$115

**AT812 Unidirectional Microphone**
Incorporates moving-coil dynamic element; frequency response 50-20,000 Hz; sensitivity -56 dB; 600-ohm nominal impedance; max. input SPL 130 dB; S/N ratio 50 dB (1 kHz, 1 µbar); battery powered; supplied with professional XLR connector with XLR, slip-in stand clamp; carrying case...$97

**ATH805S Miniature Omni Mic**
Electret condenser permanently charged element; omnidirectional pattern; frequency response 50-15,000 Hz; sensitivity -56 dB; 600-ohm impedance; max. input SPL 130 dB; S/N ratio 50 dB (1 kHz, 1 µbar); includes slip-on desk stands and 13-ft cables with 1/4" phone plug...$90

**ATM91 Unidirectional Microphone**
Cardioid microphone with permanently polarized fixed-charge condenser element; 4-micron gold vaporized diaphragm; designed for vocal applications; frequency response 70-18,000 Hz; sensitivity -56 dB; EIA sensitivity -150 dB; 600-ohm impedance; max. input SPL 150 dB; S/N ratio 50 dB at 1 kHz; 1 µbar; leak-proof UM3 AA battery-powered; includes slip-in stand clamp and carrying case...$140

**ATM21 Unidirectional Microphone**
Cardioid microphone with moving-coil dynamic element; designed for instrumental applications; frequency response 50-18,000 Hz; sensitivity -56 dB; EIA sensitivity -150 dB; 600-ohm impedance; includes slip-in stand clamp and carrying case...$140

**ATM21SM. Same as ATM21 except supplied with shock mount and windscreens in fitted case**...$125

**ATM31 Unidirectional Microphone**
Cardioid microphone with permanently polarized fixed-charge condenser element; 4-micron gold vaporized diaphragm; frequency response 40-20,000 Hz; sensitivity -55 dB; EIA sensitivity -149 dB; 600-ohm impedance; max. input SPL 125 dB; S/N ratio 60 dB at 1 kHz, 1 µbar; leak-proof AA battery-powered; includes slip-in stand clamp and carrying case...$120

**ATM11 Unidirectional Microphone**
Cardioid microphone with permanently polarized fixed-charge condenser element; designed for instrument applications; frequency response 50-20,000 Hz; sensitivity -56 dB; EIA sensitivity -150 dB; 600-ohm impedance; max. input SPL 130 dB; S/N ratio 50 dB at 1000 Hz, 1 µbar; leak-proof UM3 AA battery-powered; includes slip-in stand clamp and carrying case...$120

**ATM11 SM. Same as ATM11 except supplied with shock mount and windscreens in fitted case**...$140

**ATM10. Similar to ATM11 but omnidirectional pattern; frequency range 40-18,000 Hz; sensitivity -48 dB; EIA sensitivity -142 dB, max. input SPL 125 dB**...$105

**AT805S Microphone**
Cardioid microphone with built-in shock mount and windscreen in fitted case...$125

**GC/AUDIOTECH**

**30-2388 Electret Microphone**
Tubeless omnidirectional microphone with built-in self-powered FET preamp, suitable for studio and home use. Features foam wind screen; on/off switch; microphone holder; aluminum housing with matte black finish; electret condenser element; 1.5-volt battery operation. Frequency range 50-16,000 Hz; impedance 600 ohms; output level -65 Comes with 20-ft cable with 1/4" plug...$24

**30-2388 Omnidirectional Microphone**
Dual-impedance omnidirectional microphone with built-in pop and wind screen, on/off switch, swivel holder. Frequency range 100-10,000 Hz; impedance 250 or 50k ohms; output level -62 to 60 dB at 50k ohms. Comes with 15-ft cord with 1/4" plug...$34

**30-2584 Lapel-Style Microphone**
Ultraminiature electret microphone with tie clip. Attaches to battery power supply. Suitable for PA, broadcasting, general taping use; black plastic housing; chrome tie clip; can be unplugged from battery to conserve power. Frequency range 50-16,000 Hz; impedance 1000 ohms; output level -63 dB at 1 kHz. Comes with 13-ft cable with 1/4" phone plug...$20

**30-2383 Omnidirectional Microphone**
Cardioid microphone for public speakers, general taping use. Has on/off switch. Frequency range 70-12,000 Hz; impedance 30,000 ohms; output level -57 ±3 dB. Comes with 16.5-ft cable with phone plug, neck strap...$16

**30-2382 Stereo Electret Microphone**
Unique single microphone has two matched unidirectional elements for separate channels. Has anodized aluminum and chrome body; self-contained wind screen on which are indicated left and right channels. Frequency range 50-16,000 Hz; impedance 600 ohms; output level -60 dB at 1 kHz. Comes with 9.9-ft cable with two 1/4" plugs...$37

**30-2378 Unidirectional Electret Microphone**
Tubeless microphone has built-in self-powered condenser type FET preamp and operates 10,000 hours on 1.5-volt battery. Suitable for studio recording, vocal and instrumental music, etc., and has built-in wind screen for outdoor use. Gold anodized aluminum housing. Frequency range 30-16,000 Hz; impedance 600 ohms; output level -68 dB at 1 kHz. Comes with 20-ft heavy-duty cable with 1/4" plug...$90

**30-2376 Low-impedance Dynamic Microphone**
Sturdy plastic body and chrome wind screen, appropriate for general indoor/outdoor use. Frequency range 100-13,000 Hz; impedance 500 ohms; output level -61 dB at 1 kHz. Comes with holder, vinyl carrying case, 25' low-impedance cable with 1/4" plug...$37

**30-2374 High/low-impedance Microphone**
Dual-impedance dynamic mike allows matching to amplifier, tape recorder, etc. Attractive chrome housing and finish; 149 dB sensitivity; frequency range 80-15,000 Hz; impedance 500 or 50k; output level -72 dB at 50k ohms, -52 dB at 50k ohms at 1 kHz. Comes with mike holder, 20-ft shielded cable with 1/4" plug. Connects to cable via 4-pin screw-type connector...$28
30-2373 Cardioid Dynamic Microphone
Cardioid response pattern minimizes sound pickup from rear and sides to reduce feedback problem. Built-in pop and wind screen, on/off switch, swivel from rear and sides to reduce feedback problem. 30-2373 Cardioid Dynamic Microphone...

30-2372 Low-impedance Dynamic Microphone
Professional-quality mike constructed for reliability and long life. Attractive black housing and wind screen. Pickup pattern minimizes background noise. Frequency range 60-15,000 Hz; impedance 200 ohms; output level —75 dB at 1 kHz. Comes with vinyl storage case, holder, 20-ft shielded cable with 4" phone plug and 3-pin microphone connector...

30-2302 High-impedance Taping Microphone
Designed to improve sound of many portable recorders. Features on/off switch. Frequency range 50-13,000 Hz; impedance 300 ohms at 1 kHz; polar pattern omnidirectional; output level —60 dB ± 3 dB at 1 kHz. Comes with 4.5-ft cable with 2.5- and 3.5-mm plugs, desk stand...

30-2308 Matched-Pair Stereo Microphone
Sensitivity omnidirectional response pattern minimizes feedback. Features on/off remote-control switch, wind screen, desk stand. Frequency range 100-10,000 Hz; impedance 500 ohms at 1 kHz; output level —74 dB ± 3 dB at 1 kHz. Comes with 4.3-ft cables with 4" phone plugs...

Beyer Dynamic, Inc.

M-130 Bi-Directional Ribbon Microphone
Figure-8 bidirectional ribbon microphone incorporating two 0.012-inch aluminum ribbons that move above and below each other with 0.020-inch separation, designed for studio broadcasting or recording; frequency response 40-18,000 Hz; sensitivity —125 dBm (EIA); output level —62 dBm; 200 ohms; swivel and clamp; suspension; comes with 16' and 2-1/2' cables, two table stands, mic cord in black leatherette case; black matte finish; 5.47" L...

M-160 Super Cardioid Ribbon Mic
Super-cardioid dynamic double-ribbon microphone; frequency response 40-18,000 Hz ± 2.5 dB; sensitivity —152 dBm (EIA); 200-ohm impedance; low self-noise at 120 degrees to axis; suitable for stereo recording; Cannon XLR terminology...

M-88 Super Cardioid Moving-Coll Mic
Super-cardioid dynamic frequency response 30-20,000 Hz ± 2.5 dB; sensitivity —144 dBm (EIA); special transducer mounting eliminates body noise; will withstand rough handling, humidity and temperature changes; for studio work, recording artists, and instrumentalists...

M-500 Unidirectional Microphone
Hypercardioid dynamic ribbon microphone with professional-application tailored presence boost; frequency response 40-16,000 Hz; integral four-stage bass filter for high-level sound sources; includes clamp, 152-ohm clip (115 dBm/1 Pa); 200-ohm impedance; 20 dB side attenuation at 120°; matte black aluminum case; 16¾"-ft, 2-conductor cable with XLR-type connector; leatherette carrying case; 7½ in. long...

M-260-S Super Cardioid Ribbon Mic
Super-cardioid dynamic frequency response 50-20,000 Hz ± 2.5 dB; sensitivity —153 dBm (EIA); high-energy ribbon; 200-ohm impedance; suitable for speech, music, or vocals; has on/off switch and Cannon XLR termination...

M-101 Omnidirectional Moving-Coll Mic
Omnidirectional type; frequency response 40-20,000 Hz; sensitivity —150 dBm (EIA); 200-ohm impedance; withstands pressures associated with modern music (modulated voltages up to 2 V); low handling noise; 4½" x 3¾"; Cannon XLR termination...

M-201 Hypercardioid Dynamic Microphone
Professional application unidirectional dynamic microphone with "hum-bucking" coil construction; frequency response 40-18,000 Hz; sensitivity —149 dBm (EIA), —56 dBm (1mW/Pa); impedance 200 ohms electrical, 1 kohm minimum for more load; more than 20 dB side attenuation at 120°; 18½"-ft, 2-conductor cable and Switchcraft A3F connector; matte black brass case with windscreen, clamp, 6.3-in. long...

M-111 Omnidirectional Leveller Microphone
Miniature omnidirectional leveller microphone with filter providing flat frequency response when unit is suspended over chest; designed for TV broadcasting; frequency response 60-15,000 Hz (decreases 6 dB between 700-800 Hz and rises to 8 dB from 1000-10,000 Hz); output —62 dBm; 200-ohm impedance; milled inner chassis; suspended within outer housing; available with standard Cannon three-pin connector or one-meter cable and 6-pin connector for use with company's TS-730 small-diameter microphone transmitters; clamp and cord in black leatherette case; matte black finish; 3.35"L...

M-112 Similar to M-111 minus chest filter; zinc-alloy diecast case...

MCE-5 Omnidirectional Microphone
Broadcast-quality clip-on omnidirectional electret condenser microphone designed for on-camera applications; frequency response 60-15,000 Hz; sensitivity —141 dBm; electrical impedance 700 ohms; load impedance 2500 ohms; supplied with detachable windscreen and one-meter cable with 6-pin male connector; battery-powered with T3400 (or equiv.), Varta 4023, or Mallory Px23 battery or 12-/48-V phantom-powered; 60-ohm battery life; non-reflecting dark surface; 6.5-oz...

M-69 Cardioid Moving-Coll Microphone
Dynamic cardioid design; frequency response 50-16,000 Hz ± 3 dB; sensitivity —144 dBm (EIA); 200-ohm impedance; for indoor/outdoor applications; unaffected by temperature, humidity...

M-69-5M. Same as M-69 but with on/off and bass-cut switch...

M-400 Moving-Coll Cardioid Microphone
Moving-coil dynamic super-cardioid type; frequency response 50-15,000 Hz; sensitivity —146 dBm (EIA); 200-ohm impedance; on/off switch; three-pin XLR termination; built-in bass filter; 24.6-ft cable; black snood; manufacture case and clamp...

M-400S. Same as M-400 except with on/off switch...

M-818 Matched-Pair Microphone
Cardioid dynamic matched-pair microphones; frequency response —50-16,000 Hz; output level —55.8 dBm; 500-ohm impedance; front-to-back attenuation 16 dB; comes with attached 6.5-ft cables with 4" phone plug, two table stands, mic clamps, stereo adapter cable, mounting bar, and presentation case; 5.47"L...

CALECTO

30-2373 Cardioid Microphone
Cardioid microphone; frequency response 50-20,000 Hz ± 2.5 dB; sensitivity —153 dBm (EIA); high-energy ribbon; 200-ohm imped...

30-2388 Omnidirectional Microphone
Lightweight omnidirectional microphone with satin silver finish; frequency response 100-15,000 Hz; dual-impedance 250/50,000-ohm output; —79 dB (low), —60 dB (high); swivel and 15-ft cable included...

30-2308 Matched-Pair Microphones
Omnidirectional matched-pair stereo microphones for voice and stereo recording applications; on/off switch; windscreen; frequency response 100-15,000 Hz; impedance 250/50,000 ohms; sensitivity —74 dB; includes desk stand and 4-ft cord with plug...

30-2383 Lavaliere Microphone
Hand-held lavaliere microphone; frequency response 70-12,000 Hz; output —57 dB; impedance 30,000 ohms; includes 3-ft cord with miniature phone plug...

Cerwin-Vega

Professional Series

UE-1 Cardioid Microphone
Uni-electret microphone for stage instruments; frequency response 90-20,000 Hz; dual 600- and 10,000-ohm impedances; sensitivity —70 dB ± 3 dB into 800 ohms (0 dB = 1 V/1 ubar); built-in pop filter; on/off switch; includes 16-ft cable with 4" in three-conductor phone plug and Cannon XLR-3-11C equiv. connector; 1.930" X 7.323"...

UD-1 Cardioid Microphone
Unidirectional dynamic microphone for live vocal application or studio use; frequency response 70-15,000 Hz; 600-ohm impedance; sensitivity —73 dB ± 3 dB (0 dB = 1 V/1 ubar); built-in pop filter; on/off switch; includes 16-ft cable with 4" in three-conductor phone plug and Cannon XLR-3-11C equiv. connector; 1.756" X 7.323"...

Crown

Pressure Zone Microphones

Hermetically-sealed, electret microphones engineered to respond to coherent wave front at surface of acoustic boundary, thus eliminating comb filtering; designed for television, theater, concert, and PA applications; reduced pressure-calibrated electret modules mounted within a few millimeters of rigid surface and facing a boundary; need for fewer channels; simplified design for easier set up; handles 152-dB SPL. Equipped with standard power supply of combination transformer, battery, and phantom power supply arranged in 3-in-square metal cube or phantom power supply in cylindrical metal tube with XLR connectors; four models available in gold or black.

General Purpose. XLR connector, electret cap...

Low Profile. Cantilever holding electret capsule, mounted on Z-3 in aluminum plate; XLR connector or at end of several feet of cable, suitable for conference rooms or television programming...

Flush Mount. All connections at section of mike extending below level of capsule, ensuring invisibility of mike; suitable for mounting into podium, lectern, or pulpit; cantilever capsule protected from elements or papers by three small metal pegs...

Lavalier. Smallest model of PZM™, designed to be worn on tie, scarf, or coat...

PZM-315 Pressure Zone Microphone
Designed to complement the PZM 30GP to provide...
**ELECTRO-VOICE**

**644 Cardioid Microphone**
Cardioid very directional microphonic; flat response 40-12,000 Hz; — 53 dB output; switchable high and low impedance; on/off switch; A3F-type mke connector and 15-ft cable with matching connector; gray finish...

$210

**1777 Cardioid Microphone**
Cardioid microphone with electret element; frequency response 60-18,000 Hz; — 54 dB output; —150-ohm impedance; EIA sensitivity — 144 dB; powered by 4.5 V internal battery or 24-28 V phantom supply; A3F-type connector; supplied with 15-ft cable, A3F connector, and stand adapter; zinc and aluminum with non-reflecting gray finish... 

$150

**1776 Cardioid Microphone**
Single-D cardioid electret condenser microphone; frequency response 60-18,000 Hz; — 50 dB output; low impedance; on/off switch; A3F-type mke connector and 15-ft cable with matching connector; supplied with stand adapter; non-reflective gray finish ...

$124

**1776P. Same as 1776 but with 25-ft cable with two professional connectors...**

$131

**671B Cardioid Microphone**
Single-D cardioid dynamic microphone; shaped response 60-14,000 Hz; — 56 dB output (10-2); — 57 dB output (lo-Z); switchable high and low impedance; on/off switch; A3F-type mke connector and 15-ft cable with matching connector; supplied with stand clamp and integral windscreens/pop filter; satin chrome finish...

$97

**660 Super Cardioid Microphone**
Continuously Variable-D super cardioid dynamic microphone; shaped response 90-13,000 Hz; — 56 dB output; switchable high and low impedance; A3F-type mke connector and 15-ft cable with matching connector... 

$100

**660A. Same as 660 with gray finish...**

$100

**630 Omnidirectional Microphone**
Omnidirectional microphone; flat response 60-11,000 Hz; — 55 dB output; switchable high and low impedance; on/off switch; A3F-type connector and 15-ft cable with matching conector; satin chrome finish...

$95

**627C Cardioid Microphone**
Single-D cardioid dynamic microphone; shaped response 60-13,000 Hz; — 58 dB output; switchable high and low impedance; on/off switch; A3F-type mke connector and 15-ft cable with matching connector; supplied with stand adapter; satin chrome finish...

$84

**631B Omnidirectional Microphone**
Omnidirectional microphone; frequency response 80-13,000 Hz; — 56 dB output; switchable high and low impedance; on/off switch; A3F-type connector and 15-ft cable with matching connector; satin chrome finish...

$83

**634B Omnidirectional Microphone**
Omnidirectional dynamic microphone; shaped response 70-16,000 Hz; — 56 dB output; low impedance; EIA sensitivity 60-18,000 Hz; — 57 dB output; high and low impedance models available; integral cable; gray finish...

$54

**Professional Microphone Systems**

**CL42S Condenser Shotgun System**
Cardioid hypercardioid (isolated front above 1 kHz) microphone with electret element; frequency response 90-12,000 Hz; — 33 dB output; 250-ohm impedance; A3F-type connector and small coil cord; supplied with shock mount, handle, and Acoustatom windscreens/fawn beige microcratte finish...

$660

**CH15S Hypercardioid Microphone**
Hypercardioid microphone with electret element; frequency response 55-15,000 Hz; 150 ohm impedance; supplied with miniature shock mount, utility storage case, and windscreens; fawn beige micromate finish...

$508

**DL42 Cardioid Microphone**
Cardioid very directional microphonic; shaped response 50-12,000 Hz; — 50 dB output; long reach pickup; low impedance; integral cable; supplied with carrying case, windscreenshock mount and handle; fawn beige finish...

$453

**667A Cardioid Microphone**
Continuously Variable-D cardioid dynamic microphone; shaped response 40-10,000 Hz; — 51 dB output; boom; low-impedance; pos- sive equalizer switch provides three LF and two HF variations; A3F-type microphone connector and 15-ft cable with matching connector; supplied with integral windscreens/pop filter and shock mount; grey...

$454

**RE20 Cardioid Microphone**
Continuously Variable-D cardioid dynamic microphone; flat response 45-18,000 Hz; — 57 dB output; built-in shock mount and electrostatic shielding; low impedance; bass tilt-down switch; A3F-type microphone connector and 15-ft cable with matching connector; supplied with metal carrying case and stand adapter; non-reflective fawn beige finish...

$417

**CO15P Condenser Omni Microphone**
Omnidirectional phantom-powered electret condenser microphone; designed for up-close studio and stage use; dynamic pickup; frequency response 20-20,000 Hz; 50 speakermencms output; — 45 dB; max. SPL 154 dB at 1000 Hz, 1% THD; equiv. noise level — 26 dB SPL, A weighted; includes 15A windscreens, 310A clamp, and metal carrying cases; grey micromate finish; 7.5 oz...

$265

**RE18 Cardioid Microphone**
Variable-D dynamic cardioid microphone; flat response 90-15,000 Hz; — 57 dB output; integral shock mount; low-profile blast filter; A3F-type microphone connector with 15-ft cable; supplied with stand adapter; non-reflective fawn beige finish...

$251

**CS15P Cardioid Microphone**
Single-D dynamic cardioid microphone; shaped response 40-18,000 Hz; — 45 dB output; remote powering; low impedance; A3F-type microphone connector and 15-ft cable with matching connector; supplied with stand clamp, metal carrying case, and integral windscreens/pop filter; non-reflective fawn beige finish...

$246

**RE55 Omnidirectional Microphone**
Omnidirectional dynamic microphone; frequency response 40-20,000 Hz; — 55 dB output; low impedance; A3F-type microphone connector and 15-ft cable with matching connector; supplied with stand clamp and metal case; fawn beige finish...

$242

**RE16 Super-Cardioid Microphone**
Continuously Variable-D super cardioid dynamic microphone; designed for broadcast and high-quality sound reinforcement; frequency response 80-15,000 Hz; impedance 150 ohms; output — 56 dB; EV acoustically pneumatic; bass tilt down switch; A3F-type microphone connector and 15-ft cable with matching connector; supplied with stand clamp, metal carrying case, and integral windscreens/pop filter; non-reflective fawn beige finish...

$250

**RE15 Super-Cardioid Microphone**
Variable-D dynamic super cardioid microphone; supplied with shock mount, handle, and headband; black finish...

$203

**CO85A "Tie-Tac" Omni Microphone**
Omnidirectional condenser element, electret microphone; shaped response 70-16,000 Hz; — 56 dB output; battery housing may be clipped to belt; low impedance; A3F-type microphone connector and 15-ft cable with matching connector; supplied with windscreens, belt clip, tie clasp assembly, and metal carrying case; non-reflective fawn beige finish...

$180

**RE11 Super-Cardioid Microphone**
Continuously Variable-D super cardioid dynamic microphone; shaped response 80-15,000 Hz; — 56 dB output; bass tilt down switch; low impedance; A3F-type microphone connector and 15-ft cable with matching connector; supplied with stand clamp, metal carrying case, and integral windscreens/pop filter; non-reflective fawn beige finish...

$165

**RE50 Omnidirectional Microphone**
Omnidirectional dynamic microphone; shaped response 80-13,000 Hz; — 55 dB output; double-wall, shock-isolated case and special cable for noise-free operation; impedance; A3F-type microphone connector and 15-ft cable with matching connector; supplied with stand clamp, metal carrying case, and integral windscreens/pop filter; non-reflective fawn beige finish...

$146

**DS35 Cardioid Microphone**
Single-D dynamic cardioid microphone; shaped response 80-13,000 Hz; — 61 dB output; low impedance; A3F-type microphone connector and 15-ft cable with matching connector; supplied with stand clamp, metal carrying case, and integral windscreens/pop filter; non-reflective fawn beige finish...

$138
<table>
<thead>
<tr>
<th>Microphone Model</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>M900 Cardioid Mic</td>
<td>Directional; built-in spherical wind screen; frequency response 50-18,000 Hz ± 3 dB; sensitivity 51 dB ± 3 dB high impedance; 20-ft detachable cable with heavy duty Cannon-type connector.</td>
</tr>
<tr>
<td>M500 Cardioid Mic</td>
<td>Unidirectional dynamic microphone for acoustic instruments; frequency response 50-16,000 Hz; output level at 1000 Hz 76 dB (low impedance), 56 dB (high impedance); 200-ohm low impedance, 20,000-ohm high impedance; 16-ft detachable cable with XLR-connector.</td>
</tr>
<tr>
<td>M400 Cardioid Mic</td>
<td>Cardioid condenser microphone built-in FET preamp and 1 1/2 V battery; frequency response 40-16,000 Hz ± 3 dB; sensitivity 51 dB ± 3 dB high impedance; 20-ft detachable cable with heavy duty Cannon-type connector.</td>
</tr>
<tr>
<td>M300 Cardioid Mic</td>
<td>Cardioid dynamic microphone; frequency response 60-13,000 Hz ± 3 dB; sensitivity 61 dB ± 3 dB high impedance; 10-ft heavy duty cable.</td>
</tr>
<tr>
<td>M200 Cardioid Mic</td>
<td>Cardioid dynamic microphone, frequency response 60-13,000 Hz ± 3 dB; sensitivity 61 dB ± 3 dB (high impedance), 50 dB ± 3 dB (low impedance); 10-ft heavy duty detachable cable.</td>
</tr>
<tr>
<td>M50 Dynamic Microphone</td>
<td>Dynamic microphone, frequency response 60-13,000 Hz ± 3 dB; sensitivity 61 dB ± 3 dB high impedance; 10-ft heavy duty cable.</td>
</tr>
<tr>
<td>M30 Dynamic Microphone</td>
<td>Dynamic microphone; frequency response 70-12,000 Hz ± 3 dB; sensitivity 56 dB high impedance; 10-ft heavy duty cable.</td>
</tr>
<tr>
<td>M20 Cardioid Microphone</td>
<td>Cardioid dynamic microphone; frequency response 60-13,000 Hz ± 3 dB; sensitivity 60 dB ± 3 dB (high impedance), 50 dB ± 3 dB (low impedance); 10-ft heavy duty detachable cable.</td>
</tr>
<tr>
<td>M118 Caskette Microphone</td>
<td>Type B microphone designed to fit most cassette recorders and supplied with dual plugs for audio and remote control. Impedance 500 ohms; sensitivity 70 dB at 1 kHz.</td>
</tr>
<tr>
<td>M129 Cardioid Microphone</td>
<td>Ball-type dynamic microphone with built-in pop and blast filters; on/off switch; black satin and chrome finish. Frequency range 40-14,000 Hz; sensitivity 56 dB at 1 kHz; supplied with 20-ft cable and stand adapter.</td>
</tr>
<tr>
<td>M133 Low-Z Microphone</td>
<td>Type D low impedance microphone for cassette recorders with extremely low impedance (200 ohms). Comes with dual plugs for audio and remote control.</td>
</tr>
<tr>
<td>M211 Microphone</td>
<td>Type E single-plug microphone designed for tape recorders requiring high-quality mic with single mini-plug. Supplied with adapter to convert from miniature to standard &quot;1/4&quot; phone plug; on/off switch; 5-ft cable; impedance 200 ohms; sensitivity 70 dB at 1 kHz; frequency range 60-12,000 Hz.</td>
</tr>
<tr>
<td>M235 Microphone</td>
<td>Omnidirectional single-impeance microphone. Comes with on/off switch; stand; styrofoam case with sleeve; &quot;1/4&quot; adapter plug; 6-ft cable with attached miniature plug. Frequency range 50-15,000 Hz; sensitivity -78 dB at 1 kHz; impedance 600 ohms.</td>
</tr>
<tr>
<td>M242 Stereo Microphones</td>
<td>Type F matched-pair stereo microphones for stereo recorders. Supplied with adapters to convert from miniature to standard &quot;1/4&quot; phone plug; 5-pin cardiod capsule; 500 ohms; sensitivity 70 dB at 1 kHz; frequency range 60-12,000 Hz.</td>
</tr>
<tr>
<td>M247 Microphone</td>
<td>Dynamic omni-directional microphone with removable windscreen, designed for vocals and recording. Comes with on/off switch; 20-ft cable with &quot;1/4&quot; phone plug; black satin and chrome finish. Frequency range 50-14,000 Hz; sensitivity -57 dB at 1 kHz; Impedance 50 and 50 ohms.</td>
</tr>
<tr>
<td>M279 Lapel Microphone</td>
<td>Omnidirectional electret condenser microphone with clothing clip, 10-ft cable, mini-plug. Frequency range 30-16,000 Hz; impedance 600 ohms.</td>
</tr>
<tr>
<td>M100 VCR Microphone</td>
<td>Compatible with all videocassette recorders and tape decks with microphone inputs and with video cameras and audio dub and voice-over recordings. Comes with on/off switch; stand; adapter plug, 15-ft cable with miniature plug. Frequency range 60-12,000 Hz; sensitivity 70 dB at 1 kHz; impedance 500 ohms.</td>
</tr>
<tr>
<td>M100 Dynamic Cardioid Mic</td>
<td>Cardioid moving-coil microphone with low-mass diaphragm and voice coil in a compact design; designed especially for vocals; triple metal screen pop, blast, and wind filter; double casing and foam suspension reduce sensitivity to vibration; immune to hum and magnetic fields; frequency responses 30-20,000 Hz ± 3.5 dB; sensitivity — 76 dB at 1 kHz (0 dB = 1 V/µbar); impedance 250 ohms; supplied with Cannon-type XLR-3 connector; anodized black matte finish; 10.4 oz.</td>
</tr>
<tr>
<td>M100 CM-300 Electret Condenser Microphone</td>
<td>Studio-type microphone with interchangeable capsules; frequency response 50-18,000 Hz ± 3 dB; sensitivity 56 dB ± 3 dB high impedance; 20-ft detachable cable.</td>
</tr>
<tr>
<td>M100 NAKAMICHI</td>
<td>DM-1000 CM-300 Electret Condenser Microphone</td>
</tr>
<tr>
<td>M100 CM-300 Electrode Microphone</td>
<td>Studio-type microphone with interchangeable capsules; frequency response 50-18,000 Hz ± 3 dB; sensitivity 56 dB ± 3 dB high impedance; 20-ft detachable cable.</td>
</tr>
<tr>
<td>M100 CM-300 Electrode Microphone</td>
<td>Studio-type microphone with interchangeable capsules; frequency response 50-18,000 Hz ± 3 dB; sensitivity 56 dB ± 3 dB high impedance; 20-ft detachable cable.</td>
</tr>
<tr>
<td>M100 CM-300 Electrode Microphone</td>
<td>Studio-type microphone with interchangeable capsules; frequency response 50-18,000 Hz ± 3 dB; sensitivity 56 dB ± 3 dB high impedance; 20-ft detachable cable.</td>
</tr>
</tbody>
</table>
### Microphones

**NEUMANN**

- **110 Cardioid Microphone**
  - Unidirectional dynamic cardioid microphone designed for performers, features built-in hi/lo and on/off switch; built-head design; triple-mesh construction; includes 18-ft shielded cable with standard phone plug, swivel mike adapter, and vinyl case; satin gold finish.
  - $38

- **MM-330 Cardioid Microphone**
  - Unidirectional dynamic cardioid microphone designed for performers, features built-in hi/lo and on/off switch; built-head design; triple-mesh construction; includes 18-ft shielded cable with standard phone plug, swivel mike adapter, and vinyl case; satin gold finish.
  - $38

**SCHUHR**

- **575S Omnidirectional Microphone**
  - A dynamic microphone designed for wall/panel mount, on desk or floor stand, or lapel or hand-held use. Locking slide-to-talk switch; high impedance. Frequency range 40-15,000 Hz; output power level - 80 dB; black ARMO-DUR finish with satin anodized cap and stainless-steel grille; 5 oz.; includes stand adapter, lavalier assembly, and quick-release clip.
  - $65

- **515 SAC Unidyne® B Microphone**
  - Dynamic cardioid type for good-quality sound systems and tape recorders. Has locking-on/off switch; Output level - 59 dB; frequency range 80-13,000 Hz; high impedance. Comes with 1/4" phone plug, built-in shock mount.
  - $553

**REALISTIC**

- **33-1085 Electret Condenser Microphone**
  - One-point stereo microphone with two back electret elements (two mics in one) in rotatable capsules; frequency response 30-18,000 Hz with selectable low-frequency contour; includes stand adapter; 16.5-ft cable with dual 1/4" plugs.
  - $60

- **33-919 Dual Pattern Microphone**
  - Stereo Electret condenser microphone with two integral capsules; features switchable wide and normal pickup patterns; frequency response 20-20,000 Hz; 600-ohm impedance with low-impedance balanced option; includes foam windscreen and stand adapter; 16.5-ft heavy-duty cable with XLR connector; uses "AA" battery.
  - $50

**REKTON**

- **MM-650 Cardioid Microphone**
  - Unidirectional electret condenser stereo microphone designed for outdoor use; 1.5-V battery-powered; sensitivity - 68 dB at 1000 Hz; frequency response 50-16,000 Hz; 600-ohm impedance; includes windscreen and 3-m cord; aluminum casing.
  - $295

- **MM-620 Cardioid Microphone**
  - Unidirectional electret cardioid microphone designed for performing, broadcast, PA, and home recording; sensitivity - 68 dB; frequency response 30-16,000 Hz; low impedance (200-600 ohms); operates on 1.5-V AA battery; supplied with 18-ft shielded cable with standard phone plug, swivel mike adapter, and vinyl case; satin gold finish.
  - $45

**SANUI**

- **DM11 Cardioid Microphone**
  - Unidirectional dynamic microphone; frequency response 100-15,000 Hz; 600-ohm output impedance; -76 dB sensitivity (frontal); includes windscreen eliminates popping; ideal as vocal microphone.
  - $110

- **EM1 Cardioid Microphone**
  - Unidirectional electret condenser microphone; frequency response 50-15,000 Hz; 600-ohm output impedance; sensitivity - 75.5 dB (frontal); music/vocal/office switch; three urethane foam windscreen in orange, blue and black for quick channel identification; includes holder, desk stand, 1.5 V dc; "AA" penlight battery, and 6-m cord with connecting plug.
  - $80

**SCHOEPS**

- **501 Multi Purpose Mic Stand**
  - Microphone boom stand with arm for stereo pairing; mike-mount holes at both ends of adjusting boom; boom is 35 1/2-in long and rotatable over 360 degrees; supplementary bar is included to extend boom to 43 1/2-in; collapsible stand; four mike-mounting screws (Philips); matte black finish.
  - $200

**SIMPSONS**

- **MD 211 U Omnidirectional Microphone**
  - Omnidirectional dynamic microphone; frequency response 40-20,000 Hz; sensitivity 0.13 mV/µbar ±2.5 dB; supplied with Cannon XLR connector and cable; 1" diameter X 4.3" L.
  - $356

- **MD 431 U Super Cardioid Microphone**
  - Super cardioid dynamic vocal microphone; frequency response 40-16,000 Hz; sensitivity 1.4 mV/µbar at 94-dB SPL; output - 53 dBm (1 mW/10 dynes/cm²); 200-ohm source impedance at 1000 Hz; built-in bass/proximity cut-off and pop filters; on-off switch with lock; metal housing with replaceable stainless-steel grille; one-piece collapsible and shock-mounted; can be used in mobile situations; includes quick-release clip with lock, XLR connector, 16-ft cable, and phone plug.
  - $352

- **MD 421 U Cardioid Microphone**
  - Cardioid dynamic microphone; 200-ohm impedance; frequency response 30-17,000 Hz; sensitivity 0.2 mV/µbar ± 3 dB at 1 kHz; EIA rating - 145.8 dB; output level - 53 dBm (1 mW/10 dynes/cm²); front-to-back ratio 18 dB, -2 dB; variable bass attenuator; supplied with XLR connector and cable; 7" X 3 1/2" X 3 1/2".
  - $327

- **MD 416 U Cardioid Microphone**
  - Cardioid dynamic microphone; designed for close miking; frequency response 50-15,000 Hz; sensitivity 0.13 mV/µbar ±3 dB; 200-ohm impedance; built-in isolation system to eliminate handling noise; built-in pop filter, outdoor pop filter; supplied with Cannon XLR connector, threaded stand mount with quick-release clip, and cable.
  - $300

**SIDEWALK**

- **MD 402 Super Cardioid Microphone**
  - Super cardioid dynamic microphone; frequency response 50-15,000 Hz; output level - 57 dB at 94 dB SPL; includes windscreen, 15-ft cable, and quick-release clamp.
  - $80

**SOUNDBRIDGE**

- **Electret Condenser Mike System**
  - One common powering module in balanced version (K3UL) or unbalanced version (K1) serves three different compact heads: ME20 omnidirectional head, ME88 spot microphone head, ME20 omnidirectional head, ME88 spot microphone head, ME20 omnidirectional head.
  - $147

**SOONH**

- **MD 441 U Super Cardioid Microphone**
  - Super cardioid dynamic microphone; frequency response 40-20,000 Hz; sensitivity 0.2 mV/µbar ± 3 dB; brilliance switch for nominal 5-dB boost at 5 kHz; five-position bass attenuator; front-to-back ratio 20 dB, -3 dB; supplied with cable and quick-release mount for floor stand or MZT-441 table stand; stands MZW-441 windscreen; 1/3", H 1.4", W 9.6" L.
  - $455

- **MD 426 U Cardioid Microphone**
  - Cardioid dynamic microphone; frequency response 40-20,000 Hz; sensitivity 0.2 mV/µbar ± 3 dB; supplied with Cannon XLR connector and cable; 1" diameter X 4.3" L.
  - $388

- **MD 431 U Super Cardioid Microphone**
  - Super cardioid dynamic vocal microphone; frequency response 40-16,000 Hz; sensitivity 1.4 mV/µbar at 94-dB SPL; output - 53 dBm (1 mW/10 dynes/cm²); 200-ohm source impedance at 1000 Hz; built-in bass/proximity cut-off and pop filters; on-off switch with lock; metal housing with replaceable stainless-steel grille; one-piece collapsible and shock-mounted; can be used in mobile situations; includes quick-release clip with lock, XLR connector, 16-ft cable, and phone plug.
  - $352
516 E-Quality® Microphone
Unidirectional cardioid dynamic equalizer microphone for tape recording. Equalization and re-sonance-isolating control; four switches on microphone handle provide 16 different combinations of special effects to eliminate undesirable effects or enhance various instruments. Frequency range 50-15,000 Hz; impedance 150 ohms. Comes with foam wind-screen, swivel adapter, cable, mini-plug adapter cable, carrying case...$118

516 EQ-PR. Pair of 516 EQ micros...$210

588 SAC Unisphere® B Microphone
High-impendance cardioid mike for rock vocal and music. Has pop/blast filter; on/off switch; hand-held use with slip-in stand attachment; output power level -56.5 dB; frequency range 80-13,000 Hz. Comes with 15-ft cable and connector, chrome finish...$76

585 SAC Unisphere® A. Same as 588 SAC except output power level is -59 dB, frequency range is 50-13,000 Hz...$48

Unidyne® II Series Microphones
Dynamic cardioid type for high-quality music and vocal recording and reproduction. Dual-impedance version. Frequency range 50-15,000 Hz; power level -56.5 dB in low impedance. Supplied with 15-ft cable...$110

54SD. Same as 54SD but with on/off switch in handle...$113

545SH. Same as 545SD but with on/off switch in permanently attached stand mount...$119

545SD-CN. Same as 545SD plus on/off switch and 20-ft cable with three-pin professional connectors...$132

Unisphere® I Series Microphones
Dynamic cardioid type for high-quality recording and reproduction. Has built-in pop filter. Dual-impedance version. Frequency range 50-15,000 Hz; power level -57 dB in low impedance. Comes with 15-ft cable...$123

565SD. Same as 565SD plus on/off switch in handle...$126

565SH. Same as 565SD but with on/off switch in permanently attached stand mount...$132

565SD-CN. Same as 565SD plus on/off switch and 20-ft cable with three-pin professional connector...$132

Professional Microphones
SM11 Miniature Lavalier Microphone
Dynamic omnidirectional type with lavalier, tie-bar, and tie-tack mounting options. Frequency range 50-15,000 Hz; power level -64 dB; low impedance. Weighs only 0.28 oz. Comes with 45-in. cable and mounting accessories...$65

SM17. Similar to SM11 but includes musical instrument mounting accessories and 10-ft cable...$90

SM57-CN Unidirectional Microphone
Dynamic type, cardioid polar pattern, suitable for instrument pickup. Frequency range 40-15,000 Hz; output power level -56 dB; dual impedance. Comes with 20-ft cable with three-pin professional connector...$141

SM58CN Unidirectional Microphone
Dynamic type, cardioid polar pattern, suitable for vocal pickup. Frequency range 50-15,000 Hz; output power level -56.5 dB; dual impedance. Comes with 20-ft cable with three-pin professional connector...$176

Starmaker® Series Microphones
Small, lightweight, rugged dynamic cardioid type designed for stand-mount or handheld use. Frequency range 50-15,000 Hz; output power level -57.5 dB; low impedance...

C-48 Condenser Microphone
Professional switchable omni/bidirectional condenser microphone designed for critical studio recording applications. Features dual-diaphragm capsule design, LED directivity indicator; low-noise high-gain FET preamp and transformer; 10-db PAD switch (prevents overload at SPLs above 126 dB); low-cut switch; two-way power source (ac/dc power supply or battery operation). Frequency response 30-16,000 Hz; output impedance 150 ohms ±25%; S/N 70 dB at 1000 Hz, 10 db; max. SPL 138 dB; dynamic range 104 dB; XLR-3-12C type connector; includes carrying case, 006P battery, and screw adaptor; 9" H X 2½" W X 1½" D...$795

SONY
C-76 Condenser Cardioid Microphone
Unidirectional gun-type condenser microphone designed for theatrical use; frequency response 40-16,000 Hz; 250-ohm impedance; S/N 60 db; sensitivity -56 dB; max. SPL 126 dB; dynamic range 112 dB; low-cut switch; battery-powered with optional external ac/dc power supply provision; LED battery indicator; XLR-3 mic connector; includes urethane windscreen; 1" diameter X 26½" L...$795

C-74. Similar to C-76 except designed for media use; 1" diameter X 18½" L...$675

C-38B Condenser Microphone
Professional condenser microphone with switchable omnidirectional or unidirectional characteristics; features directivity switch and five-position function switch for mic adjustment; internal battery or phantom power; frequency response 30-16,000 Hz; 15 db; 250-ohm output impedance; S/N 70 dB; max. SPL 140 dB; dynamic range 116 dB; high-cut switch; pad switch; FET circuit; windscreens and shock mounting; fixed mike connector; 20-ft cable; carries with case, 3" dia. X 8½" L...$545

C-37P. Similar to C-38B; high-cut switch and internal battery power; max. SPL 154 dB; dynamic range 130 db; 1½" dia. X 2½" L...$495

ECM-53FP Cardioid Microphone
Unidirectional cardioid back electret condenser microphone designed for desk or podium use; frequency response 40-15,000 Hz; 250-ohm output impedance; S/N 66 db; max. SPL 126 dB; dynamic range 98 db; movable head; battery-powered (optional ac/dc operation available); fixed mic connector; 10-ft cable; XLR-3 mic connector; includes swivel, carrying case, battery, and mike-adapter; 9½" dia. X 10¾" L...$295

ECM-65F Cardioid Microphone
Back electret condenser microphone designed for information desk and receptionist use; frequency response 20-20,000 Hz; 250-ohm output impedance; S/N 66 db; max. SPL 134 dB; dynamic range 106 dB; low-cut switch; external phantom power system or battery power; battery check lamp; 90 degree adjustable angle; rubber cushion in mounting reduces vibration; fixed mic connector; 20-ft cable; 2½" dia. X 8½" L...$265

F-660 Dynamic Cardioid Microphone
Unidirectional dynamic microphone for vocal/orchestral recording; frequency response 100-10,000 Hz; 250-ohm output impedance; safety lock; XLR-3 mike connector; includes double windscreens and mic holder; 1½" dia. X 8½" L...$250

ECM-65F Cardioid Microphone
Hand-held professional back electret condenser microphone for stage, broadcasting, or studio use; frequency response 20-20,000 Hz; 250-ohm output impedance; S/N 66 db; max. SPL 137 dB; dynamic range 109 db; double windscreens; phantom power system or battery power; XLR-3 mike connector; 20-ft cable; 2½" dia. X 6½" L...$235

ECM-64P. Similar to ECM-65F except omnidirectional for use; frequency response 40-20,000 Hz...$235

ECM-50PS Omnidirectional Microphone
Professional omnidirectional electret condenser microphone with microphone grill design; frequency response 40-14,000 Hz; 250-ohm output impedance; S/N 66 db; max. SPL 126 dB; dynamic range 98 db; phantom power supply or internal battery; non-reflective satin nickel finish; comes with windscreens, carrying case and lavalier; fixed mic connector; 10-ft cable; ¼" dia. X 7" L...$675

NEED MORE INFORMATION?
Write directly to the manufacturer or distributor. A list of names and addresses starts on page 4.

ECM-30 Condenser Omni Microphone
Professional omnidirectional condenser microphone for outdoor use in all weather conditions; built-in waterproof screen; also has double-structured accessory windscreens; frequency response 40-12,000 Hz; 100-ohm output impedance; interchangeable windscreen mounting; balanced output with "Cannon" plug; fixed mike connector; 20-ft cable; 1½" dia. X 8½" L...$160
TAPE RECORDING & BUYING GUIDE

ECM-23F Cardioid Mike
Unidirectional back electret condenser microphone designed for studio interviews; telesopic design; frequency response 20-20000 Hz; 16-ft cable; includes carrying case; S/N 63 db; max. SPL 126 db; dynamic range 95 db; output impedance; S/N 83 db; max. SPL 126 db; dynamic range 95 db; requires "AA" batteries; output -68 db sensitivity; frequency response 180-20,000 Hz; max. SPL 126 db; dynamic range 95 db; -58 dBm at 94 dB SPL; impedance 250 ohms; low-cut filter; 10-dB pad; includes windscreen, clamp, table stand and storage case...

ECM-33F, Similar to ECM-23F except battery or phantom powered; S/N 66 db; max. SPL 130 db; dynamic range 102 db; 1 3/4" dia. X 6 1/4" L...

ECM-41 Cardioid Microphone
Unidirectional electret condenser microphone designed for studio interviews; telesopic design; frequency response 20-20000 Hz; 16-ft cable; includes carrying case; S/N 63 db; max. SPL 126 db; dynamic range 95 db; output impedance; S/N 83 db; max. SPL 126 db; dynamic range 95 db; requires "AA" batteries; output -68 db sensitivity; frequency response 180-20,000 Hz; max. SPL 126 db; dynamic range 95 db; -58 dBm at 94 dB SPL; impedance 250 ohms; low-cut filter; 10-dB pad; includes windscreen, clamp, table stand and storage case...

ECM-170A Omnidirectional Mike
Omnidirectional electret condenser microphone for professional use; good for recording or lecturing outdoors; frequency response 20-16,000 Hz; 2000-ohm output impedance; S/N 64 db; max. SPL 126 db; dynamic range 98 db; low-cut switch; output for balanced and unbalanced circuits; detachable windscreen; FET impedance transistor; easy-to-assembly clip; satin nickel finish; Sony type microphone; includes mic cable, mic holder, and carrying case; 1" dia. X 6" L...

ECM-150 Omnidirectional Mike
Omnidirectional electret condenser microphone with miniature design; frequency response 40-13,000 Hz; 250-ohm output impedance; S/N 60 db; max. SPL 117 db; dynamic range 83 db; plug adapter; for mini and phone connections; on/off switch; includes windscreen, case with mike stand, tie clip, and battery; fixed mike connector; 6-ft 5-in cable; 1 1/2" diameter X 1 3/4" L...

ECM-260F Cardioid Microphone
Unidirectional back electret condenser microphone; frequency response 50-14,000 Hz; 200-ohm output impedance; S/N 68 db; max. SPL 126 db; dynamic range 98 db; battery-powered; 16-ft cable with phone cable plug; includes windscreen, battery, mic holder, stand adaptor, and carrying case; 1 1/2" diameter X 7 1/4" L...

ECM-31M Cardioid Microphone
Unidirectional electret condenser microphone designed for indoor or outdoor interview; telesopic design; frequency response 50-13,000 Hz; 250-ohm output impedance; battery-operated; 8-ft cable with mini cable plug; includes urethane windscreen and mic holder; 2 1/2" diameter X adjustable 10X 1"-3/4" L...

F-400A Dynamic Cardioid Microphone
Unidirectional microphone recommended for pop and rock vocals; frequency response 100-12,000 Hz; 250-ohm output impedance; fixed phone plug connector, 8-ft cable; 2 1/4" dia. X 7 1/4" L...

F-420 Cardioid Microphone
General-purpose microphone with 1/4" phone plug that fits Hi-fi tape recorders...

F-V3T "The Mic" Dynamic Microphone
Cardiopattern dynamic microphone with unmatch plug that fits all home tape recorders. Frequency range 100-12,000 Hz; impedance 600 ohms...

F-V4T "The Vocal Mic" Microphone
Cardiopattern dynamic microphone for vocal applications, with unmatch plug to fit all home tape recorders. Frequency range 50-13,000 Hz; Impedance 250 ohms...

F-991T "The Stereo Mic" Stereo dynamic microphone for recording purposes, with left and right unimatch plugs to fit all home tape recorders. Frequency range 90-13,000 Hz; Impedance 200 ohms...

ECM-16T "The Tie Tac Mic" Omnidirectional electret condenser microphone for lavelier applications, with unmatch plug to fit all home tape recorders. Frequency range 50-13,000 Hz; Impedance 250 ohms...

F-V24 "The Dynamic Mic" Dynamic microphone with pull-apart design to function as one-point stereo mic or two separate mono mics; frequency range 50-15,000 Hz; output -52 dB re 94 dB SPL; impedance 1000 ohms; remote start/stop switch...

EC-7 Cardioid Microphone
Cardioid electret condenser microphone; frequency response 40-16,000 Hz; output -62 dB re 94 dB SPL; impedance 250 ohms; low-cut filter and on/off switch; includes floorstand adapter...

ECM-3210E Stereo Microphone
Cardioid electret-condenser microphone with two elements physically aligned for stereo perspective. Tripod desk stand included. Frequency range 50-12,000 Hz...

RP-3540E Electret Microphone
Wide-response cardioid electret-condenser microphone designed for excellent detail for complex instrument ensembles. Comes with tripod desk stand. Frequency range 40-14,000 Hz...

ECM-F-V4T "The Vocal Mic" Microphone
Cardioid electret condenser microphone with high signal-handling ability for excellent dynamic range in music comes with tripod desk stand. Frequency range 50-12,000 Hz...

ECM-F-V24 "The Dynamic Mic" Dynamic microphone with pull-apart design to function as one-point stereo mic or two separate mono mics; frequency range 50-15,000 Hz; output -52 dB re 94 dB SPL; impedance 1000 ohms; remote start/stop switch; includes floorstand adapter...

ECM-3210E Stereo Microphone
Cardioid electret-condenser microphone with two elements physically aligned for stereo perspective. Tripod desk stand included. Frequency range 50-12,000 Hz...

TECHNICS

RP-V340 Cardioid Microphone
Dynamic cardioid microphone designed for voice recording has built-in windscreen and boilers with 2" mic holder adapter. Frequency range 100-10,000 Hz...

RP-V730 Dynamic Microphone
Unidirectional dynamic microphone designed for vocal and musical instrument recording comes with 2" mic holder adapter. Frequency range 40-12,000 Hz...

RP-3500E Electret Microphone
Cardioid electret-condenser microphone with high signal-handling ability for excellent dynamic range in music comes with tripod desk stand. Frequency range 50-12,000 Hz...

TOSHIBA

EM-420 Cardioid Microphone
Unidirectional back electret condenser microphone; low cut switch for music or voice; frequency response 50-20,000 Hz; S/N 45 db; long battery life; supplied with windscreen...

EM-220 Electret Condenser Microphone
Back electret condenser microphone; frequency response 50-18,000 Hz; S/N 45 db; long battery life...

UCHER by WALTER ODEMER

M 646 Cardioid Microphone
Electret condenser cardioid microphone; frequency response 30-20,000 Hz; sensitivity 3.5 mV/Pa; 280-ohm impedance; supplied with table stand and windscreen; powered by internal primary battery or from recorder's mike cable with 8-pole plug...

M 634 Cardioid Microphones
Stereo pair dynamic shot-gun-type cardioid microphones with stereo/mono switch; high-quality construction.

VIDAIRE ELECTRONICS

VIDAIRE ELECTRONICS

942 Dynamic Cardioid Ball Microphone
Dual impedance dynamic ball microphone; frequency response 30-15,000 Hz; switchable 600/50,000 ohm impedance; sensitivity -54 dB at 50,000 ohms. -72 dB at 600 ohms; 20 ft shielded cable...

RP-3500E Electret Microphone
Cardioid electret-condenser microphone with high signal-handling ability for excellent dynamic range in music comes with tripod desk stand. Frequency range 50-12,000 Hz...

M 534, Similar to M 634 except single microphone for desk use...

$203

$194

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e Void after April 1, 1982

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PRINT NAME ___________________________

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This latest version contains everything you need to get the fullest, most realistic reproduction from your stereo equipment. You can actually perform a complete stereo system checkup by ear alone.

A test lab in a record jacket

Employing the most advanced recording, mastering, and pressing techniques, the Stereo Review SRT14-A is produced to strict laboratory standards. Engraved in its grooves are a series of precisely recorded test tones, frequency sweeps, and pink noise signals that enable you to accurately analyze and check your stereo system for:
- Frequency response.
- Stereo separation.
- Cartridge tracking ability.
- Channel balance.
- Hum and noise, including turntable rumble.

Step-by-step Instructions

Included with SRT14-A is a detailed instruction manual, complete with charts, tables, and diagrams. It explains the significance of each test. It tells you what to listen for. It clearly describes any aberrations in system response. And it details corrective procedures.

For professionals too

Included on the record are a series of tests that call for the use of sophisticated measuring instruments, such as oscilloscopes, chart recorders, and distortion analyzers. These tests permit the advanced audiophile and professional to make precise measurements of transient response, recorded signal velocity, anti-skating compensation, IM distortion, and a host of other performance characteristics.

SRT14-A record contents
- Cartridge tracking, high frequency
- Frequency response, 20 kHz to 25 Hz
- Separation, Left-to-Right
- Separation, Right-to-Left
- Cartridge tracking, low frequency
- Channel balance
- Cartridge and speaker phasing
- Low-frequency noise
- Tunable flutter
- Frequency-response sweep, 500 to 20,000 Hz, Left Channel
- Frequency-response sweep, 500 Hz to 20,000 Hz, Right Channel
- Tone-burst
- Intermodulation distortion
- Anti-skating adjustment
- 1000-Hz reference tones
- Flutter and speed accuracy
- Stereo spread
- Chromatic octave
- Standard "A"
- Guitar tuning tones

The final step

Start getting the most out of your stereo system. Make the SRT14-A your next record purchase. Just complete the coupon and mail it along with your remittance . . . today!
**BIAMP**

1642 Professional Mixing Console
Professional mixing console comprised of 96 inputs, four equalization bands, four separate echo/line channel returns, four submaster outputs, two main outputs, three auxiliary busses, and headroom monitoring. Input section includes low-impedance mic/high-impedance line switching; trim rotary controls continuously variable from 0 to -40 dB; aux. bus pre/post switch; aux. buss control; post-fader, post-EQ echo bus; monitor (adjustable to pre-fader, pre-EQ echo bus; monitor bus); equalization controls set at 12,500, 3700, 250, and 80 Hz with ±18 dB boost or cut; post-fader and post-EQ solo; mute; channel assignment switches; (pan auto odd-even scheme); dual-color LED indicators; input channel fader; wrist pad. Submaster section: channel inputs (17-20) with own level control; line record switch; sub/band control; left/right program solo; sub/master faders; sub/master pan. Left main section: aux. buss, echo, and monitor solo and level controls; meter 3 assign; left main solo and fader controls. Right main section: phantom power (+48 V of power to mic inputs of 16 channels); headphone level control; meter 4 assign; right main solo. Other features include four lighted VU meters, LED overload indicators for each channel, two on each channel, and priority solo system for instant monitoring. Frequency response 15-33,000 Hz ± 1 dB; THD 0.02%; IM dist. 0.01%; slew rate 8 V/µsec; SN 80 dB. 5'4" H × 19" W × 5'4" D...

**CERWIN-VEGA**

3990 Preamp/Modules/Mixer
Preamp/mixer designed for creative audio, disco, and disco-format broadcast use. Phono/aux. section: features two sets of line and phono inputs with own rotary level control and crossover/transition switch; master gain control. Gain 78 dB max. with A-1002E card and CMA-481 transformer; frequency response 20-20,000 Hz ± 0.25 dB; power output +24 dBm; input impedance 200 ohms (with mic transformer), 100k ohms (low-level direct), 47k ohms (magnetic phono), 50k ohms (high level); load impedance 600 ohms balanced (with CMA-481 transformer) or unbalanced controls; -20 dB at +24 dBm; noise -125 dBm; 7" H × 19" W × 12" D...

**DUBIE**

CD-10 Sound Control System
Sound control system integrates up to six recorders and receiver/amplifier through one-time patch cord hookup; dub, records, plays back, mixes sound-on-sound, monitors and fades; six solid state four-position recorder controls; eight-position microphone control, patch panel connections for recorders and amplifier/record/or. Max. input signal +1 V at 1000 Hz; frequency response 0-100,000 Hz on all functions; 4" H × 13" W × 5" D...

**Gli**

3990 Preamp/Modules/Mixer
Preamp/mixer designed for creative audio, disco, and disco-format broadcast use. Phono/aux. section: features two sets of line and phono inputs with own rotary level control and crossover/transition switch; special effects third set of line/ phono inputs; master level control with complete cueing capabilities; two sets of stereo main outputs and mono output; frequency response 20-20,000 Hz ± 0.25 dB (phono and aux); HD and IM 0.01% (phono and Aux.); S/N 60 dB below 10 mV unweighted (phono), 90 dB (aux. inputs 1 and 2), 96 dB (aux. input 3); overload 320 mV at 1000 Hz (phono), 7 V (Aux.); slew rate 9 V/µsec (phono and aux.); input impedance 47,000 ohms (phono), 40,000 ohms (aux. inputs 1 and 2), 50,000 ohms (aux. input 3); phono subsonic filter 18 dB/octave at 18 Hz. Microphone section: features balanced differential input, bass equalization, and optoelectronic talkover with adjustable program mute attenuator; frequency response 20-20,000 Hz ± 0.25 dB, bass equalization ±8 dB at 80 Hz, S/N 60 dB below 10 mV; HD and IM dist. 0.01%; gain 60 dB (signal processor out), 80 dB (main out), 32 dB input, 20 dB (equalizer gain), 6 dB (mix), 20 dB (line amp); overload 315 mV; slew rate 9 V/µsec; program attenuation talkover -2 to -20 dB. Signal processor section: features switchable signal processor loop; input S/N 100 dB below 100 mV, input impedance 10k ohms; output 1.75 V at 600 ohms and 10 V at 10k ohms; output impedance 500 ohms; output S/N 107 dB below 2 V out; output dist. 0.003%. Audition output section: can be directly connected to integrated or power amplifier; output 2 V at 600 ohms and 7 V at 10k ohms; HD and IM dist. 0.01% from 20-20,000 Hz; talkover muting 10.5 dB with audition output muted. Headamp: S/N 96 dB below 2 W into 10 ohms; max. output 3 W continuous into 8 ohms with 0.1% HD and IM, slew rate 12 V/µsec; frequency response 20,000 Hz ± 0.1 dB; rack mountable 7" H × 19" W...

**PMX-9000 Mixer/Equalizer**
Combination mixer/ graphic equalizer. Mixer; features two sets of switchable line and phono inputs each with slide level control and crossfader transition slider and mic input channel with standby and talkover; complete cueing facilities with level and selector controls; S/N 76 dB below 10 mV (phono), 75 dB below clipping (mic), 85 dB (aux.); max. input 220 mV at 1000 Hz (phono), 200 mV (mic); 10 V (aux.); input impedance 47k ohms (phono), 600 ohms (mic); phono subsonic filter 18 dB/octave at 30 Hz; mic talkover 14 dB program level reduction. Five-band graphic equalizer with center frequencies at 60, 250, 1000, 3500, and 12,000 Hz, ± 12 dB boost or cut; has bypass switch and switchable signal processor loop. Other features include illuminated VU meters with calibrated sensitivity control (20 to -3 dB range); master level control; two sets of stereo main out-
MIXERS

MIX-5000 Master Mixer
Six-channel master mixer; each channel features 10-B input level slider controls with 20-B master input level control, independent pan pots, LED overload indicators, four-position mic/line switch for stereo/line select switches, and echo switches with three-select position echo level control. Additional features include mix out/tape in monitor select switch; two VU meters; input jacks for phone, line, tap, and mic; recording, monitor, and headphone jacks. Min. input/impedance 0.2 mV/200-5000 ohms (six-channel mix), 1.4 mV/47k ohms (phono), 60 mV/10k ohms (line and tape); rated output level/impedance 0.3 V/600 ohms (rec and monitor), 0.3 mV/3-10000 ohms (headphones); frequency response 20-30,000 Hz (± 3 dB (mic) and line), 30-20,000 Hz (± 0.5 dB (phono RIAA)), 10-25,000 Hz (± 1 dB (tape in), dist. 0.5%; S/N (65 kR) 56 dB (mic), 67 dB (line), 65 phono) .............$430

LT SOUND

MX-8 Mixing Board
8 X 2 mic/line mixes use balanced ultralow-noise solid-state microphone preamplifiers. Designed for studio and portable recording and PA use. Features gain control; echo; cue; solo; rotary fader control; multiple output. Maximum output level +22 dBV; S/N ratio greater than 85 dB; low and high boost out 18 dB .............$349

OPAMP LABS

1204RS Recording Studio Console
12-in/4-out, four echo bass, 8-track mixdown-monitor system; input channels: mix slide pot (film type) with 90-dB attenuation; input select: 0, -10, -20, -30 dB and mikes level, line 1, 2, and 3; 12 echo send, four echo return, four echo return assign controls for four echo buses; low-frequency equalization (+ 12 dB); 1500 Hz (peaking), 3000 Hz (peak), 5000 Hz (peaking), and 10,000 Hz (shelf); four output assign lighted alternate action switches; four 4-in/2-in lighted VU meters for output assign channels, two 4-in lighted VU meter for tape mixdown; four master pots; eight mono earphone

NEED MORE INFORMATION?
Write directly to the manufacturer or distributor. A list of names and addresses starts on page 4.
**Model 3 Studio Mixer**

Eight-in/out stereo mixer, features 8 microphones, 8 line inputs, 4 phone inputs, or any combination of line/mic/phono inputs. Mic input impedance/nominal level 100kHz high, greater than 1kHz low; -0.8dB at 1kHz, 0dB at 2kHz; stereo mix, or parallel mix control; choices output level/nominal level greater than 10kHz/mic; -20dB mic attenuator switches; trimpots; ac-powered.

Model 4 Cassette Recorder

8-line in, 4-line out, two-monitor (8 X 4 X 2) versatility in a compact mixer. Features unlimited flexibility and portability; 40dB input attenuation; input selection: mic-phonos-line, 4-frequency, 2-channel equalization; direct output and channel assignment; 4 aux. outputs in parallel with 4 line outputs; selectable high cut filters at 5kHz or 10kHz; low-cut filters 100Hz or 200Hz; color-coded push-button channel assignment buttons along with four-channel real-time monitor/monitor/room monitoring; optional talk-back monitoring; 24 dB/S/N 60 kHz; 3-kHz: $1,000-8,000 Hz ±12 dB; high: 100 Hz or 200 Hz adjustable, middle 1-8 kHz adjustable, 10 kHz fixed ±12 dB; S/N ratio better than 80 dB; THD less than 0.1% at 1kHz; input impedance/nominal level greater than 100k; -10 dBV; power consumption 120 mW at 12 V dc regulated (obtained from MM-20); 15.6" x 8.6" x 3.7"; 8.5 lbs; $350

**Model 6 Monitor System**

Four-in/out stereo monitor systems for recording; features 8 line inputs, and 2 stereo headphone feeds. Selectable headphone loads: 300 ohms/110 dB, 600 ohms/100 dB balanced, or 0.1% at 1kHz.

Model 7 Monitor System

Eight-in/out stereo monitor system for studio; features 8 line inputs, and 2 stereo headphone feeds. Selectable headphone loads: 300 ohms/110 dB, 600 ohms/100 dB balanced, or 0.1% at 1kHz.

Model 8 Monitor System

Eight-in/out stereo monitor system for recording; features 8 line inputs, and 2 stereo headphone feeds. Selectable headphone loads: 300 ohms/110 dB, 600 ohms/100 dB balanced, or 0.1% at 1kHz.

Model 9 Monitor System

Eight-in/out stereo monitor system for recording; features 8 line inputs, and 2 stereo headphone feeds. Selectable headphone loads: 300 ohms/110 dB, 600 ohms/100 dB balanced, or 0.1% at 1kHz.

Model 10 Monitor System

Eight-in/out stereo monitor system for recording; features 8 line inputs, and 2 stereo headphone feeds. Selectable headphone loads: 300 ohms/110 dB, 600 ohms/100 dB balanced, or 0.1% at 1kHz.

Model 11 Monitor System

Eight-in/out stereo monitor system for recording; features 8 line inputs, and 2 stereo headphone feeds. Selectable headphone loads: 300 ohms/110 dB, 600 ohms/100 dB balanced, or 0.1% at 1kHz.
ADC PROFESSIONAL PRODUCTS

Sound Shaper Three Paragraphic EQ
Three 12-band parametric graphic equalizer controlling 'ranges' per channel, ranging from 262-2,150 Hz ± 12 dB; graphic equalizer center frequencies set at 32, 50, 60, 100, 180, 320, 560, 1000, 1600, 3200, 6400, 10,000, and 18,000 Hz; features internal switching and monitoring with line/record and tape monitors, EQ bypass, 24 linear potentiometers, and two vertical LED signal level meters. 

Sound Shaper Two MkII Equalizer
Twelve-ban stereo frequency equalizer with center frequencies set at 30, 50, 100, 180, 300, 500, 1000, 1500, 2000, 3000, 5000, 6000, and 10,000 Hz. Features internal switching and monitoring with pushbutton line/record/bypass/equalization; dual seven-segment ± 12 dB LED meter with 1-dB adjust switch and two channel LEDs; rear-panel variable frequency spectrum level balancing controls/ch; two main and two tape monitors. Features ± 6 dB control range; one-way tape dubbing; LED slide control position indicators; subsonic filter; LED power indicator adjustable for 12, 24, or 36 dB output level; bypass/equalize, meter in/out, line/record switches; sound-level meter (SLM) input jack on front panel. 

Sound Series

One IC Equalizer
Five-band/channel stereo graphic equalizer with center frequencies at 60, 240, 1000, 3500, and 10k Hz, with ± 6 dB control range; tape monitor switch. 

Ten IC Equalizer
Ten-ban stereo graphic equalizer with center frequencies at 31.6, 63, 126, 250, 500, 1k, 2k, 4k, 8k, and 16k Hz. Features a bank of LEDs adjacent to each of the 10 slider controls to graphically illustrate adjusted frequency curve; ± 6 dB control range; tape monitor switch. 

Two IC 12-Band Equalizer
12-band equalizer with center frequencies at 32, 56, 100, 180, 320, 560, 1, 18k, 3k, 5k, 6k, 10k, and 18k Hz. Features a bank of LEDs adjacent to each slider control to dramatically indicate position on a ± 6 dB range scale, one-way tape dubbing; line/record/bypass/equalizing, and power switches. 

Three IC Paragraphic Equalizer
Top-of-the-line ADC Paragraphic equalizer with 24 auxiliary switches to bring 36 bands per stereo channel under control, combining parametric EQ versatility and ease of operation of graphic EQ. Features ± 12 dB range slide controls (center frequencies at 32, 56, 180, 320, 560, 1, 1.8k, 3.2k, 5.6k, 10k, 18k Hz); LED vertical signal-gain meters (± 12-dB range in 2-dB increments) and separate left and right slide controls; separate left and right meter-level controls; two-rectangle dicro bombing; LED slide control position indicators; subsonic filter; LED power indicator adjustable for 12, 24, or 36 dB range; bypass/equalize, meter in/out, line/record switches; sound-level meter (SLM) input jack on front panel. 

SA-1 Spectrum Analyzer
Real-time spectrum analyzer with built-in pink-noise generator and supplied calibrated microphone. Features a network of 132 LEDs that display audio spectrum in real time for visual evaluation of sound system's frequency response; range selector with 12-, 24-, and 36-dB positions; left and right mode selector button; peak-hold and slow display buttons; LED signal level meters. 

ADS

ADS 10 Digital Time Delay System
Digital time-delay system with built-in amplifier (100 W/ch continuous into 4 ohms, 20-20,000 Hz, 0.08% THD), matching 2-way speakers. Delay section: three initial delays, first delay variable 10-40 msec, longest delay variable up to 100 msec; reverbération decay time 0.1-1.6 sec (variable 0 to 60 dB), controls include ambience-channel bandwidth, stage depth (final delay), half size (remaining delays), extra outputs for additional amplifier/speaker systems; "Source Ambience Discriminator" extracts ambience in recordings, reduces reverberation of FM announcer voices; can be driven from line-level (preamp or tape output) or speaker terminals (using optional cables); LED delay indicators; ambience outputs, 30-13,000 Hz, + 1 - 3 dB, less than 0.3% THD + noise, 83 db dynamic range. Power amplifier section: 94 dB S/N (A-weighted), frequency response 3-100,000 Hz ± 0.5 db. Model L10 speakers: 2-way (7-in woofer and 1-in soft-dome tweeter); frequency response 48-18,000 Hz ± 3 dB, 38-20,000 Hz ± 5 Hz; efficiency 90 db/ 21 V; input range 50-100 W. Delay/amplifier 311/4"H X 15 1/2"W (19 W optional) X 12"D. 

C-101 EQ/LED Spectrum Analyzer
Ten-band two-channel graphic equalizer features 101 LED spectrum analyzer display, LED spectral display operates on various levels, shows controllable peak-reading modes (fast or slow); horizontal LEDs which indicate sound pressure level with external microphone or VU meter readings; switchable calibration levels from 2 db/LED (analyzes pink noise and microphone) to 4 dB/LED (displays wider dynamic range). Center frequencies set at 32, 60, 120, 240, 480, 960, 1920, 3840, 7680, and 15,000 Hz with ± 15 dB range. - 1 dB subsonic rolloff at 25 Hz, - 3 dB rolloff at 20 Hz, and - 21 dB rolloff at 10 Hz. Other features include continuously variable input level sensitivity with calibration; automatic line/mic input switching; built-in pink-noise generator; stereo paired equalizer sliders; equalization tape button; 18-db/octave subsonic filter; phase correlation rumble reducer circuit. Frequency response 3-100,000 Hz ± 1 dB; distortion 0.04% at 1 V from 20-20,000 Hz, and noise -96 dB at 1 V, 10,000-Hz bandwidth; max input level 15 V; input impedance 100 kohms; max output level 7 V. Output impedance 650 ohms; 3.5"H X 19"W X 6.5"D. 

C-22 Octave Equalizer
Ten-band two-channel octave equalizer with center frequencies set at 32, 60, 120, 240, 480, 960, 1920, 3840, 7680, and 15,000 Hz with ± 15 dB range, - 1 dB subsonic rolloff at 25 Hz, - 3 dB rolloff at 20 Hz, - 21 dB rolloff at 10 Hz. Features stereo paired sliders, 18-db/octave subsonic filter, equalization tape button, and phase correlation rumble reducer circuit. Frequency response 3-100,000 Hz ± 1 dB; distortion 0.04% at 1 V from 20-20,000 Hz, and noise -96 dB at 1 V, max input level 7 V; input impedance 100 kohms; max output level 7 V; output impedance 650 ohms; 3.5"H X 19"W X 6.5"D. 

S20B EQ/Speaker Control System
Five-band equalizer/speaker control system with 18-db/octave subsonic filter. Center frequencies set at 36, 60, 120, 1000, and 15,000 Hz; equalization range ± 12 ± 15 dB. Features tape monitor loop and separate function switches; 1/7 tape inputs/outputs and 1/11 main inputs/outputs. Frequency response 15-30,000 Hz ± 1 dB, distortion 0.04% from 20-20,000 Hz; 1 V, and noise -96 dB at 2 V out, -90 dB at 1 V, max input level 7.5 Vrms, input impedance 470k ohms; max output level 7 V rms; output impedance 600 ohms; 2.6"H X 12.3"W X 5.0"D. 
BIAMP

**EQ/270A Graphic Equalizer**

- 27-band 1/3-octave graphic equalizer with center frequencies set from 40-18,000 Hz with ± 12 dB boost or cut. Features EQ bypass switch; LED overload indicator; transformer-type connectors and phone jacks on inputs and outputs; transformer-less balanced lines in and out; combining filters; Frequency response 10,000 Hz ± 1 dB, 15,000 Hz ± 0.5 dB; hum and noise < 90 dB at 0 dB reference, 115 dB below rated output; filter bandwidth 1/3 octave at 3 dB point with 6 dB attenuation; frequency tolerance ± 2% of band centers; input impedance 600 ohms/500 ohms switchable; max. input +24 dB; signal noise ratio 90 dB; Dimensions: 31,2" H X 19" W X 5,4" D; Weight: 8 lb

**CROWN**

**EQ-2 Synergistic Equalizer**

- Eleven-band two-channel octave center equalizer with center frequencies set at 20,40, 80, 160, 320, 640, 1250, 2500, 5000, 10,000, and 20,000 Hz, ± 15 dB boost or cut; each channel features octave frequency band switches, 15-band shelving EQ with tone controls with bass hinge points adjustable from 180-1800 Hz and treble hinge points adjustable from 1000-10,000 Hz; equalizer cancel and tone cancel master controls; and 2-band shelving EQ. Rear panel has unbalanced inputs, balanced inputs with selectable switch: ± 10 dB gain selection, screwdriver-adjusted attenuation controls, and normal/inverted outputs. Frequency response 10,000 Hz ± 0.3 dB, 20,000 Hz ± 0.1 dB, controls flat with IHF load; hum and noise 90 dB below rated output, 20-20,000 Hz bandwidth; IM dist. 0.01% at rated output; rated output 25 V rms into IHF load; input impedance-25,000 ohms balanced, 20,000 ohms unbalanced (transformers); output impedance 300 ohms (normal), 600 ohms (balanced); satinated aluminum front panel with grey Lexan inlay; 7" H X 19" W X 14" D

**dxe**

**dbx Type II Tape Noise-Reduction Systems**

- Type II systems reduce noise by more than 30 dB across entire audio-frequency spectrum and add ± 10 dB additional recording headroom when used with any tape recorder. In addition, they decode dbx discs. Model 224. Linear decibel compander offers simultaneous encode/decode process for full monitoring capability with 3-head open-reel and cassette recorders, but will also work with 2-head decks. Effective noise reduction 30 dB plus 10 dB headroom; dynamic range 10 dB peak signal to weighted background noise; input level nominal/maximum 300 mV/16 V; output level 7 V rms; frequency response ± 0.5 dB, 10,000 Hz ± 10 dB enhancer section, 20-20,000 Hz NR section; IM distortion less than 0.2%; SMPTE; power consumption 7 W; 17" W X 10" D X 34" H; Weight: 12 lb

**BOZAK**

**902S Time Delay System**

- Analog electronically-controlled time-delay system with built-in 35-W power amplifier and separate input for each channel. Features delay time, delay remix, signal blend, treble control, and output level controls; delay 30-130 msec continuously variable; high-frequency EQ ± 12 dB; 140 dB SNR; frequency response 20-20,000 Hz ± 0.5 dB; THD and IM distortion 0.1%; 250, 500, 1k, 2k, 4k, 8k, 16k Hz; EQ range ±14 / -20 dB; equivalent input noise -85 dBV, referenced to 1 V, 20-kHz bandwidth; THD 0.1% at 1.0 expansion; IM distortion less than 0.2%; SMPTE; power consumption 20 W; 8 lb

**CERWIN-VEGA**

**E-3 Stereo Graphic Equalizer**

- Covers 13 frequency bands (32.5 Hz to 16.5 kHz) with ± 15 dB of boost or cut on each band. Features delay time, delay remix, signal blend, treble control, and output level controls; delay 30-130 msec continuously variable; high-frequency EQ ± 12 dB; 140 dB SNR; frequency response 20-20,000 Hz ± 0.5 dB; THD and IM 0.05%. 20 dB per octave control above 250 Hz; 250, 500, 1k, 2k, 4k, 8k, 16kHz EQ range ±14 / 15 dB; accuracy ± 0.1 dB at full boost/cut, ± 0.25 dB gain; 14-dB IHF, 20-kHz bandwidth; THD 0.1%; 20-kHz bandwidth; THD 0.1%; 17"W X 10"D X 34"H; Weight: 8 lb

**dbx DP Model 20/20 Computerized Equalizer**

- Automatic equalizing system combines a microprocessor-controlled 10-band graphic equalizer, real-time analyzer, pink-noise generator, audioprocessor (SPL indicator) and a calibrated microphone. EQ center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16kHz; EQ range ±14 / 15 dB; accuracy ± 0.1 dB at full boost/cut, ± 0.25 dB gain; 14-dB IHF, 20-kHz bandwidth; THD 0.1%; 20-kHz bandwidth; THD 0.1%; 17"W X 10"D X 34"H; Weight: 8 lb

**dbx Dynamic Range Expanders**

- Designed to increase the dynamic range of records, tapes, and FM broadcasts by as much as 50%, while reducing noise by as much as 20 dB.

**Model 3BX**

- Advanced expander makes loud passages louder, soft passages quieter, Bass, midrange, and treble frequencies are processed independently. Features 3 rows of LEDs that monitor degree of expansion in each range; expansion level control; transition level control; tape-monitor loop to restore loop required by expander in stereo system. Expansion ratio continuously variable 1.0-1.5 (0 to 50% increase), linear; dynamic range 100 dB peak signal to weighted background noise; input level nominal/max. 300 mV/7 V rms; output level 7 V rms; frequency response ± 0.5 dB 20-20,000 Hz at 1.0 expansion; equivalent input noise -85 dBV unweighted, referenced to 1 V, 20-kHz bandwidth; THD 0.1% at 1.0 expansion; IM distortion less than 0.2%; SMPTE; power consumption 10 W; 17"W X 10"D X 34"H; Weight: 12 lb

**dbx Signal-Improvement Units**

**Model 1B**

- Dynamic range expander is a single-band linear decibel expander/compander and limiter/peak unlimiter designed to expand dynamic range of any program source. Specifications same as Model 3BX; power consumption 5 W; 10"W X 3"D X 5"H; Weight: 4 lb

**Model 110**

- Subharmonic synthesizer that passes low-frequency signals plus same signals a full octave lower (synchronized by sampling original signals) to recreate subharmonics. Dynamic range 100 dB peak signal to weighted background noise; input level nominal/max. 300 mV/7 V rms; output level 7 V rms; frequency response 20-20,000 Hz ± 2 dB; equivalent input noise -85 dBV unweighted referenced to 1 V, 20-kHz bandwidth; THD 0.1%; typical, main signal channel; IM distortion 0.1%; SMPTE, main channel; power consumption 10 W

**dbx Model 20/20 Computerized Equalizer**

- Automatic equalizing system combines a microprocessor-controlled 10-band graphic equalizer, real-time analyzer, pink-noise generator, audioprocessor (SPL indicator) and a calibrated microphone. EQ center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16kHz; EQ range ±14 / 15 dB; accuracy ± 0.1 dB at full boost/cut, ± 0.25 dB gain; 14-dB IHF, 20-kHz bandwidth; THD 0.1%; 20-kHz bandwidth; THD 0.1%; 17"W X 10"D X 34"H; Weight: 8 lb

**dbx Model 20/20 Computerized Equalizer**

- Automatic equalizing system combines a microprocessor-controlled 10-band graphic equalizer, real-time analyzer, pink-noise generator, audioprocessor (SPL indicator) and a calibrated microphone. EQ center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16kHz; EQ range ±14 / 15 dB; accuracy ± 0.1 dB at full boost/cut, ± 0.25 dB gain; 14-dB IHF, 20-kHz bandwidth; THD 0.1%; 20-kHz bandwidth; THD 0.1%; 17"W X 10"D X 34"H; Weight: 8 lb
**EVENTIDE**

JJ193 Digital Delay
OMOS-logic digital delay line designed for recording studio, concert hall, auditorium, or radio station; produces signal doubling, realistic echo effects, synchronization of sound reinforcement speakers and pre-echo delay. Features RAMs; variable time delay switches (0-max. in 2 -db steps); four outputs and one input; six-LID input level indicators; input level control; input impedance 20k ohms balanced; 10k ohms unbalanced; input level = 10 dB above +3 dBm (full dynamic range); output impedance 300 ohms electronically balanced; max. output level +22 dBm; distance 0.05%; delay range 90 dB; ± 2% or 230 V ac, 50-60 Hz ± 2%; 3.5" H X 19" W X 9" D...

$1195

CD254. Similar to JJ193 except has two outputs; 0-254 msec time delay controllable by internal switches; no front-panel controls...

$995

**HM-80 Harmonizer**
Compact portable harmonizer features 1-2 octave pitch control, 270-msec delay, word or short riff repeat, time reversal, and dry vs. effect output mix, and feedback controls; dynamic range 90 dB; 2.25" H X 10.5" W X 8.25" D...

$775

F2201 Instant Flanger
Manual, remote, and envelope controls may be used in any configuration; features time delay circuit, effect modifier block (designed to imitate motor or servo hunting bounce), and depth control; effects percentage of direct vs. delayed signal and relative phase of each; line in/out control and LED indicator; high level input and output (optional balanced line in/out available); LED mode indicators; max. level 50-15,000 Hz +1 dB (direct channel), 50-10,000 Hz + 1.5 dB (delay channel); dist. 0.05%; 1.75" H X 19" W X 8" D...

$700

**8280 Omnipressor**
Dynamic omni driver combines functions of compressor, expander, noise gate, and limiter. Features continuously variable expansion/compression control (10:1 gate to 10:1 abrupt reversal); attenuation and gain limit controls (60 db to ± 1 dB); variable time constant controls (1000:1); bass/cut switch; logarithmic response /gain meter /in/out bypass switch. Frequency response 20-16,000 Hz ±0.5 dB; input/output level 0 to -8 dBm nominal; input impedance 10k ohms electronically balanced; output impedance 600 ohms nominal; gain unity, +10, +20 dB (eq disabled); compression continuously variable from 1:1 to unity to 10:1; expansion continuously variable from 1:1 to 10:1; expansion/comp time constant 0-254 msec; input 10k ohms unbalanced; max. output level 8.3 V rms; max. output level 8.3 V rms; frequency response 45-7000 Hz; decay time 1.8 sec with 30-msec interval delay; limiter compression ratio 10:1; S/N 74 dB (A weighted, EQ flat); aluminum front panel and steel chassis; rack-mountable; 1.75" H X 19" W X 6" D...

$315

**RC-1 Reverberation System**
Reverberation system incorporates shock-mounted triple Accutronics 16-in spring assembly, fast-attack peak limiter, and quasi-parametric midrange control; features long decay times, parallel and serial decay modes, and reverber level controls; LED limit /threshold indicator (flashes green when gain reduction begins), and midrange frequency (160-1400 Hz), ± 18 dB midrange control (EQ), ± 18 dB band input, 1.75" H X 19" W X 8" D...

$700

**FISHER**
NR500 Tape Noise-Reduction System
Studio Standard "Super D" dual-process noise-reduction system designed for use with three-head cassette decks. Comprising system uses special phase-compensated split-band system that processes low and high frequencies separately to eliminate "breathing" effects. Features separate encoding and decoding channels; tape/source monitoring switch; internal calibration system to ensure compatibility with any tape deck; fluorescent peak level meters. Controls: gain max.; dynamic range 100 dB; THD 0.06% at 1 kHz, rated level; frequency range 20-30,000 Hz; noise-reduction system designed for use with three-head cassette decks. Comprising system uses special phase-compensated split-band system that processes low and high frequencies separately to eliminate "breathing" effects. Features separate encoding and decoding channels; tape/source monitoring switch; internal calibration system to ensure compatibility with any tape deck; fluorescent peak level meters. Controls: gain max.; dyn.

$350

**FURMAN SOUND**
**PO-6 Stereo Parametric Equalizer/Preamplifier**
Three-band stereo parametric equalizer designed as instrument preamp, feedback suppressor in PA system, or patchable outboard equalizer for recording studio, broadcast stations, or stage productions. Equipped with 4 bands per channel: bass, midrange, and treble band controls with controls with overlapping and variable frequency controls covering 20-500, 500-2500, and 2500-10,000 Hz respectively and +20 dB boost to minus infinity; delay switch (EQ in/bypass); LED and low-end compensation-level control. Input 100k ohms unbalanced, with max. input before clipping 30mV rms for low-level output; output 10 ohms unbalanced; frequency response 20 Hz to 20,000 Hz ± 0.1 dB; total harmonic distortion 0.5% at 1 V rms out; THD and IM distortion 0.0005% from 20-20kHz at 6V; slew rate 14 V/µsec; S/N 90 dB below 2 V rms; max. output level 10 V before clipping; 19" rack-mountable...

$250

**GLI**
**EQ-1500 BI-FET Graphic Equalizer**
Ten-band stereo graphic equalizer with center frequencies at 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000, and 16,000 Hz, ± 12 dB boost or cut. Features high-speed operational amplifier BIFET IC circuitry; 20 slide controls (10/10) with center detent at 1000 Hz and LED status indicator; main, aux., and tape monitor output switches with LED. Frequency response 20-20,000 Hz ± 0.5 dB (EQ flat), ± 1 dB (EQ bypassed), ± 0.05% at 1 V rms out; THD and IM distortion 0.0005% from 20-20kHz at 6V; sle

**INTEGREX**
**Dolby B Noise Reducer Kit**
Stereo unit incorporates four Dolby channels for simultaneous encoding/decoding for three-head tape machines; designed to reduce hiss in magnetic-tape recording machines; decodes commercial-available Dolby B-encoded reels or cassettes or Dolby B FM radio broadcasts and/or encodes blank tapes from any source; cannot be used for discrete 4-channel encoded or non-encoded tapes; Dolby noise reduction 9 dB weighted (CCIR / ARM); min. sensitivity 35 mV rms (tape and Dolby FM tuner inputs), 40 mV rms (aux. inputs); impedance 40k ohms (all inputs), all outputs variable input level controls; max. variable output level 580 mV rms (Dolby level); overload 98 dB above Dolby level for 0.99% distortion; 0.05% (all outputs at Dolby level); S/N unweighted, ref. Dolby level, at monitor output 76 dB (from aux. in), 80 dB (from tape and tuner in, Dolby on), 70 dB (from tuner in, at tape output 70 dB, from aux. in, and tuner in), 76 dB (from tuner in, Dolby FM on). Kit includes two-color fiberglas printed circuit board with component locations, all alignment circuits, and solid mahogany cabinet; assembly time approx. 10 hrs; 2.75" H X 15.5 W X 6.75 D...

$137

**Dolby Calibration Tapes**
Specify reel or cassette...

$20

**DFM Dolby Noise Reducer**
Decodes Dolby B-encoded cassette or reel tapes and Dolby-encoded FM broadcasts; front-panel on/off, 25/75-usc deemphasis input switch, and jim-75-usc deemphasis output switch; rear-panel input level calibration, output level 25/75-usc deemphasis input and output, 75-decay time, and offset controls; noise reduction 9 dB weighted (CCIR / ARM); sensitivity 35 mV rms (Dolby FM tuner level) at 1000 Hz, 76 dB (from aux. in), 80 dB (from tape and tuner in, Dolby on), 70 dB (from tuner in, at tape output 70 dB, from aux. in, and tuner in), 76 dB (from tuner in, Dolby FM on). Kit includes two-color fiberglas printed circuit board with component locations, all alignment circuits, and solid mahogany cabinet; assembly time approx. 10 hrs; 2.75" H X 15.5 W X 6.75 D...

$315
**LT SOUND**

**ACC-2 Amplitude Control Center**
Stereo unit has Allison Research vca with lead-forward circuit design, de-essing with switchable knee, or normal compression. Functions as compression, limiter, expander, de-esser, and on-board oscillator for amplitude-modulated tremolo effects. Each channel has compression ratio, compression attack and release times, expander threshold, expander ratio, and attack and release controls; three-color LED gain-reduction indicators. S/N ratio 90 dB below 1 V; typical distortion 0.001%; compression ratio 1:1 to infinity; and infinity; 19" W x 3/4" H x 7/8" D. $495

**RCC. Reverb control center similar to ECC without echo capability; frequency response 10-40,000 Hz ± 0.5 dB direct, 20-6500 Hz reverberation; dynamic range 72 dB below 1 V; THD and IM dist. 0.05%... $195**

**RV-2 Stereo Reverb Unit**
Unit for line-level signals only; features -6 dB and peak amplitude LEDs; three equalization controls; direct, reverb, reverb drive controls; send/receive buss. Frequency response 2-40,000 Hz ± 0.5 dB direct; 2-25,000 Hz ± 1 dB; reverb time 2.5 sec; input impedance 47k ohms; output impedance 200 ohms for 2k-ohm loads; S/N 90 dB (direct); 2"x 19" W x 7 3/4" D. $305

**PEQ-2 Parametric Equalizer**
Dual 4-band parametric equalizer. Studio quality EQ has rumble filter, selectable peak-dip or shelving response on upper and lower bands, bypass switch, peak indicator, both RCA balanced and unbalanced inputs and outputs. Frequency range coverage 20-20,000 Hz; bandwidth 0.15-2.0 octaves; maximum level +22 dB; maximum boost/cut 15 dB; input impedance 47k ohms; output impedance 47 ohms; THD 0.007%; IM distortion 0.002%; 19" x 7 1/4" x 3/8"; 8.5 lb. $475

**PEQ-1. Same as PEQ-2 but single-channel version and no low-frequency rumble filter; 5" x 2" S$49**

**MARANTZ**

**EQ 20 Equalizer**
10-band stereo graphic equalizer with separate left- and right-channel controls and 24-karat-gold plated input and output jacks for low-oxidation/low-distortion audio connections. Features 20 de- centered slide controls; tape equalization recording capability; extra tape monitor switch with EQ defeat switch to bypass equalizer. Frequency response 10-25,000 Hz ± 1 dB; S/N Ratio 110 dB A weighted; 19" W x 3 1/4" H x 7 3/8"; 54 lbs. $370

**MULTIVOX**

**MX-312 Multi-Echo Chamber**
Solid-state computer-type tape dumping system uses 16-ft endless tape, has one record, one erase, and four playback heads and FG servomotor drive; produces up to 15 echo, 75 different repeat echo, reverb, echo/reverb, reverb echosound, on-sound, and swell reverb, echo. Features include selective instrument input controls, nine modes of echo sound, repeat rate, and echo feedback, sound-on-sound, three-position tone switch, VU meter, three-position reverb/echo blend switch, four footswitch jacks and two output jacks. Wow and flutter 0.15%; delay time 100-800 msec; 6 1/8" H x 17" W x 12 3/4" D. $730

**MXD-5 Analog Delay Line**
Echo delay line uses spring reverb with 20-200 millisecond range. Features include selective im- pedance matching in inputs and outputs to provide compatibility with almost any instrument, microphone, phone, amplifier, recording console, PA mixer; LED indicators for monitoring input signal and overload; an 1 kHz reference for echo and direct and echo sound mix; O/0.2-40 dB output level selector; jacks for optional footswitch. Size is 19" W x 8" D x 34" H; weight is about 8 lb. $400

**MXR**

**One-Third Octave Equalizer**
31-discrete-band one-channel 1/3-octave equalizer

**KOSST**

**K/4DS Digital Delay System**
Designed to recreate concert hall sound in home environment; stores in digital format 17,000 bits of information of live performances from club, theater, concert hall, and auditorium employing 16,384-bit computer circuitry and RAM; automatically delays recorded material to conform with optimized ideal room stored in computer; hooks into any stereo system; second set of speakers required. Features built-in 15 W per channel; switchable speaker selector for 4th dimension, stereo only, and phones and left/right speaker dimension control; EQ switch (enhances bass response of ambition speakers and rolls off bass response below 50 Hz); min./max. gain set with LED limit indicator; stereophones level, dimension, and 4th dimension/ stereo comparator controls with two phone jacks. $396

With speakers $459

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**1982 EDITION**

**SEA-70 Graphic Equalizer**
Stereo graphic equalizer with 12 frequency "tone zone" controls in each channel, two-deck SEA recording/ dubbing. Features wide dynamic range expansion; LED status indicators; ±12 dB ± 6 dB control-range switch. $400

**SEA-20GL Graphic Equalizer**
Seven band "tone zone" controls (one per 1/2 octave); each slide cover controls 60, 150, 400, 1000, 4000, 6000, or 15,000 Hz tone zone; includes defeat, record, tape monitor, and input attenuation (0 dB / -6 dB). $90

**BN-5 Biphonic Processor**
Biphonic processor for biphonic effects through speakers; input terminals Line In/Tape Play at 80 mV / -20 dB, 100 ohms input impedance; output terminals Line Out at 300 mV, -8 dB output level, 3.5k ohms Tape Rec output impedance; consumes 7W; 3¼" H x 15¼" W x 9 3/4" D. $280

**DNF 1201A Dynamic Noise Filter**
Processes any two-channel or matrix encoded material from turntable, tape deck, cassette deck, receiver or tuner; pushbutton controls select proper noise reduction; sensitivity control with LED readout; frequency response (max and bandwidth) -3 dB at 500 Hz, -10 dB at 1 kHz, -20 dB at 2.5 kHz; (max. bandwidth) ±0.5 dB max. 10 Hz to 20 kHz, -3 dB at 30 kHz, -25 dB at 100 kHz; attenuation rate 0 dB/octave; noise reduction levels up to 30 dB above 5 kHz, 14 dB above 400 Hz; HD 0% max.: 0.0 dB gain at 1 kHz adjustable to 10 dB; internal noise 100 µV rms at 20 kHz; 8 phone jacks and end deck connectors; 2¼" H x 17 1/2" W x 8 3/4" D. $379

**TC-1 Thompson Vocal Eliminator**
Removes most of the vocal signal from two stereo records and leaves most of the background instruments and vocals untouched. Works on tapes and records. 19" W x 7 3/4" D x 2 1/2" H. $295

**TAD-4 Thompson Analog Delay**
Stereo ambient unit for recording use features two separate channels each of analog delay and studio reverb. Controls continuously variable for echo EQ, reverb EQ, echo repeat, direct level, echo level, reverb level. Delay time continuously variable 20-240 msec; delay bandwidth ratio continuously variable with delay time ratio; bandwidth 12 kHz at 20-70 msec, 8.4 kHz at 100 msec; down to 3.5 kHz at 240 msec; dynamic range greater than 90 dB; 19" W x 7" D x 2 3/8" H. $725

**ECC Echo Control Center**
Single-channel unit functions as preamplifier for two low-impedance microphones and two low-level low-impedance line level aux. inputs, three-band equalizer/variable, four switches for mic level, EQ, and echo; features bi-FET op amp circuitry, relay on/off transient protection, and mu metal shielding for reverb unit. Delay dynamic range 85 dB below 1 V, 0.5% at 1000 Hz, 0.075V/10 sec; delay range 20-240 msec; frequency response of delay ±1.5 dB; mic input impedance 2000 ohms for 0-2k-ohm load; output impedance 200 ohms for 2k-ohm loads; EQ range ±18 dB for bass, mids, and treble; rack-mountable; 2" H x 19" W x 7 3/4" D. $495

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with center frequencies set at 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, 10000, and 20,000 Hz, ± 12 dB boost or cut, EQ/in out switch; dynamic range 108 dB; THD 0.01% at 0 dBV (20-20,000 Hz), 0.009% at 0 dBV (1 kHz); IM distortion 0.005% at 0 dBV (1 kHz); frequency response 10-20,000 Hz ± 0/-1 dB; max. slew rate 7 V/us; max. input level +18 dBV; input impedance 20k ohms; output impedance 100 ohms; equivalent input noise -95 dBV; maximum output level: +18 dBV (10k ohms); input impedance separate for microphone, line, and instrument input, two tape loops, two processor inputs, two console outputs, two rear-panel tape loop; can process two independent left and right level controls; switchable subsonic filter; complete tape monitoring facilities with a peak-to-peak frequency response of 20-20,000 Hz ± 1 dB at 0 dBV; THD less than 0.1% (400 Hz, ref 0 dB level); power consumption approx. 20 W, 19" W × 10.25" H × 21" D; 12 lb 2 oz ...$450

**Nakamichi**

**High-Com II Noise-Reduction System** Designed to improve dynamic range of high-quality cassette decks; compressor/expander with two independent frequency bands and 2:1 ratio for maximum suppression of noise pumping; 20 dB reduction of noise plus 3-7 dB headroom improvement; built-in 480 Hz calibration tone; two wide-range peak meters; defeatable subsonic and multiplex filters; automatic gain control; worldwide input/output jack adapters; $480

**NR-100 Noise-Reduction System** Dolby-C noise-reduction processor designed specifically to be used with Nakamichi 700ZXK, 700ZXKXL, and 1000 XLZ cassette decks. Can be used without recorder calibration and is selected by setting noise-reduction switch on cassette deck to EXT. Provides 4 channels of NR (both stereo channels in record and playback); noise reduction approximately 18 dB at 1 kHz, 20 dB 2kHz; power supplied by removable battery pack; can be connected to any tape recorder; 9V" + 4.5VAC x 1x9" H; cable length 27" ...$230

**NR-200 Noise-Reduction System** Dolby-C noise-reduction system designed to be used with any high-quality tape recorder. Rack-mountable system has its own power supply, peak-responding LED recording-level meters; left, right, and master recording-level controls; output control; calibration oscillator; MPX filter; and switch for choosing between Dolby B and C processing. Features encoder and decoder sections for true off-tape monitoring with 3-head cassette decks. Noise reduction Dolby B/C 10 dB beyond 2 kHz/20 kHz. THD 0.01% (60 Hz /7 kHz, 0 dBV); THD less than 0.1% (400 Hz, ref 0 dB level); power consumption approx. 20 W, 19" W × 10.25" H × 21" A; 12 lb 2 oz ...$450

**MCS 3030 Stereo Frequency Equalizer** Five-band stereo graphic equalizer with center frequencies set at 50, 100, 200, 2500, and 10,000 Hz ± 12 dB boost or cut. Features power and EQ on/off toggle switches with LEDs; tape-source tape monitor switch; left and right delayed signals; rear-panel terminals for connecting to preamp tape-out terminals; rear-panel tape-in terminals for direct connection to tape deck; Delayed output to second amplifier; Main output for single amplifier/receiver systems. Delay time 27-135 msec large, 16-48 msec mid, 13-64 msec small; reverberation at 500 Hz 0.2-2 sec large, 0.2-1 sec small; audio input/output; 0.1 V 2.3 V; frequency response 20-20,000 Hz ± 1 dB main, 20-5000 Hz ± 3 dB delayed; THD 0.02% main (20-20,000 Hz), 0.6% delayed (500 Hz); S/N unweighted 80 db main, 60 db delayed; 19" W × 13" D × 21/2" H; 11 lb ...$350

**Jc Penney**

**MCS 3030 Stereo Frequency Equalizer** Five-band stereo graphic equalizer with center frequencies set at 50, 100, 200, 250, and 10,000 Hz ± 12 dB boost or cut. Features power and EQ on/off toggle switches with LEDs; tape-source tape monitor switch; left and right delayed signals; rear-panel terminals for connecting to preamp tape-out terminals; rear-panel tape-in terminals for direct connection to tape deck; Delayed output to second amplifier; Main output for single amplifier/receiver systems. Delay time 27-135 msec large, 16-48 msec mid, 13-64 msec small; reverberation at 500 Hz 0.2-2 sec large, 0.2-1 sec small; audio input/output; 0.1 V 2.3 V; frequency response 20-20,000 Hz ± 1 dB main, 20-5000 Hz ± 3 dB delayed; THD 0.02% main (20-20,000 Hz), 0.6% delayed (500 Hz); S/N unweighted 80 db main, 60 db delayed; 19" W × 13" D × 21/2" H; 11 lb ...$350

**EQ-1 Graphic Equalizer** Ten-band stereo graphic equalizer (± 15 dB boost or cut per band) with directed five-stage boost/out slider controls; frequency bands set at 5.1, 6.3, 12.5, 250, 500, 1000, 2000, 4000, 8000, and 16,000 Hz; tape monitor switch; equalizer gain switch (± 6 dB, ± 6 dB); pre/post + EQ tape monitor switch; LED equalizer in/out switch; LED power on switch. Frequency response ± 50-500 Hz, ± 1 db, range 0.007% S/N 105 dB (60 Hz /7 kHz, 0 dBV); "A", 3/4" × 19" × 9" ...$330

**EQ-2 Graphic Equalizer** Six-band stereo graphic equalizer with center frequencies set at 40, 125, 400, 1250, 4000, and 12,500 Hz, ± 12 dB boost or cut. Features tape monitor switch; EQ in/out with LED; 12-position EQ slider control; power-on LED; frequency response 50-500 Hz ± 1 dB; range 0.05% from 20-20,000 Hz (60 Hz /7 kHz, 0 dBV); input impedance 100 ohms; output level/impedance preference 1 V, 5 V/560 ohms; gain 0 dB; rack mountable ...$210

**ATD-1 Time Delay Synthesizer** Designed to be used in audio systems where delay is piped through its own amplifier and speaker systems but will operate successfully with any amplifier/systems. Features three separate Hall Size controls for up to 15 different time delays; five Reverberation controls; three Hall Character controls to combine time delayed signals for multi-reflection effect; Stage Delay control; front-panel input level control with 5-step LED peak-level indicator; output-level control. Tape Mode button for mixed or discrete recording of direct and time-delayed signals; rear-panel terminals for connection to preamp tape-out terminals; rear-panel tape-in/out terminals for direct connection to tape deck; Delayed output to second amplifier; Main output for single amplifier/receiver systems. Delay time 27-135 msec large, 16-48 msec mid, 13-64 msec small; reverberation at 500 Hz 0.2-2 sec large, 0.2-1 sec small; audio input/output; 0.1 V 2.3 V; frequency response 20-20,000 Hz ± 1 dB main, 20-5000 Hz ± 3 dB delayed; THD 0.02% main (20-20,000 Hz), 0.6% delayed (500 Hz); S/N unweighted 80 db main, 60 db delayed; 19" W × 13" D × 21/2" H; 11 lb ...$350
**1100 Series Two Parametric EQ**
Five-band stereo parametric equalizer with center frequencies set at 63, 250, 1000, 4000, and 16,000 Hz, ± 12 dB boost or cut; separate controls and overload indicators for each channel; tape monitor loop with status indicator; bypass switch. Frequency response 20-20,000 Hz, ± 0.009%; S/N 95 dB (nominal); 33' 1/4" H X 16' 1/4" W X 9' 1/4" D. $250

**RE-500.** Similar to RE-700 except 31/16" H X 16' 1/4" W X 10' 1/4" D. $150.

**SAE**
2800 Stereo Parametric Equalizer
Four-band parametric equalizer system with control over cut/boost plus bandwidth frequency; separate controls for each channel; input level controls and peak indicators; tape equalization facilities for pre-equalized tape recordings; control functions are divided into four frequency bands (LO, LO-MID, HI-MID, HI); continuously variable frequency adjustment within each band covering 10-320 Hz, 400-1200 Hz, 240-7500 Hz, 1200-15,000 Hz; each band has slider control that adjusts gain over ±16 dB range, detent at center (0-dB) setting; bandwidth adjustment is slider control calibrated in octaves from 0.3-3.5; each channel has master-level slider providing up to 70 dB of attenuation; max. output before clipping 9 V into 10,000 ohms; input impedance 100,000 ohms; output impedance 500 ohms; features at 40, 125, 400, 1000, 2500, 6000, and 15,000 Hz, ± 12 dB boost or cut; features tone defeat and tape monitor switch; frequency response 10-100,000 Hz, ± 2 db; THD 0.006%; S/N 100 dB; input sensitivity/impedance 0.775 V/55 k ohms; output sensitivity/impedance 0.775 V/600 ohms; 51/8" H X 16' 1/4" W X 10' 1/4" D. $400

**PIONEER**
SG-9 Stereo Graphic Equalizer
Graphic equalizer with ± 10-dB EQ range in each of 12 channels (center frequencies at 16, 32, 64, 125, 250, 500, 1 k, 2 k, 4 k, 8 k, 16 k, 32 k Hz), using slide-type controls. Rated THD 0.006%; 20-20,000 Hz with all controls flat; 1-V output. 16' 1/4" W X 14" D X 5 1/8" H; 15.5 lb. $395

**SR-303 Reverberation Amplifier**
Reverb amplifier with 3-dimensional-effect visual display. Frequency response 5-70,000 Hz ± 1 dB (depth volume control set to minimum); S/N ratio 90 dB; reverberation time 0.00 sec at effect 1, 400 Hz; THD 0.05% at 1 kHz, depth volume control set to minimum, output 1 volt; 16' 1/4" W X 13 3/4" D X 3 3/4" H; 9.5 lb. $195

**RG-2 Dynamic Range Expander**
Dynamic processor improves dynamic range of reproduced music and tape and record noise reduction levels; automatic operation; max. output 6.5 V; THD 0.05% at 1 V, dynamic expansion 4, 7, 10, 13, 16 dB; impulse response: attack time 0.3 msec; release time 120 msec; input impedance 50,000 ohms; output impedance 300 ohms; residual noise 10 µV. S/N 100 dB (1 kHz, dynamic expansion 16 dB); twin Fluorescent meters; 3 1/2" H X 16' 1/4" W X 13 3/4" D. $195

**ROTEL**
RE-1010 Stereo Graphic Equalizer
Ten-band stereo graphic equalizer with center frequency slide controls (ch at 32, 63, 125, 250, 500, 1000, 2000, 4000, 8000, and 16,000 Hz, ± 12 dB boost or cut. Features inductor-less circuitry, two tape monitors with dubbing, EQ record function, and bypass switch. Frequency response 15-45,000 Hz ± 0.01 dB; THD 0.009% from 20-20,000 Hz, 1 V; input sensitivity/impedance 1.0 V/50 k ohms (line and tape monitor 1, 2); hum and noise -108 dB, 32' 1/2" H X 16' 1/4" W X 11' 3/4" D. $250

**RE-700 Stereo Graphic Equalizer**
Seven-band stereo graphic equalizer with center frequencies at 40, 125, 400, 1000, 2500, 6000, and 15,000 Hz, ± 12 dB boost or cut; features tone defeat and tape monitor switch; frequency response 10-100,000 Hz, ± 2 dB; THD 0.006%; S/N 100 dB; input sensitivity/impedance 0.775 V/55 k ohms; output sensitivity/impedance 0.775 V/600 ohms; 51/8" H X 16' 1/4" W X 10' 1/4" D. $400

**Stanford Linear**
Mix and match components to create the ultimate audio system for your home, car, or office. Whether you're looking for high-end equipment or something more affordable, we have the perfect solution for every budget. Our products are designed to provide the best possible sound quality, from the bass notes to the high-end treble frequencies. With our wide range of options, you can create a system that fits your lifestyle and budget. Contact us today to learn more about our products and how we can help you create your dream audio system.
nominal rated output 2.5 V; frequency response (controls at flat) 20,12,000 Hz ±0.25 dB; clipping level 8.5 V at 1000 Hz; THD 0.01% at 2.5 V; 0.026% at 8.5 V; -0.9 dB gain; front panel 8.3" H X 19"; chassis depth 3" in...$700

1800. Two-band version of 2800 with lo band covering 40-1200 Hz and hi covering 1200-20,000 Hz; sensitivity: 2.5" H X 9.5" W X 3.5" D...$400

C-6, Unassembled walnut cabinet for C-4...$45

C-4, Unassembled walnut cabinet for 1800...$45

18 Parametric Equalizer Two-band stereo parametric equalizer with adjustable bandwidth (0.3-3.6 octaves) and center frequency in each control group; features tape equalization facilities and level match controls; frequency response 20-20,000 Hz ±0.25 dB; THD and IM dist. 0.02%; S/N 90 dB; 4"xH X 17.5"W X 3.25"...$500

4100 Time Delay Ambience System Time-delay ambience system features short, medium, and long time delay level slide controls from 70 to 0 dB; input and output level slide controls with LED peak level indicator; regeneration slide control from 0-10 maec; pot, rotary gain control. Input impedance 50k ohms; decoding output level/impedance 530 mV / 330 ohms; 134" H X 17.38" W (19" chassis depth) X 3"2...$77

Time-delayambiencesystem

5000A Click and Pop Filter Filter is designed to eliminate or considerably reduce audible effects of scratches, grit, mistrack ing, static, imperfections, and normal wear of records during normal play and tape recording. Frequency response 20-20,000 Hz ±1 dB; S/N ratio greater than 98 dB; THD and IM less than 0.1%; 10X"W X 9"D X 3"H; 6 lb...$225

SANSUI

SE-9 Graphic Equalizer Microprocessor-controlled stereo graphic equalizer with unique motorized fader-setting system, 4-cur vemon memory storage, spectrum-analyzer display, built-in pink-noise generator, and external elec tronic condenser microphone. All 18 (6 bands X 2 channels) frequency controls are dual slide potentiome ters, one section boosting/cutting its band by ±12 dB, the other producing a varying dc voltage for physically positioning the sliders. Using the automatic adjustment procedure, fader-to-fader interaction is minimized. Automatic setup procedure requires only 30 seconds overall. Left/right frequency spectrum peaks are shown on a gas-display calibrated in 3-dB increments over a 24-dB range. Under and over LEDs warn of out-of-range conditions. Features 2-way dubbing, 2-deck monitoring facilities. Center frequencies 60, 180, 315, 630, 1,250, 2,500, 5,000, and 10,000 Hz, ±1 dB boost or cut; features two-band overlapping, stereo output level control, and equalizer defeat/on/record controls. Frequency response 10-100,000 Hz +0/-1 dB; THD 0.08%; hum and noise -110 dB; ratio: black finish; 8"xH X 17.5"W (with detachable handles for rack mounting) X 11" D...$700

SE-9B, SE-9 with matte black front panel and rack-mounting hardware...$700

SE-7B Graphic Equalizer Ten-band graphic equalizer with center frequencies set at 32, 63, 125, 250, 500, 1000, 2000, 4000, 8000, and 18,000 Hz, ±12 dB boost or cut; features two-band overlapping, stereo output level control, and equalizer defeat/on/record controls. Frequency response 10-100,000 Hz +0/-1 dB; THD 0.08%; hum and noise -110 dB; ratio: black finish; 8"xH X 17.5"W (with detachable handles for rack mounting) X 11" D...$300

SE-7S. Same as SE-7B but with brushed aluminum front panel and rosewood cabinet; 8"xH X 17.5"W X 11" D...$300

SE-5B Graphic Equalizer Eight-band graphic equalizer with center frequenc ies set at 60, 180, 315, 630, 1250, 2500, 5000, and 10,000 Hz, ±12 dB boost or cut; frequency response 0-100,000 Hz +0/-1 dB; features tape monitor switch, equalizer defeat/on/record controls, and output level control; matte black cabinet; 4.5"H X 19.2"W (with handles) X 11.5" D...$230

RA-700 Reverberation Amplifier Continuously adjustable reverb time with visual in dication; can handle two tape recorders simul taneously; adds echo effects during recording or playback; frequency response 20-20,000 Hz ±2 db (at reverb time min), 20-30,000 Hz ±10 dB (reverb max); S/N 85 dB at 300-mV output; reverb time 1.9-3.2 sec (at 1000 Hz); input/output jacks; tape recorder playback A and B; load impedance 100,000 ohms; simulated walnut-grain enclosure; 41/4"H X 11 1/2"W X 10 1/4"...$190

PLUS N55 Noise-Reduction System Features Sanyo's "Super D" tape noise reduction system designed to keep maximum separation between low and high frequencies with minimum distortion; fluctuating peak reading signal-level meters; multiplexer filter, D tape/surface monitor, and record calibration switches; left/right play level and left/right record level controls. Dynamic range 100 dB; THD 0.08% at 1000 Hz; frequency response 10-30,000 Hz ± 1 dB; noise reduction 40 db max. (using tape deck with 50-db min. S/N); record/playback input level/impedance 350 mV/50 k ohms; record/playback output level/impedance 350 mV/308 ohms; 19"W X 17.5"W (w/ handles) X 11" D...$300

PLUS N35 Noise-Reduction System Super D noise-reduction system uses companding scheme. Features a phase-compensated bandsplitting filter; "Decliner" 2.1 compression; optimized level metering; mic/line mixing; fluorescent peak-reading signal-level meters; MPX filter. Dynamic range 100 dB; frequency response 10-30,000 Hz ±1 dB; THD 0.08% at rated output, 1 kHz; noise reduction 40 dB maximum using a tape deck with 50-db min. S/N; ratio: black finish; 17 3/4"W X 10 1/4"D X 19"H...$300

SONY

SE-5B Graphic Equalizer

SE-7B Graphic Equalizer

SE-6B, SE-9 with matte black front panel and rack-mounting hardware

PLUS N55 Noise-Reduction System

PLUS N35 Noise-Reduction System

SANYO

SR107 Equalizer Ten-channel equalizer. Rotary controls for each oc cupy (15-db boost or cut) at 31, 63, 125, 250, 500, 1000, 2000, 4000, 8000, 16,000 Hz; 15-db master level control; LED overload indicator; 20-db additional variable gain; by-pass switch, balanced/unbalanced line input; balanced microphone output; balanced/unbalanced AUX-level output; 19.5W X 8 1/2"D X 1 3/4"H; 120 V ac, 50/60 Hz, 6 W...$315

M63 Audio Master Add-on tone-control unit for compact mixers; two high-level input; outputs (high-impedance/high-level AUX; high- and low-impedance mic; 500 -ohm balanced line, headphone); high- and low-pass 96-dB octave filters; separate bass and tre ble boost/cut controls; output VU meter; 120 V ac, 50/60 Hz, 3 W; 12"XW X 8 1/2"D X 2 3/4"H...$205

M610 Feedback Controller Ten-band, cut-only equalizer with eight linear potentiometers and two slide switches; high/low-impedance three-pin input and output connectors; phono-jack AUX-level input and output; bypass switch; master volume control; 120 V ac, 50/60 Hz, 3 W; 12"XW X 7 1/2" D X 2 3/4"H...$210

SONYTEC

NF-6X2 Mixer Six-input stereo mixer with transformerless discrete circuitry. Each input has gain trim switch for optimizing S/N ratio, phase-reversal switch, pan pot, rotary gain control. Input noise figure 2 dB (150-ohm mic).; frequency response 5-50,000 Hz ±0.1 dB; THD at max. gain (one input) and output level of +24 dBm is 0.002%; slew rate greater than 200 V/µsec; black anodized rack mount aluminum; 1 1/4"H X 19"W X 6"D...$990

SONY

PCM-10 Digital Audio Processor Two-channel analog-to-digital pulse-code modulation system using 14-bit/14-bit A/D converters; sampling frequency 44.056 kHz; recording density 2643 bits/sec; code 126 bits/11 TVH (includes 16 bits for CRCC and 28 bits for error correcting); data 14 bits/ch; dynamic range 85 dB; HD 0.03%; frequency response 0-20,000 Hz ±1 db; inputs -10 dB, 50kohms unbalanced, using Cannon XLR-3-14 or phono jacks (line), 1 V p-p, 75 ohms unbalanced using phono jack (video); outputs -10 dB, 300ohms unbalanced, using Cannon XLR-3-14 or phono jacks (line), -10 dB, 3.3kohms with unbalanced phono jack (external line) 1 V p-p, 75 ohms unbalanced using phono jack (video), -10 dB at 8-ohm load with stereo phone jack (headphone); supplied with 5V, 0.01A power jack. Input smear time 1.5 usec; switchable power supply (9V or 14V), connecting cord power cord, and demo tape; 7 1/4"H X 18"W X 15"D...$5500

Tape Recording & Buying Guide
SOUND CONCEPTS

SD550 Ambience Restoration System
Digital channel audio delay system; continuous delay varies from 50 to 100 msec; continuous reverb variation from 0 to 100%; high frequency rolloff from -3 to +6 db; front mix level from 0 to 100%; rear level 0 to 100%; 50 or 100 msec delay range; rear output delay or delay mix; input front or rear; input impedance 60,000 ohms min.; output impedance 300 ohms max.; frequency response 20-10,000 Hz + 1, -3 db. Im 5 msec delay and zero dB high frequency rolloff, dynamic range 90 dB min.; S/N 85 dB min.; 90 dB weighted; 1% max. dist. at 1 KHz and 1 V rms, consisting almost entirely of 2nd harmonic; 3%*W x 15%*H x 9" D. ...............................................

$700

IR2100 Image Restoration System
Expands stereo image beyond confines of space between speakers to reproduce sonic image presented to recording microphones; loudspeaker/listener angle continuously adjustable from 20-100 degrees; continuous adjustment of parameter to central sound level balance; master volume control; connects in tape loop or between pre- and power amp; S/N 80 dB; dist. 0.1% max.: handheld with 15-ft remote control; 6"H x 3"W x 1.5" D. .......$250

SX80 CX Decoder
Reexpands source material encoded by CBS CX companding system, improves perceived S/N ratio by 20 dB. frequency response 20-20,000 Hz ± 0.25 dB; S/N 85 dB; THD 0.1% maximum; provision for dispaced tape recorder; bypass, volume, calibration controls; 5"xW x 3"xD x 2"H,.... $100

SOUNDCRAFTSMEN

SP4002 Signal Processor/Preamplifier
Ten-band channel graphic equalizer/preamplifier. Equalizer: center frequencies set at 30, 80, 125, 250, 400, 800, 1250, 2500, 5000, and 12,500 Hz; + 15 db boost or cut; features LED input-to-output balancing indicators and 18-db zero-gain control; HD and IM ratio 0.1% at 2 V; S/N 114 dB at 100 dB output. Input impedance 10k ohms; -20 dBV input level; -20 to +20 dBV output. Preamp: features two stereo or four mono phono preamps, each with inputs, outputs, and independently variable ± 20 db gain stage; accepts moving-coil, variable-reluctance, or moving magnet cartridges with 0.25-300 mV output; 0.750 pf variable cartridge loading; pushbutton switching from one to six input sources through subsonic filter, two external processing loops, A + B mixer to two tape or two line outputs; three-way tape dubbing; two amplified headphone outputs from 8-2000 ohms; ± 20 db stepped level control; frequency response ± 0.25 dB (hi level), 20-20,000 Hz ± 0.5 dB (phone); THD IM and distortion 0.01% at 1 V; phone impedance 47k or 100k ohms switchable; phone S/N 97 dB at 10 mV in. Includes environmental test record and Computone charts; rack-mount brushed aluminum black and silver panels; 7"H x 19"W x 11"D. .................................................. $699

TG3044-R Third-Octave Equalizer
Third-octave stereo equalizer with 15 center frequencies set at 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, and 1000 Hz on three octave and six center frequencies set at 1800, 2500, 4000, 6300, 10,000, and 16,000 Hz on alternate 1/2 octaves, 22 db boost or cut (controls full), 15 db boost or cut (controls flat); features pushbutton EQ defeat, lo-trim, and separate monitor input and output controls; LED unity gain input-to-output balancing indicators; separate zero-gain control; HD and IM distortion 0.01% at 2 V; S/N 114 dB at 100 dB output, 100 dB right level controls with peak-reading LEDs and input mix; impedance 10k ohms; -20 dBV input; ± 15 db boost or cut each octave. Noise level -76 dBm from 20-20,000 Hz, unweighted; nominal decay time 2.5 sec. 1/4 in phone jacks; 3"W x 19"H x 11"D. .................................................. $750

262B. 262 with transformer-isolated balanced outputs; nominal output level +4 dBm balanced into 600 ohms; includes XLR connectors. .......................................... $600

242C Stereo Reverb
Designed to interface with latest 4- and 8-track recording systems. Input section: features separate left and right dry/reverb mix with LEDs; source impedance 47 ohms; nominal level -2 db into 800 ohms. EQ section: features separate low and high slide controls/ch covering 50-1000 Hz (low) and 500-10,000 Hz (high) ranges at ± 15 db boost or cut. Other features include B/FET preamp circuitry; noise level -80 dBm from 20-20,000 Hz; unweighted; nominal decay time 2.5 sec. 1/4 in phone jacks; 3"W x 19"H x 11"D. .................................................. $750

AE2420 Analyzer/Equalizer
Incorporates dc differential/comparator circuitry for EQ analysis and equalizer; comparator converts wave shapes of pink noise input signal and speaker output signal to dc levels with 0.1-db accuracy; eliminates precisely-calibrated pink noise generator and provides user with complete system analysis and automatic cartridge adjustment; includes pink noise generator, 12-in pink noise test record, and Computone charts. .............................................. $499

RP2215-R Equalizer
Provides front-panel pushbutton control of line or tape equalization for conventional hi-fi systems or separate stereo outputs for multi-system equalization. Features environmental test record providing equalized program material during use. Features environmental test record for listening environment equalization; four LEDs for front-panel display controlled by zero-gain level controls for input vs. output level balancing. S/N 114 dB; THD 0.01% at 2 V, 0.05% at 1 V (typical); ± 15 dB boost or cut each octave; 600 ohm output; black anodized aluminum panel; 5"H x 19"W x 1/4"D. ........................................ $370

RP2201-R. Similar to RP2215-R without LED/zero-gain balancing circuit; has 18-db zero-gain controls; S/N 105 dB at 10 V out; ± 12 dB boost or cut each octave. ........................................... $299

SE450. Same as RP2201-R without environmental test record, Computone charts, and line equalization. S/N 100 dB; available in brushed aluminum silver or black front panel with black vinyl cabinet; not rack-mountable. ........................................ $249

SOUND WORKSHOP

262 Stereo Reverb
Stereo reverb system designed for professional interface. Input section: features balanced transformerless amplifier inputs/circuitry, input mix without external patching, and -2 to -12 dB LED display indicators; impedance 10k ohms; -20 dBV (min.) and +20 dBV (max.) levels. Output section: features separate left and right dry/reverb mix with LEDs; source impedance 47 ohms; nominal level -2 db into 800 ohms. EQ section: features separate low and high slide controls/ch covering 50-1000 Hz (low) and 500-10,000 Hz (high) ranges at ± 15 db boost or cut. Other features include B/FET preamp circuitry; noise level -80 dBm from 20-20,000 Hz, unweighted; nominal decay time 2.5 sec. 1/4 in phone jacks; 3"W x 19"H x 11"D. .................................................. $750

242C Stereo Reverb
Designed to interface with latest 4- and 8-track recording systems. Input section: features separate left/right reverb level controls with peak-reading LEDs and input mix; impedance 10k ohms; -20 dBV input; ± 20 dBV (max.) levels. Output section: left/right reverb level controls; source impedance 47 ohms; nominal level -8 dbm into 10k ohms. EQ section: left/right variable controls; ± 10 db at 4300 Hz. Noise level -76 dBm from 20-30,000 Hz

PHONO CARTRIDGES

Cutalian test record, Computone charts, and line equalizer. S/N 100 dB; available in brushed aluminum silver or black front panel with black vinyl cabinet; not rack-mountable. 

 sceptric test record, Computone charts, and line equalization. S/N 100 dB; available in brushed aluminum silver or black front panel with black vinyl cabinet; not rack-mountable. 

THERE'S A NEW SOUND WAITING IN YOUR SYSTEM. CIRCLE NO. 9 ON READER SERVICE CARD

FILL IN THE BLANKS.
STEREO BI-FET EQUALIZER WITH VARIABLE CENTER FREQUENCY

GEM-4 Varigraphic Equalizer stereo bi-FET equalizer with variable center-frequency potentiometers that provide "parametric-like" control, true EQ curve modifier, and total tape-recording flexibility with switching facilities for EQ'ing during recording and/or playback. Features five slide and five rotary controls per channel with frequencies at 33.78 Hz, 110-260 Hz, 470-1.1 k Hz, 2.19-4.5 kHz, 10-20 kHz ± 12 dB; frequency response 10-50,000 Hz ± 2 dB, THD less than 0.01% at 1 kHz; S/N 94 dB IHF A weighted; input/output impedances 1000 ohms; output 6 V rms with 10,000-ohm load; gain unity (0 dB) in flat positions; center G 2.5; power consumption 3 W nominal, 19'W X 7.4'D X 5.3'H; 11 lb. $210

SPECTRO ACOUSTICS

SUPEREX

GEM-1 Graphic Equalizer

Five-band stereo graphic equalizer module with center frequencies at 60, 240, 1000, 3500, and 10,000 Hz, ± 12 dB boost or cut. Features two-band switch (two switches) and 32-band switch (one switch). Provides equalization control at the important high and low ends (high treble and deep bass) and mid-range. Each stereo channel has five slide controls with center frequencies at 36, 68, 240, 1.6k, and 15kHz. Features three exclusive tape function system to permit recording with equalization, playing back with equalization, and monitor controls; programmable capability with optional Superex program cards. Frequency response 10-150,000 Hz ± 0.5 dB, THD 0.02% at 0 dB gain; rated output 10 kHz, ± 12 dB range; input level control, and LED input overload indicator. Frequency response 5-100 kHz ± 0.1 dB; THD less than 0.005%; S/N 89 dB IHF A weighted; input/output impedances 50k/100 ohms; overall gain 0 ± 1 dB; 61321-I X 161s $5995

SH-8020 Stereo Frequency EQ

Twenty-channel stereo octave equalizer with center frequency slide controls at 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000, 16,000, and 32,000 Hz, ± 12 dB boost or cut, with LEDs on slide pots showing ± 12 dB gain. Features include switches for tape/source monitoring, source/rece EQ position, normal/reverse. SH-8015 Graphic Equalizer stereo graphic equalizer with illuminated display that indicates the variable control ranges. Features five-band graphic equalizer for each channel (63, 240, 1k, 4k, 16 kHz ± 12 dB range), equalizer on/off switch; equalizer position switch; tape monitor switch with LED indicator that permits monitoring signal source/tape deck output. Frequency response 5-100kHz ± 3 dB; max. output 6 V; THD 0.02%; input sensitivity 0.5 V; S/N ratio 101 dB IHF A weighted at 0 V output; overall gain ± 0 dB; output voltage 0.5 V at 0.02% THD; power consumption 12 W; 15"W X 14"D X 3.9"H. $200

TECHNICS

SH-8030 Dimension Controller New Space Station Dimmer Controller with band stereo equalizer, mixing capabilities, and dimension display. Features slide-control equalizer section; and out of signal path; and 3-dimensional-effect dimension display with peak-level scale. Frequency response 7-150,000 Hz ± 0.5 dB line in, 20-20,000 Hz RAA ± 0.5 dB phone, 35-30,000 Hz ± 3 dB mic; THD line in at 150 mV output 0.005%; S/N ratio 80 dB IHF A curve, line in, dimension controller effects 90-900 msec, sound-image localization 30° forward, EQ center frequencies 60, 250, 1k, 4k, 16k Hz over ±12 dB range, input sensitivity 150 mV line in, AUX, tape, 2.5 mV phone, 1.5 mV mic; output 150 mV line and rec out; power consumption 10 W; 13"W X 16"H X 3.5"D; 15.6 lb. $5995

USA MAJOR

Space Station SST-282 Digital Reverb System Digital reverb, multi-tap digital delay, and delay-effect system using PCM circuitry with RAM. Features reverb processors and adjustable controls for reverb parameters including initial delay pattern, decay time, and high- and low-frequency decay time; eight audition 1 delay taps, built-in mixer; 16 programs of delay times; reverb/echo feedback. Frequency response 20-7000 Hz:dist. 0.1%; dynamic range 80 dB, delay time 256 msec; reverb decay 3.5 sec; echo decay 10 sec. $2195

URSA MAJOR
ALLSOP

Allsop 3 Cassette Deck Cleaner
Cassette deck cleaning kit designed to clean pinch roller, capstan, and head in 20-40 sec; cleaner has two non-abrasive felt pads and ribbonless wiper arm; includes cassette-sized cleaner and cleaning solution.............................................. $7.95
Refill Kit. Comprises of three large and three small non-abrasive felt pads and 1-oz bottle of cleaning solution...................................................... $2.95

Allsop 3 CHS VCR Cleaner
Cassette-format video cassette recorder cleaner cleans audio and video heads, pinch rollers, and capstan. Cleans in 4-6 seconds; shuts off automatically; has absorbent cleaning chemios and non-abrasive felt pads; includes cleaning solution.......................... $29.95
Replacement cartridge with cleaning solution.................................................. $8.95

Allsop Beta VCR Cleaner
Beta-format videocassette recorder cleaner for audio, video, and erase heads, pinch rollers, and capstan. Cleans in 4-6 seconds; shuts off automatically; has absorbent cleaning chemios; includes cleaning solution.......................... $29.95
Beta replacement cartridge with cleaning solution.......................................... $5.95

ASPEN

The company carries a complete line of tape accessories for use with open-reel, cassette, 8-track, and car tape equipment.

Head Cleaner Kit. Includes Aspen aerosol spray tape head cleaner, extension nozzle, and six 4-in wipe heads nonabrasive, nonflammable, residue-free.................................................. $5.95
Wipe Heads, 25 6-in jumbo tip swabs per package........................................ $1.49

Plastic Wax
Dustcover cleaner and polish; removes scratches from plastics and eliminates static electricity; for use on plastic, wood, glass, metal, formica, vinyl, etc.
8 oz. ................................................................................................................. $9.95

Decktester
8-track cartridge for home and auto use to check 8-track tape decks for tape speed-time, speaker rattle, speaker phasing, wow and flutter, head alignment, cross-talk, channel switching, and worn heads........................................................................ $9.95

Video Disc Cleaner
Cleans and polishes video discs; removes scratches, eliminates static, and retards dust accumulation, smudges, and fingerprints.
Heavy-duty model............................................................................................. $8.95
Light-duty model................................................................................................. $6.95

AUDIO CONTROL

CSOA LED Realtime Analyzer
LED spectrum analyzer with built-in pink noise generator and microphone. Features 101-LED spectrum display that shows fast or slow peak-reading modes, sound pressure level with external mic or VU meter readings, and pink noise and microphone analyses with switchable calibration levels from 2- to 4-dB/LED. Other features include continuously variable input level sensitivity with calibration; auto mic/line input switching................................................ $399.00

RVR-RVP Series Drop-In Modules Kits
User-replacement electronics kits designed to improve noise specifications of the non-Dolbyized Revox A-77 tape decks by 1.5 dB; kits include record and playback drop-in modules and externally-fitted bias-trap network. A-77 improvements with modules: record amp overloads at min. 6 dB above saturation levels of any tape at any frequency; THD 0.2% at 6 dB above saturation; response at 20,000 Hz = 1.5 dB at 7½ ips; recalibrates meter sensitivity due to headroom increase. Available for 3½, 7½ and 9½ ips A-77 models; factory-calibrated for bias, equalization at two speeds, record gain; user adjustable in conjunction with A-77 instruction manual. Complete RVR/RVP kit............................................. $425.00

BIB

Audiophile Edition
24-4E Cassette Tape Splicer
1/4-in. cassette tape splicer suitable for recording tape of any thickness; makes diagonal or butt splices................................................................. $24.95

90-4E Tape Head Demagnetizer
Designed for cassette, 8-track, reel-to-reel recorders; built-in auto-off switch when not in use; includes inspection mirror with cleaning brush, cleaning fluid, and replacement tips................................................................. $16.95

115-4E Tape Head Cleaning Kit
Multangled tape head cleaning tools for use on all tape recorders; includes inspection mirror with cleaning brush, cleaning fluid, and replacement tips................................................................. $14.95

122-4E Tape Head Cleaning Fluid
Professional fluorocarbon formula; cleans tape heads, capstans, pinch rollers; residue-free, safe for all recorder surfaces........................................ $3.45

Videophile Edition
VE-2 Video Maintenance Kit
Comprises five VE-5 cleaning tools, VE-7 head cleaning fluid, VE-4 dust-airway blast, inspection mirror, antistatic cleaning cloth, maintenance manual for VHS- and Beta-format recorders.... $24.95

VE-4 Dust-Away Air Blast
Compressed air spray blaster removes dust, dirt, oxide from tape travel path; moisture-free, temperature constant...................................................... $15.95

VE-9 Video Tape Splicing Kit
Repairs broken video tape easily and accurately................................................ $39.95

VE-11 Head Cleaning Cassettes
Removes harmful debris from tape path in 15 sec; safe and nonabrasive; for VHS-format machines........................................................................ $26.95

VE-12, Same as VE-11 except for Beta-format machines........................................ $26.95

VE-13 Video Lens Care Kit
Cleaning fluid, special brush with dust cap and antistatic cloth in handy carry-along wallet...................................................... $8.95

VE-15 Antistatic TV Screen Treatment
Prevents attraction of dust and dirt by preventing static build-up on TV screen; removes smudges and fingerprints........................................ $7.95
**MAGNESONICS**

**Modular Tele-Cord Electronic Secretary**
Records telephone communication through hook-up with cassette recorder; includes modular duplex adapter (connects to modular line plug and telephone line), sub-miniature plug connecting to remot input of recorder, and miniature plug connecting to aux. or mic input of recorder. $49.95

**Erase-Sure**
Erases cassette or 8-track cartridge to 65 dB from 0 reference; includes four "AA" batteries, 2 3/4" H X 4" W X 3 1/2" D. $24.50

**Ac Adaptor**
Jump start. $9.50

**Rapid Rewind**
Designed to check and test cassettes before recording for cassette tape tension stabilization, tape binding elimination, and uniform tape pack; winds C-60 cassette in 30 sec; includes four "AA" batteries. $24.50

**DM-10 Head Demagnetizer**
Slim-line, easy-to-use recorder head demagnetizer, designed for company's cassette decks. $28.00

**PC-501 Index Label Book**
Contains 100 replacement labels and 156 color-coded identification tabs for cassettes. $4.99

**PC-502 Index Card Book**
Provides 24 color-coded cassette replacement labels and 100 self-adhesive identification tabs. $4.99

**PC-507 Cassette Repair/Maintenance Kit**
Designed for repairing and/or editing cassette tapes. Provides precision splicing block with 90° and 60° cutting slots and tape hold-downs. Includes scissors, tweezers, Phillips and straight-slot screwdrivers, splicing tape, sensor tape, tape probe, replacement pressure pads, and screws. $24.95

**QC-205 Tape Deck Cleaning Kit**
Contains separate cleaning solutions for tape heads and pinch rollers (11 ml each), mirror, and 10 cotton swabs. Fluid refill available. $7.99

**QC-209 Head-Cleaning Cassette**
Cleaning tape removes oxides from tape heads, capstans, pinch rollers, depositing it on a replaceable, specially-surfaced pad. Safe to use on all tape heads. $7.99

**TC-1 Tape Head Cleaner**
Nonflammable spray-type cleaner for all tape heads, pinch rollers, and plastic and metal parts. Comes with 10 cotton swabs and extension tube. $5.99

**REALISTIC**

The company's tape accessory line is as follows:

44-232. Bulk tape eraser... $15.95

44-215. Head demagnetizer... $5.95

44-207. Illuminated head demagnetizer... $13.95

44-1165. Electronic cassette demagnetizer... $19.95

44-214. Cassette tape splicer... $5.95

44-222. Tape recorder dust kit... $5.95

44-626. Cassette repair kit... $1.09

44-627. 8-track cartridge repair kit... $3.95

44-1170. Cleaning swabs and 2-oz Freon head-cleaning solvent... $2.99

44-612. Cassette storage album... $2.99

44-206. Electronic cassette winder... $9.99

44-290. 7-in metal reel... $6.95

**RECORDER CARE / NORTRONICS**

**QM333 The Splicer**
Edits, repairs, or adds leader to magnetic tape, designed for 1/4-in reel-to-reel, 8-track cartridge, and cassette tapes; splits tape; has pop-out tape guide. $21.00

**Professional Splicing Blocks**
Grooved silver or gold anodized aluminum splicing blocks with two deep slits for straight and diagonal cuts; includes double-backed adhesive and stainless-steel cutting blade, 5" x 1" x 9/16". $78.00

**QM-311**
For 1 1/4-in tapes... $23.00

**QM-312**
For 0.150-in cassette tapes... $23.00

**QM-313**
For 0.1-in video and audio tapes... $26.00

**Reel Tabs**
Pre-cut Mylar or metal tabs in dispenser box; comes in quantities of 50, 200, or 1000; 1/4-in Mylar tabs in quantities of 200 or 1000 also available. $5.00

**QM-251**
1/4-in reel tabs; 50/package... $5.00

**QM-252**
Cassette reel tabs; 50/package. $5.00

**QM-254**
1/4-in metal-sensing reel tabs; 50/package. $5.00

**QM-707 Handylap**
Kit includes lapping block with five 5 X 9-in coarse abrasive black lapping sheets of paper, five 5 X 9-in medium abrasive yellow sheets, and five 5 X 9-in fine abrasive red sheets. $93.50

**QM-702**
Coarse lapping paper, black... $7.00

**QM-703**
Medium lapping paper, yellow... $13.20

**QM-704**
Fine lapping paper, pink... $13.20

**QM-230 Cassette Bulk Eraser**
Self-powered hand-held unit completely erases cassette tapes; requires no batteries or external power source; contoured Cyclacol case with wood grain finish... $32.50

**QM-211 Bulk Eraser**
Bulk eraser generates a 60 Hz magnetic field which completely erases pre-recorded reels, cassettes and 8-track cartridges up to 1/2-in wide; features touch-control Microswitch that activates on fingertip pressure and deactivates when unit is put down; built-in thermal overload protect circuit; hand-contoured Cyclacol case; coiled cord... $56.80

**QM-212 220-V professional bulk eraser... $59.60

**QM-250 Professional Bulk Tape Eraser**
Demagnetizes professional cassette, 1/4-in, 1/2-in, and 1-in open-reel, broadcast, 8-track, cartridge, and 1/2-in VHS/Beta video cassette tapes; holds up to 1/2-in reel sizes; 3.25" H X 10" W X 7" D... $336.40

**QM-202 Head Demagnetizer**
Head demagnetizer for use with reel-to-reel, cas-
Car Tape Maintenance Products
AS-9. 3-oz spray cleaner and 100 six-in cotton swabs…………………………...$6.80
AS-141. Cassette life extender features non-abrasive cleaning belt; includes liquid cleaner……..$14.40
AS-183. 8-track head/capstan cleaner; designed for use every ten hrs; includes liquid cleaner.$$4.40
AS-206. 8-track/cassette head demagnetizer; plugs into car cigarette lighter. ..........$32.00

CS -8 Cartridge Carousel
Stores 24 8-track cartridges in individual compartments in plastic smoke-finish carousel .......$10.99

CS -1A Cartridge Carousel
Stores 20 cassettes vertically in plastic smoke-finish carousel ..............................$5.99

RBM-44 Magicare Demagnetizer
8-track head demagnetizer and cleaner; designed for use after every 15-20 hrs of playing time; operates on 110 volt current; UL approved ...........$9.99

RBM-45 Magicare Demagnetizer
Cassette demagnetizer designed for use after 15-20 hrs of playing time; operates on 110 volt current ..........$9.99

RBM-41 Magic Cartridge Kit
'Magic Cartridge' functions as head cleaner, capstan cleaner, track selector test, speaker phasing test, and channel balance test; includes 2-oz Magic Tape Dwelling cleaning fluid and the Magic Wand Applicator with six replacement pads .............$6.99

RBM-40 Magic Cassette Kit
Includes 10-ft Magic cartridge head cleaner in plastic case, 3-oz Magic Tape Dwelling cleaning fluid, and Magic Wand Applicator with six replacement pads .............$5.95

RBM-42 Magic Tape Cleaning Kit
Includes 3-oz Magic Tape Dwelling cleaning fluid and Magic Applicator with interchangeable brush and pad and six replacement pads .........$2.99

RBM-43 Magicare Tape Editing Kit
For cassette and reel to reel; includes aluminum dual-purpose splicing block, leader tape, splicing tabs, 12 blank cassette labels, and razor blade ...$0.99

CH100 Record and Tape Care Kit
Complete audio maintenance system kit, for cassette and 8-track cartridges, record and stylus maintenance. Can be used on all home and auto decks. ...$29

Head Cleaners
QM -140. For cassettes ........................................$3.00
QM -141. For cassettes; includes liquid head cleaner $3.40
QM -180. For 8-track tape .......................................$3.20
QM -181. For 8-track tape; includes liquid head cleaner ...........................................$4.00
QM -182. Combination 8-track head/capstan cleaner .................................................$4.40

 cassete, and 8 -track recorders; features long, flexi-
 ble, plastic covered probe that reaches the most inaccessible heads; leaf switch activates with fin-
gate pressure and deactivates when unit is put in inaccessible heads; leaf switch activates with fin-
gate pressure and deactivates when unit is put

Alignment Tapes
AT -110B. For cassette recorders ...........$14.40
AT -200B. Master recording provides zero refer-
ence, azimuth alignment, and DIN frequency re-
sponse tests; includes 3000-Hz tone for speed and flut-
ter ..........................................................$22.00
AT -820. For 8-track; 8-min cycle .......$12.00
AT -320. Designed for NAB-type endless-loop mono and stereo cartridge recorders/players; 7-5-
ips master recording tests and adjusts head azi-
muth, program frequency response, program re-
cord level, stereo head phasing, cue tone sensitivi-
ty, and tape speed .....................................$55.20
AT -120. 4-in reel -to-reel 7-5/ips master record-
ing tape ......................................................$5.19

VCR Maintenance Products
QM -50. Deluxe video recorder care kit includes 10-oz Super Blast spray, 16-oz tape head cleaner spray, anti-static dustcloth, 25 cellular foam swabs, head/capstan cleaners, and disposable earplugs ..................$31.20
QM -95. VCR maintenance kit includes spray head cleaner, cellular foam swabs, anti-static dustcloth, and screwdriver that removes headcover screws ..........$17.00

VCR-103. Tape head cleaner spray for VCR heads, pinch rollers, and capstans; 3 oz .......$4.80
VCR-105. Tape head cleaner liquid removes dust, dirt, and tape oxide deposits from VCR heads and parts; 3-oz bottle; 5 A; 20 minutes on; $4.60
VCR-109. High-speed jet air stream Super Blast Spray Cleaner eliminates loose tape oxide dirt and dust; 10 oz. .................................................$5.20
VCR-205. Head demagnetizer with angled tip; removes residual magnetism from heads, rollers, and screwdriver that removes headcover screws ................................................................................................................ $4.60
VCR-211. Video bulk eraser erases Beta II and VHS-format cassettes; generates 60-Hz magnetic field, touch-activated microswitch that deactivates when put down; Cyclolac case; includes ac power cord for 110-120 V ac operation, 50-60 Hz ..................$56.90
QM -313. Grooved anodized aluminum splicing block for repairing or editing 1/2-in video cassettes; two deep slits for straight or diagonal cuts; includes double-backed adhesive .........$26.80
VCR-505. Illuminated inspection mirror for dark, hard-to-reach areas of VCR heads, rollers, and guides ..........................................................................................................................$25.20
VCR -211. Video bulk eraser erases Beta II and VHS-format cassettes; generates 60-Hz magnetic field, touch-activated microswitch that deactivates when put down; Cyclolac case; includes ac power cord for 110-120 V ac operation, 50-60 Hz ..................$56.90
QM -313. Grooved anodized aluminum splicing block for repairing or editing 1/2-in video cassettes; two deep slits for straight or diagonal cuts; includes double-backed adhesive .........$26.80
VCR-505. Illuminated inspection mirror for dark, hard-to-reach areas of VCR heads, rollers, and guides ..........................................................................................................................$25.20
VCR-512. Cellular foam cleaning swabs for VCR heads and surfaces ..............$4.80

Cassette Storage/Carrying Cases
Burl Walnut Vinyl Book-like cassette case; cassette storage/Carrying tapes $51.80

CASSETTE CAROUSELS
AT -120. 4-in reel -to-reel 7-5/ips master record-
ing tape ......................................................$5.19
24-014 Audio Tape Eraser
Erasable cassettes, cartridges, open-reel, digital cassettes, and magnetic stripe film, erases in seconds; reduces tape wear (variable level); no tape contact or wear; has built-in momentary contact switch; 117 V ac intermittent duty (one minute on, 20 minutes off), 220-V model also available; 5 A, 2 lbs; UL approved; 4" x 2.5" x 4.5" ... $34.50

Whistle Stop Head Demagnetizer
Automatic electronic cassette head demagnetizer in cabaret format; removes accumulation of residual magnetism from heads of home or car cassette tape machines; whistling tone, indicates erasing action. ... $26.50

25-011 Universal Head Demagnetizer
Universal head demagnetizer with changeable tips permitting use with reel-to-reel, cassette, and cartridge tape recorders; 110-120 V ac, 50/60 Hz operation; UL approved ... $15.50

29-500 VCR Head Cleaning Kit
Speck-silver chloride-like applicators are used to apply a Broad Spectrum Frasco TC based formula that quickly removes dirt, oxide buildup, and plasticizers from tape head. Kit comes with five applicators and 1 oz. bottle of cleaning formula ... $11.20

29-501. Wide Screen video head cleaner ... $4.95

29-502. Video head applicators ... $5.80

29-503. Video lint-free cleaning cloths ... $5.25

34-000 Cassette Attache Case
High-impact plastic attache-style case holds up to 16 cassettes and/or home and business computer cassettes; snap-lock carrying handle ... $5.40

34-000C. Similar to 34-000 but with smoked top ... $5.60

ROTEL
RY-1010 Spectrum Analyzer
Ten-band octave peak-level spectrum analyzer with built-in pink noise generator and separate mono electret condenser microphone; enables user to see sound characteristics on display as signals pass through component; also measures line input, five microphone sources, and residual noise levels. Spectrum analyzer display: ten bands with signal frequency swept to eat, 32, 63, 125, 250, 500, 1000, 2000, 4000, 8000, and 16,000 Hz; features twelve LED indicators for each band showing peak level; 12/24/36-D8 range selector switch; calibration control; one-octave bandwidth bandpass filter for ten bands. Pink noise generator: frequency response 20-20,000 Hz +/−0.5 dB; output level 100 mV/0.3k ohms. Microphone: omnidirectional type; two-position microphone voice/tone control switch; frequency response 30-16,000 Hz ±2 dB; includes stand and cable. Additional characteristics include three-position line mode switch for switching each channel separately or simultaneously; input sensitivity/impedance 0.2 mV/30k ohms (mic), 2 mV/30k ohms (line); 32°7/2° H X 18°6.5° W X 11°3/2° D ... $470

RUSSOUND/FMP
QT-1 Quad Patching/Control Center
Passive switching center expands tape monitor loop of audio system to accept two- or four-channel noise-reduction systems, graphic equalizers, matrix decoders, and up to four mono, stereo, or quad tape recorders, with switching functions handled through front-panel switches or patch cords.

supplied with 16 shielded patch cords. Front panel switches include record, mix, 2/4-channel play, monitor, and aux. Input and output modes: front panel, patching jacks for source; recorders in, recorders/source copy buss, recorder/monitor out, equalizer in/out, noise reduction encode in/out, and noise-reduction decode in/out. Rear panel connects all recorders and accessories with 72 RCA type phono pin jacks. Insertion loss less than 0.5 dB when operating recorders or decoders simply, 6 dB when mixing two channels or two recorder outputs; weighted 1kHz level 0.66 "1kHz" X 13"3/4" W X 5" D ... $299.95

QT-1 RM. Rack-mount version; black metal cabinet; 5"3/4" H X 19" W X 5" 5/8" ... $299.95

SP-1. Same as QT-1 except for two-channel stereo systems only; connects all four to stereo tape recorders and five stereo accessories in any combination of recording, playback, monitoring, or dubbing; supplied with 12 shielded patch cords; walnut vinyl finish cabinet and semi-gloss black front panel; 5" H X 7"4/5" W X 4 3/4" D ... $169.95

Rack-mount version of SP-1; 4 1/4"H X 7" W X 5" D ... $169.95

TMS-1 Tape Recorder Selector
Connections for up to three tape recorders to be used at once in any combination of functions; direct tape-to-tape transfer without going through a preamp; connects to tape-monitor jacks of audio system. Internal network prevents overloading system when multiple recorders are connected in parallel. Black metal case with white lettering; 4"4/5" W x 3 3/16" D x 3 H ... $50

TMS-2. Deluxe version of TMS-1. For connection of up to five tape recorders or other line-level sources; 4 1/4" W X 4 3/4" D X 4 3/4" H ... $90

SCOTCH
ERK-130 Cassette Edit/Repair Kit
Contains precision splicing block; spindle for manually winding cassette tape; six polyester picks (adhesive tipped for retrieval of tape ends lost in housing); 1600 splices; splicing tabs; detailed instruction booklet ... $3.39

Pre-Cut Tabs
SPT-7-32-36. 6 pre-cut 1.0-mil polyester splicing tabs ... $1.39

SST-7-32-18. 8 pre-cut aluminized sensing tabs ... $1.39

SK-7-32. 12.5 ft. 1.8 mil splicing tape in dispenser kit ... $2.29

Head Cleaners
S-CHC. Cassette head cleaner ... $1.79

S-8TR-HC. 8-track head cleaner ... $2.99

SOUNDARDS
Cassette Storage Cabinet
Wood cabinet with lockable-jointed doors holds 68 cassettes in four-hand-fitted drawers. Drawers have recessed sides for easy removal of cassettes; designed to fit standard record sleeves so as to function as record dividers or support sleeves with more than one cabinet; 24" x 9"6" W X 12"4/5" D ... $38.00

SOUNDCASTMEN
AS1000 Spectrum Analyzer
Real-time analyzer with differential comparator circuitry and 0.1-dB readout accuracy. Features 2-dB step display with total range of 58 dB with display pattern control; built-in pink-noise generator with auto-scan feature. Generates octave-band test signals or all-band pink noise for frequency-response measurement of a single component or equalized sound system. Sencol 10; THD 0.001%; 19" W X 11" D X 34" H ... $499

SUPEREX
TSB-3 Graphic Tape Switching Console
Stereo tape switching console features color-coded tape duplication processes graphically illustrated on front panel; three-deck capability; functions include duplicating recordings or broadcasting on three tape decks, mixing two sources for documentary effect, and transfer of program material from one tape deck to another while monitoring and recording additional different program sources; both inputs and outputs include stereo, one amplifier, and three tape decks or auxiliary components; dubbing bank for use with any stereo amplifier or receiver with monitoring facilities; controls include three input and three output toggle switches; rear panel phone jacks; 24"4 H X 6"4 W X 4 3/4" D ... $50.00

TDK
HD-11 Tape Head Demagnetizer
Hand-held universal tape head demagnetizer designed for open-reel or cassette tape decks; operating time less than one second; red LED "on" indicator and green LED "ready-to-use" indicator; side-mounted activation switch; pick-up covered metal tips; includes two 1.5 V dry-cell batteries ... $43.75

HD-01 Head Demagnetizer
Automatic head demagnetizer with less than one-second operating time; housed in transparent cassette shell with surface-mount LED indicator to show demagnetization is taking place; self-contained battery ... $30.00

HC-1 Head Cleaner
Non-abrasive cassette tape machine head cleaner ... $2.25

TAPE RECORDING & BUYING GUIDE 1982
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How do you build a cassette deck like a 24-track professional recorder?

Build the 24-track first.

The new Revox B710 cassette deck comes from a unique company founded by Switzerland's Dr. Willi Studer. For decades Studer has been making the world's most respected studio master recorders...the legendary machines used to record everything from the Beatles' Sgt. Pepper to WFMT's Chicago Symphony broadcasts. Now this engineering expertise has been applied to the first and only Revox cassette deck. There's nothing else like it on the market today.

Professional Transport Design

The B710 follows the strict design principles set for our multi-track studio recorders. The transport frame is rock-solid die cast aluminum. Mounted inside are two Hall Effect direct-drive capstan motors, both slaved to the same quartz crystal for exact synchronization. The B710 has no belts, no pulleys, no clutches. Instead, two tacho regulated spooling motors work with the micro-processor to deliver smooth tape handling and gentle, jerk-free stops. Also, the B710's unique hinged headblock engagement system assures perfect azimuth alignment—a virtual impossibility with conventional designs.

Logical Features

The four digit electronic counter doubles as a 24-hour clock timer for programmable start/stop of record or play. After rewind, the counter automatically resets to zero at the exact beginning of the tape oxide. The cassette coding sensors automatically determine correct bias and EQ for the tape formulation (I, II or IV) inserted. Mic/line mixing, MPX filter, headphone volume control, and Dolby* noise reduction are all standard.

The Sound

As with all Studer and Revox products, the B710 will ultimately be judged on its ability to reproduce music with exceptional clarity...the sound you'd expect from a professional recorder.

Judge for yourself. Hear the B710 today at your nearest Revox dealer. Or, for more information, write or call Studer Revox America, Inc., 1425 Elm Hill Pike, Nashville, TN 37210 / (615) 254-5651.

*Dolby is a trademark of Dolby Laboratories.
AMPEX GM II HIGH BIAS TAPE.

When you're recording music that's rich in high frequencies, you need a high performance tape. Ampex GM II high bias cassettes. They retain and release every note and nuance. Especially those found in highly amplified electronic music.

GM II's high performance begins with the magnetic particle. The ones we use are smaller, permit higher volumetric loading and greater uniformity of dispersion on the tape surface. This produces a more consistent energy, increased output sensitivity, and a substantial reduction in the third harmonic distortion level. Our unique oxide formulation and new processing techniques extend the high end while they lower the noise floor (-62.8dB @ 333Hz).

And to make certain that tape-to-head contact is precise, we use our exclusive Ferrosheen™ calendaring process to give the tape an ultrasmooth, glossy surface.

GM II's True-Track™ cassette mechanism is an audio achievement in and of itself. Every aspect, from the fore and aft guide system to the computer-torqued cassette housing screws, says high performance. Then every Ampex cassette must pass our stringent quality control standards.

GM II high bias, high performance tape. Use it next time you're recording a passage that's rich in high frequencies. You'll hear what a difference it can make when your high bias tape delivers high performance.

For complete information and specifications on all Ampex premium tapes, write us for a copy of our Full Line Brochure.

AMPEX
The Tape of the Stars

Ampex Corporation, Magnetic Tape Division, 401 Broadway, Redwood City, CA 94063 415/367-3888

CIRCLE NO. 3 ON READER SERVICE CARD