Stereo Review's

Tape Recording & Buying Guide® 1984

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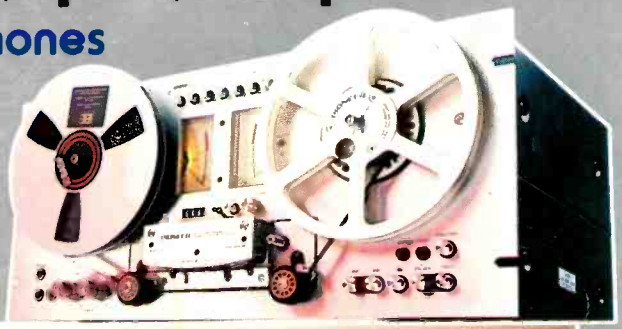

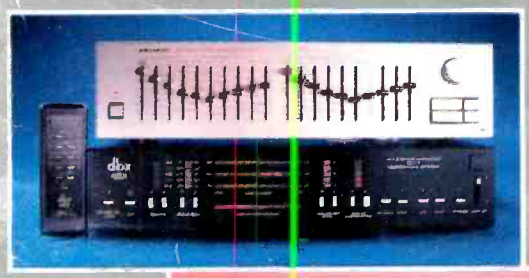

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Nakamichi Sound Research Center Concert Hall

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No great work of art—no masterpiece of music—is created without *commitment*. Every great artist—every musician—is driven by an internal need to express an emotion. At Nakamichi, we understand that need. We too are committed—to excellence—to perfection in the realm of recorded sound. In short, we are committed to *high fidelity!*

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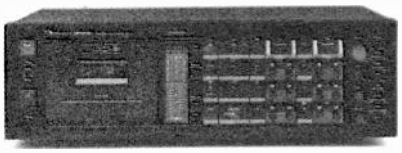

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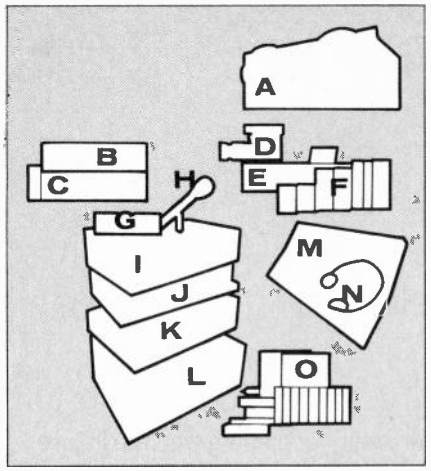

Cover Equipment: **A**—Pioneer RT-707 open-reel tape deck; **B**—Realistic 31-2005 graphic equalizer; **C**—dbx 4bx dynamic-range expander with remote control; **D**—JVC HR3CU video camera; **E**—RCA VCP900 videocassette recorder with remote control; **F**—Videotape (left to right) JVC, TDK, Maxell, Sony, Fuji, PDMagnetics, BASF; **G**—Kenwood 1022 cassette radio; **H**—Audio-Technica AT9200 microphone; **I**—Nakamichi Dragon cassette deck; **J**—Aiwa AD-F770 cassette deck; **K**—Denon DR-M4 cassette deck; **L**—Tandberg 3014 cassette deck; **M**—Bang & Olufsen Beocord 9000 cassette deck; **N**—Sony MDR-4L1S headphones; **O**—Cassette tape (left to right): Denon, Sony, Scotch, PDMagnetics, TDK, Yamaha, Maxell, Fuji, Memorex, Nakamichi, Loran, BASF; Accessory: Nagaoka by MicroFidelity Wash-Up Four cassette deck cleaner; Open-reel tape: BASF, Denon.

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Stereo Review's Tape Recording & Buying Guide® 1984

FEATURES

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"YOU DON'T LISTEN TO SPECIFICATIONS; YOU LISTEN TO MUSIC."

Most cassette tape advertising tries to impress you with specifications. The trouble is that specifications do not necessarily equate to *musicality.*

Most manufacturers' specifications are based on static measurements, the tape's response to steady test tones. Denon DX-Series Cassette Tape goes one step further: it also minimizes Dynamic Distortion, the distortion created by actual musical signals.

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Tape Recording: State of the Art

By Julian D. Hirsch

Like all other hi-fi components, tape decks have undergone continuous growth and development. The less viable products have been weeded out by marketplace pressures, and replaced by newer products. Among the losers in this competition were the 8-track format, which once dominated the car-stereo scene and has been replaced by cassette decks, and the Elcaset, a short-lived attempt to bridge the gap between the cassette and open-reel formats.

For many years, the principal recording formats for home-entertainment systems have been the open-reel and cassette (the latter should be called by its full name, "Compact Cassette" to distinguish it from the newer varieties, but we'll use "cassette" to mean the same thing). For a time, it appeared that open-reel was becoming obsolete for home use, since few new machines appeared and existing models were gradually dropped from production. It now appears that rumors of its demise were somewhat premature, and advanced open-reel decks have been produced by several Japanese manufacturers.

Today's cassette performance is far superior to what was available only a few years ago. This reflects the on-going improvements in recorders themselves and in tape formulations. For many people, the cassette medium is virtually equal to open-reel in quality (they aren't truly equal, but for any except the most critical applications, most people would have difficulty distinguishing between the two formats solely on the basis of sound). Even the smaller variants of the cassette format, such as the microcassette, are beginning to appear in miniaturized stereo components designed for home use.

At the top end of the quality (and price) scale are digital recorders. At least a couple, based on videocassette technology and transport mechanisms, have already been introduced in this country; no doubt more will follow. Some manufacturers are marketing digital recording processors that can convert a standard VCR to a digital audio recorder. Digital compact cassette recorders have been developed by several Japanese manufacturers and demonstrated to the press at recent electronic trade shows. They are still a few years away from being marketable, however.

An interesting development, bridging the gap between analog and digital tape recording (but much closer to digital in its performance potential) is the Sony Beta Hi-Fi system, which is available from other Beta licensees as well. This is a relatively simple and inexpensive modification to a Beta videocassette recorder that enables it to record two stereo channels on separate FM carriers interleaved with frequency bands allocated to the video portions of the TV signal. By recording and playing back the audio programs through the rotating video heads, the Beta Hi-Fi system achieves the advantages of wide bandwidth, low noise and flutter, and stereo sound without interferance with or from the video program, retaining the long recording/playback times of videocassettes (up to 5 hours in the Beta format). A test report on the Sony Beta Hi-Fi system appears in this issue of the *Tape Recording & Buying Guide*.

Another system for recording high-fidelity sound along with video signals has been demonstrated by JVC for VHS videocassette recorders. This system records the audio signals *underneath* the video signals, and both are scanned by rotating heads. Expected to be on the market in 1984, VHS Hi-Fi appears to achieve quality similar to that of Beta Hi-Fi, and is also compatible with existing VCRs.

Tapes themselves have been largely responsible for the emergence of the cassette as a true high-fidelity medium. Improved ferric-oxide formulations continue to appear, as well as high-bias "chrome-equivalent" tapes that have nearly displaced true chromium-dioxide (CrO_2) tapes in the market. Metal tape, following the fanfare of its introduction a few years ago, is now available from most major tape manufacturers, and its price has dropped somewhat. Most reasonably good cassette decks are now "metal compatible," although sometimes (as in the case of car-stereo players) the claim is re-

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If you won't settle for anything less than pure music, accept nothing less than BASF Pure Chrome audio tape. Unlike ferric oxide tapes, BASF Pure Chrome is made of perfectly shaped chromium dioxide particles. And that exclusive Chrome formulation delivers the lowest background noise of any tape in the world, as well as outstanding sensitivity in the critical high frequency range. And this extraordinary tape is designed especially for the Type II Chrome Bias position. So make sure you're hearing all of the music and none of the tape. Make the switch today to the world's quietest tape. BASF Chrome.

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dundant, since the only "compatibility" required for playing—as opposed to *recording*—metal tapes is the 70-microsecond equalization used for chrome and high-bias tapes.

Noise reduction has long been a mandatory feature of cassette tape recorders. For some years, Dolby B was virtually synonymous with noise reduction in home tape decks, and is still universally used. Sensing impending competition between analog and digital tape recording techniques in the consumer market (with respect to noise levels), a number of manufacturers—Dolby Laboratories among them—have been working diligently to surpass the performance of Dolby B in a reasonably economical manner. It has long been recognized that Dolby B (or its equivalent, such as JVC's ANRS) was necessary, and barely sufficient, to make a high-fidelity medium of the cassette, which was originally intended for voice dictation or similar low-fidelity applications.

The Dolby B system works by lowering the level on playback of frequencies which are present in the tape (usually called tape hiss). The noise reduction does not affect all frequencies, but operates on a sliding band of frequencies that changes (according to the signal) to reduce noise at frequencies higher than those of the music. To compensate for this reduction of high frequencies in playback, the highs are *increased* during recording. This is why Dolby-encoded tapes sound bright and trebly when played back without Dolby decoding.

For a number of years, the dbx noise-reduction system has actively competed for a share of Dolby's market in both the consumer and professional areas. (Dolby's professional noise-reduction system is called Dolby A.) Although Dolby B used with a cassette recorder couldn't come close to matching the noise level and dynamic range promised by digital recording, dbx could and did achieve comparable noise levels. It's more expensive than the Dolby system; it's also incompatible with Dolby and other decoding playback systems and must be properly decoded in playback to produce acceptable sound quality.

dbx is a "compansion" system that compresses the amplitude of the signal on recording and expands it on playback. Unlike Dolby, it is not frequency-specific. With the increasing use of digital playback from Compact Disc players, dbx is useful to maintain the wide dynamic range when dubbing CDs to cassette. It is also very useful in recording live music, which also has wide dynamic range.

Meanwhile, Dolby Labs developed the Dolby C noise-reduction system, an extension of Dolby B that increased the original 10 dB of noise reduction to 20 dB with only modest increase in cost while remaining quasi-compatible with playback through Dolby B-equipped decks. Like Dolby B, Dolby C uses the sliding-band principle to provide noise reduction that varies according to the signal being recorded. To make its noise-reduction systems even more attractive, Dolby also developed the HX "headroom-extension" system to improve the high-frequency recording headroom of cassette decks, which has traditionally been one of the weaknesses of the cassette medium. Dolby HX isn't a noise-reduction system per se; rather, it operates with control signals derived from the Dolby B circuits. It's inexpensive to add to a tape deck in its design stages. Still another variation of the headroom-extension system is the Bang & Olufsen HX Professional, which is somewhat similar to Dolby HX but isn't linked to the Dolby noise-reduction circuits for its operation.

"No, that's not tape hiss, that's Emma—she hates Bartok."

Comparison Of Tape Formats. Advocates of each tape format claim certain advantages over the others, which may—and should—influence the prospective buyer to seek the system that best meets his or her needs.

A fundamental limitation of any tape-recording system is the fact that, all else being equal, the amount of information that can be stored on or read from a tape is proportional to the area of the magnetic coating that passes the tape head gap in a given amount of time. This is why the faster tape speed of an open-reel deck gives better high-frequency performance than a cassette deck and why the wider recorded tracks on a $\frac{1}{4}$" wide open-reel tape produce higher voltages than the narrow tracks of a $\frac{1}{8}$" wide cassette tape, and thus a better signal-to-noise (S/N) ratio.

These limitations aren't immutable in practice, since there are other variables under the designer's control. Improved and more efficient tape-head designs store and retrieve more energy for a given tape than was possible in the past. Tape formulations themselves are constantly being improved, and today's tapes can carry a much greater information density than was possible with earlier formulations.

While the major effort appears to have gone into improving the cassette medium—perhaps because it was most in need of improvement—things haven't been static in the world of open-reel tape. One of the more recent developments was the announcement of "EE" (Extra Efficiency) tape by two major Japanese competitors, Maxell and TDK, simultaneously with availability of compatible decks from Akai and Teac. This tape is analogous in its benefits and requirements to cobalt-treated or metal-alloy high-performance cassette tapes. Like them, it requires a higher bias than did earlier tapes. It also provides greater headroom, especially at high frequencies; requires less recording equalization (high-frequency pre-emphasis); and should be played back with 35- instead of the usual 90-microsecond equalization time constant at $7\frac{1}{2}$ ips. In general, EE tape is claimed to give open-reel recording at low speeds, particularly $3\frac{3}{4}$ and $7\frac{1}{2}$ ips, performance hitherto available only at the next faster speed.

Although metal tape was supposed to provide similar benefits in cassette recording, especially in improved high-frequency headroom, its high price (initially about twice that of premium ferric-oxide tapes and still well above their price range) has limited its acceptance, in spite

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of the widespread availability of recorders able to make use of it.

Cassette Deck Features. Except at the lowest prices, modern cassette decks have at least Dolby B noise-reduction systems and switchable bias and equalization for ferric-oxide (normal) and chromium-dioxide (CrO_2) or chrome-equivalent tapes. Most also offer the high bias required for recording on metal-alloy tapes. Almost all current cassette decks are front-loading types, with a hinged door or panel that opens to receive the cassette. On some decks, the front-panel cassette opening isn't covered by a door, but the basic mode of operation is similar. The earliest cassette decks were top loaders; there's no functional difference between the two, but front-loading decks are more likely to blend in with the styling of other stereo components with which they're used.

Low-to-medium-priced cassette decks employ two heads: a combination record/play head and an erase head. This arrangement doesn't permit monitoring from the tape while recording; to be able to do this, separate record and playback heads and electronics are required. The chief drawback of two-head decks is the use of a single compromise head gap width for both recording and playback. The usual result of this arrangement is a more limited frequency response when recording. In spite of this, the level of performance available with a well-designed two-head deck is surprisingly high, high enough in fact to satisfy the majority of users.

A second characteristic of inexpensive cassette decks is the number of motors used to drive the tape. Single-motor machines generally use a dc servo-controlled motor to drive the capstan and, through a system of belts and clutches, the two tape hubs. A well-designed and well-constructed machine of this type can give satisfactory results, though usually with somewhat greater flutter than is typical of more advanced transport mechanisms.

A better arrangement employs two motors, one to drive the capstan and the other to handle the tape hubs. Although this doesn't necessarily yield better performance than does a single-motor transport, it frequently does exhibit lower flutter and faster high-speed operation, moving a cassette's tape from end to end in less time in fast forward and rewind. One effective method of reducing wow and flutter, used in a few cassette decks, is a double-capstan drive system. This technique maintains the tape under uniform tension as it moves, greatly reducing the effects on tape motion of mechanical imperfections in the cassette itself.

Operating controls on tape transports are likely to be "piano keys" in lowest-priced machines and light-touch buttons that operate solenoids in more expensive decks. The latter offers no performance advantage, but is easier to operate and may be adaptable to remote control with optional accessories available for some decks. Most solenoid-operated tape transports also have some form of internal logic that makes it possible to switch from one transport mode to another (playback, record, fast forward, and rewind) as rapidly as one wishes, without having to wait for tape motion to stop.

At prices in the $300 to $600 range, cassette decks are likely to have a number of convenience features that may or may not be important to a particular user. Typical among these features are memory rewind, which stops the tape in the rewind mode at a point where the tape counter indicates 000, and timer operation in which switching on power via an external clock timer automatically puts the deck into record or playback, as one desires, for unattended operation. In this price range, it's also becoming commonplace to find both Dolby B and C noise reduction available. A few decks offer dbx noise reduction in addition to one or both of the Dolby systems. On some decks, user-adjustable recording bias (sometimes with the help of an internal test signal) makes it possible to optimize the deck for any given tape.

At the upper end of this price range, one begins to find three-head decks with separate heads optimized for the record and playback functions. These heads have their own separate record and playback electronics, including noise-reduction systems. Consequently, one can listen to playback of the tape in its final form *during* recording. This is an excellent way to be sure that operating levels are set correctly and that the tape is moving properly.

The improved high-frequency response and greater headroom of a well-designed three-head deck are its principal strengths. The best examples of this type of deck offer serious competition to many open-reel tape decks. Most three-head cassette decks employ what appears to be a single record/playback head. But appearances can be deceiving because, in reality, there are two separate heads in a single housing. In addition to its economic advantages, if the head is assembled with sufficient precision, the two gaps will be inherently and permanently parallel within very tight tolerances. This eliminates the need for costly mechanisms for user adjustment of the recording head azimuth (to align its gap at exact right angles to the direction of tape motion and parallel to the playback-head gap). Playback head azimuth is normally factory aligned to match a standard alignment tape for compatibility with tapes recorded on other decks. However, when physically separate record and playback heads are used, it's vital that their gaps be set parallel to each other every time a tape is inserted into the deck for a recording. This capability is provided on only a few of the most expensive cassette decks.

The usual argument against combining two heads in a single housing is that it's not possible to set their azimuths with sufficient precision. In practice, however, better decks of this type have proven to be excellent performers. To some extent, this may be because the close spacing between record and playback heads eliminates the problem of tape skewing that necessitates user adjustment when the heads are farther apart.

A most ingenious solution to this and related problems has been incorporated in Nakamichi's Dragon cassette deck and in their deluxe car cassette receiver. A special playback head compares the signal phase at two points across the width of a tape track, driving a servomotor to continously adjust the playback head azimuth for a phase match (an indication of correct adjustment) while the tape is playing. This system, though effective, is costly.

Many of the best cassette decks use three motors: one for the capstan and one for each of the two tape hubs. These are often direct-drive motors, miniature equivalents of the ones used in many phonograph turntables. This eliminates all belts and clutches that are a source of potential trouble in a tape deck and make it possible to have a very low flutter level. Some three-motor machines also feature very fast rewind and fast forward, which can be a convenience when using longer-play C90 cassettes.

A number of top cassette decks from most major manufacturers feature automatic internal adjustments to match them to the requirements of the tape being used. This is made possible by the availability of inexpensive microprocessors, which are used to control a number of complex internal adjustments, including measuring tape performance to establish optimum settings of bias, recording equalization, and level, and storing these settings in an internal computer memory for recall at a later time.

This automatic adjustment process is essentially what every recorder undergoes in the final stages of its testing at the point of manufacture. It's far too complex for the lay user to perform, since it requires use of laboratory test instruments. If one uses a recorder with the specific tape formulation used for its initial setup, there's no need to repeat the procedure. However, no two tape types are identical, which, in the absence of this self-calibration facility, effectively

locks one into using one particular tape (not always identified correctly in the deck's user's manual).

The first cassette decks to have internal self-calibration required about 15 to 30 seconds to complete the setup process, accompanied by flashing lights to inform the user of what was happening. Today, the process is much faster (typically 4 to 8 seconds) as well as less spectacular, but it seems to be equally effective. Although decks with this self-calibration capability are much less expensive than they used to be, they're still costly, generally $500 and up. However, it's a genuinely useful feature and well worthwhile for any serious user of a cassette recorder. Some deck manufacturers claim that no automatic tape-optimizing system can be as effective as a properly performed calibration by a human user, and to this end they provide all the necessary adjustments which require the active involvement of the user. They are probably correct in their views (from the standpoint of a purist), but an imperfect tape-optimization adjustment is better than none at all.

For many years, cassette decks were limited to a single $1\frac{7}{8}$-ips speed by the licensing requirements of the inventor of the Compact Cassette, N.V. Philips of the Netherlands. A few years ago, with expiration of the earliest patents on the cassette, several companies announced availability of two-speed cassette decks. In some cases, the second speed was a faster $3\frac{3}{4}$ ips to improve high-frequency recording headroom. Since metal tapes that were beginning to appear at the time claimed to provide superior high-frequency characteristics, the faster speed was touted as giving the performance of metal tape with ordinary ferric-oxide tapes at only half the price of metal tape. Of course, since a cassette operated at double speed has only half its $1\frac{7}{8}$-ips capacity, there's no economic advantage to using the faster speed.

The other option was a half-speed mode, moving tape at only $\frac{15}{16}$ ips. Most cassette manufacturers chose not to take this route, because of the difficulty in achieving the desired performance, even with metal tape (almost a necessity at this very slow speed). Lacking any real economic or performance advantages, two-speed cassette decks have virtually disappered from today's marketplace.

During the past year, several manufacturers have announced dual-transport (or "dubbing") cassette decks. Containing two separate cassette mechanisms with internal connection paths and switching, these products are designed to simplify copying, or dubbing, tapes. One transport and head configuration are designed for recording only, the other set for playback only. The equivalent of two separate cassette decks plus the required connections are built into a single unit no larger than an ordinary cassette deck with a cost considerably less than that of two separate decks of comparable quality. Potential performance of this type of machine is high since the record and playback heads are separate and designed specifically to fulfill their own special functions. One of the drawbacks of this design approach, as compared to conventional three-head deck designs, is the inability to listen to a tape while it's being recorded. In fact, one must physically remove the tape from one transport and load it into the other transport before it can be heard in playback.

Car Stereo. Partly due to variable radio reception in mobile operation, a cassette deck is a key component of most car stereo systems. Compared to most home tape decks, it is likely to have a rather basic transport mechanism, driven by a single dc motor and having only a single playback head. The mechanism starts when a cassette is inserted, and ejects the cassette when it is shut off. However, despite this apparent simplicity, the car cassette deck must be mechanically rugged, must perform properly under a wide range of environmental conditions, and must withstand severe shock and vibration.

The electronic sophistication of some car cassette players is on a par with that of the better home units. Above the lowest-price category, one usually finds Dolby B noise reduction, and, in an increasing number of units, it is accompanied by Dolby C. A few even include dbx noise reduction as well as both Dolby systems, and some have automatic "program seeking" that accesses specific programs on a tape by counting the silent intervals between them in fast forward or rewind. All provide both 120 and 70 μsec playback equalization (the latter usually called "metal" although it is more likely to be used for CrO_2 or high-bias ferric-oxide tapes). As mentioned earlier, the Nakamichi 1200 even has the automatic azimuth optimizing system first introduced in their Dragon cassette deck.

Video Audio. Except for Beta Hi-Fi and the VHS equivalent (described earlier), the audio performance of videocassettes and VCRs falls far short of meeting minimum hi-fi standards. Disregarding the limitations of the original program's sound track, the very slow tape speed (usually much slower than that of a standard audio cassette) makes it nearly impossible to achieve a frequency response beyond a few thousand Hertz from the narrow longitudinal mono sound track along the edge of the tape. Furthermore, the tape formulation is optimized for video, placing the sound at an even greater disadvantage in respect to noise, distortion, and frequency response.

Some top-of-the-line VCRs have stereo capability and Dolby B noise reduction. Of course, this is usable only where the original tape has been recorded in stereo with Dolby B encoding, and the end result still does not meet high-fidelity standards. If one of the PCM (pulse code modulation) adapters now available is used with a VCR, it becomes a digital audio recorder of superb quality (though much more expensive than even a good home open-reel analog recorder).

Open-Reel Tape Decks. There are few fundamental design differences between open-reel and cassette decks, since their basic requirements are virtually the same. Most current open-reel decks have three heads and three motors and offer either two- or three-speed operation. The preferred speeds are $3\frac{3}{4}$ and $7\frac{1}{2}$ ips; the third is either $1\frac{7}{8}$ or 15 ips.

Although most home recording is done using 7" tape reels, many home machines are capable of accommodating $10\frac{1}{2}$" reels as well, doubling their uninterrupted record/play time. Logic-controlled solenoid-operated transports are the rule. Most decks designed for home use employ the standard $\frac{1}{4}$-track stereo format, with two stereo tracks in each direction of tape movement (as is the case with cassettes). However, many open-reel decks can be purchased with two-track stereo heads for improved S/N performance. Professional features, such as low-impedance inputs for balanced microphones, are offered on some of the more expensive models.

Prices for open-reel decks cover a range as wide as for cassette decks. There are a few open-reel decks priced competitively with medium-priced cassette decks, but those with professional performance and features are likely to cost between $1,000 and $3,000, like some of the best cassette decks.

In general, noise reduction isn't built into open-reel decks, nor is it likely to be needed, except in the most demanding applications. External noise-reduction accessories are available from several manufacturers for this purpose. The wider tape tracks and faster speed of open-reel decks give this medium an inherently greater dynamic range than is possible with cassette decks, especially at high frequencies, where there's much less tendency toward tape saturation at high signal levels.

Barring those cases where the higher inherent quality of an open-reel deck is needed to handle the program content, the chief advantage of this format is the ease with which the tape can be edited. For serious recording, an editing capability is vital. □

Home Taping: Sin, Crime, or Right?

By Carl Kaplan

Do you have a right to tape? Since the invention of recorders for audio and video, people have been taping live concerts, making home movies, and making copies of records and television shows. When copyrighted material is duplicated without permission in mass quantities and the copies are sold, it is called piracy and is illegal.

But is home taping like piracy? And if taping a record or videotaping a television show is infringement of copyright, what should be done?

These questions are at the root of the "Right To Tape" controversy, a controversy that has reached the Supreme Court, and one likely to be decided by the United States Congress. It concerns the conflict between the basic rights of an individual to his or her creations and the basic rights of individuals to have access to information.

Like many other maddeningly abstract legal issues, the home taping debate has at its nub the story of a single human being. In the "Betamax Case" his name is William Griffiths.

Beginning in 1973 or 1974, William Griffiths of California started recording television programs off the air using a industrial-model videotape recorder made by Sony. A little later, after learning about the existence of the "Betamax" home video recorder while visiting Japan, Griffiths instructed his sons to buy him one in the United States at the first opportunity. They purchased a VCR, model 7200, at Henry's Camera store.

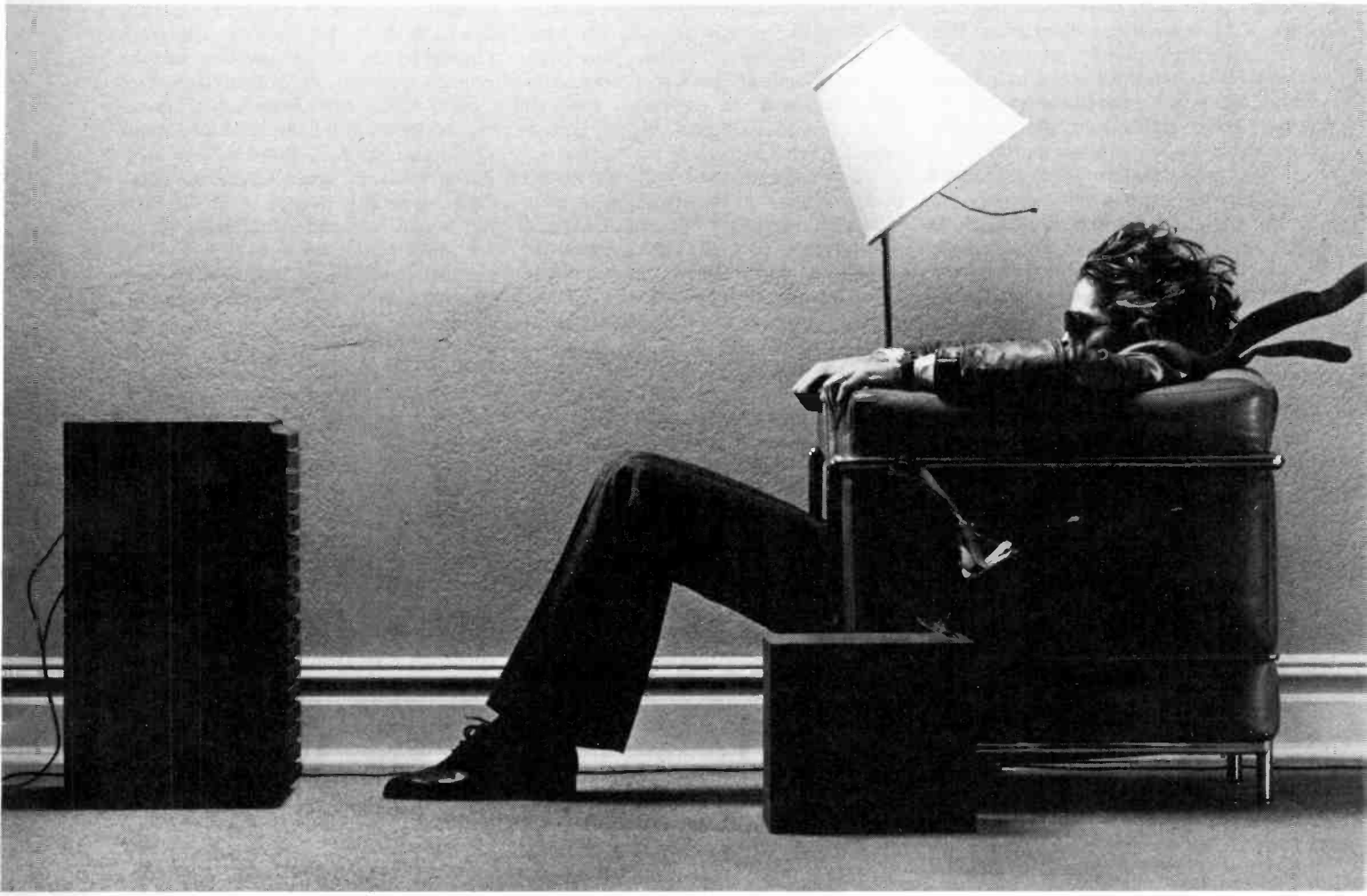
Shortly after he acquired his Betamax, Griffiths copied about 20 minutes of a Universal movie broadcast over the air called *Never Give An Inch* and two episodes from the Universal TV series *Baa Baa Black Sheep* and *Holmes and Yo Yo*. He also copied but later erased Universal films *Alpha Caper* and *Emelia Earhart*. For collection in a private home videotape library, Griffiths copied television documentaries, news broadcasts, sporting events and political programs such as a rerun of the Nixon/Kennedy debates. A friend of Griffiths copied Walt Disney's "The Mickey Mouse Club."

In 1976, at the request of a legal friend, William Griffiths consented to be a defendent in a lawsuit that would challenge the very legality of taping off the public airwaves for private use. The case, filed in United States District Court, Central District of California, before Judge Warren J. Ferguson, pitted two Hollywood studios, Universal City Studios and Walt Disney Productions against Sony Corporation and its ladder of distribution, including its American sales subsidiary, its several California retailers (including Henry's Camera), its California advertising agency and one consumer, the home taper everyman, William Griffiths.

Back in 1976, when the video revolution was barely beginning, Universal, an MCA company, and Walt Disney foresaw that their property, copyrighted programs, would be one day be copied at home by millions of consumers. Such copying, they claimed in their suit, was unlawful. Only the owner of a creative work has the right—a copyright—to make a duplicate. The plaintiffs—MCA and Disney—asked Judge Ferguson to declare that home videotaping constitutes copyright infringement, a kind of property theft. They also asked the court to prohibit the future manufacture and sale of videotape recorders and to access monetary damages against Sony, its distributors, retailers, advertising agencies and Betamax consumers.

The issue, tagged "The Betamax Case" by the press, turned out to be a tricky one. Although the concept of copyright is included in the Constitution (Congress is empowered "to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries"), placed into law by the Copyright Act of 1909, The Sound Recordings Amendment of 1971 and The (revised) Copyright Act of 1976,

AFTER 500 PLAYS OUR HIGH FIDELITY TAPE STILL DELIVERS HIGH FIDELITY.



If your old favorites don't sound as good as they used to, the problem could be your recording tape.

Some tapes show their age more than others. And when a tape ages prematurely, the music on it does too.

What can happen is, the oxide particles that are bound onto tape loosen and fall off, taking some of your music with them.

At Maxell, we've developed a binding process that helps to prevent this. When oxide particles are bound onto our tape, they stay put. And so does your music.

So even after a Maxell recording is 500 plays old, you'll swear it's not a play over five.

IT'S WORTH IT.

there had never been a single case before in the history of U.S. law that had tested the legality of home copying for private noncommercial use.

The Copyright Act of 1976, of course, does not mention by name videocassette recorders, or audio cassettes for that matter. The law is a tool, a blunt one at that, for balancing copyright protection with the right of society for access to information. In its first section, the law broadly and clearly grants copyright holders a limited monopoly over all reproductions of their works. In latter sections, the law qualifies that monopoly: in certain circumstances, a consumer is granted the privilege of using copyrighted material without the consent of the copyright holder. This "fair use" of copyrighted material, for the betterment of society, is granted to scholars, news reporters, librarians and others that courts may decide in individual cases.

The "fair use" doctine of copyright law is muddy water indeed. There is no rigid definition of what constitutes fair use; the Copyright Act provides four scales that might be employed to weigh fair use in a case, but those scales can be applied differently by different judges.

The defendants in the case, Sony et. al, made two arguments in their behalf: First, they said that home videotaping, while not specified in the Copyright Act of 1976 as a noninfringing activity, is nevertheless implicitly legal. As proof, Sony pointed out that in 1971 Congress passed a law, the Sound Recording Act, whose purpose was to amend the 1909 Act so as to combat record pirates. The House report that accompanied that piece of legislation specified that home audio recording was legal. (" . . . It is not the intention of the Committee to restrain the home recording from broadcasts or from tapes or records, or recorded performances, where the home recording is for private use and with no purpose of reproducing or otherwise capitalizing commercially on it.") Since Congress incorporated the 1971 act into the general revision of copyright law in 1976, it is reasonable to assume that Congress in 1976 intended to exempt private noncommercial home audio recording from copyright infringment, said Sony. And since audio and video home taping are in principle the same, then the present law grants William Griffiths and everyone else a right to tape.

Sony's second argument was that even if a home videotaping right is not implicit in the law, then it falls under the "fair use" doctrine. Home videotaping is fair use because it is for private use and not for profit. The activity does not harm the business prospects or programmers like MCA and Disney who receive payment to broadcast their movies.

On October 2, 1979, Judge Ferguson handed down his opinion. Home videotaping of public airwaves for private use is a right implicit in the legislative history of the Copyright Act, he declared, as is the right to make private-use audio recordings. Furthermore home videotaping is a "fair use" of copyright, he said. Lastly, even if home videotaping was copyright infringment, Sony, its retailers, distributors and ad agencies are not "contributory infringers" nor are they liable for damages.

The videotape industry officials heaved a sigh of relief at the favorable outcome and went about their business. MCA and Disney, now involved in the prerecorded videotape market themselves, routinely appealed the decision without fanfare. Many consumsers continued to tape at home, confident that their right to tape had been vindicated.

Nearly two years after the Ferguson decision, the earth moved for the video industry. Consumers were shaken out of their slumbers. On October 19, 1981, the United States Court of Appeals, Ninth Circuit, reversed the district court on all points in the matter of MCA and Disney vs. Sony et. al. Writing for the three-judge panel, Justice Kilkenny threw out the Sony argument that there was an implied exemption from home video taping built into the Copyright Act of 1976 due to the legislative history of the bill. "The statutory framework [of the Copyright Act] is unambiguous," said the panel, there is no need to delve into a legislative history for guidance. And even if the legislative history of the 1971 Sound Recording Amendment were relevant, "beyond question the [home audio recording exemption in the 1971 amendment] was not intended to apply equally to home videorecording."

Having struck down Ferguson's first point, the Appeals Court went on to scotch his second: New technology, which makes possible the mass reproduction of copyrighted material (effectively taking control of access from the author), places a strain upon the fair use doctrine ". . . It is our conviction that the fair use doctrine does not sanction home videorecording." Kilkenney's main reason for nixing the fair use defense was that he viewed home taping as not having "a productive use." When a medical scientist copies a copyrighted biology book to further his research, for example, that's "fair use" because the doctor is using one creative work to produce a second. But the home taper, implied Kilkenney, tapes merely for his own entertainment, and entertainment is not fair use of someone else's property.

Finally, in returning the case back to the district level for the consideration of damages against Sony et. al, the Appeals Court suggested that the lower court, rather than order the permanent stoppage of VCR imports into the U.S., consider "a continuing royalty" as a means to compensate MCA and Disney for the use of their property.

At this point in story we have to shift the focus from the courts to Congress. Goosed by the Appeals decision, and the public's sudden paranoia that "Copyright Police" would enter their homes, several legislators, most notably Senator Dennis DeConcini (D-AZ), immediately introduced bills that would amend the copyright law so as to declare home videotaping noninfringement. Consumers, Senator DeConcini said, need to know that they are not breaking the law when they videotape off public television channels. Senator DeConcini's bill, S. 175, is still pending before the Senate Judiciary Committee.

A second series of bills were also introduced to the Senate and the House, but they differed from DeConcini's measure. Senator Charles Mathias' (R-Md) bill this term, S. 31, is more of a compromise between consumers and copyright holders. That bill, which has identical sections for video and audio, declares that while home taping is infringement, consumers should be excused from copyright liability. But, the bill goes on to say, copyright holders deserve to be compensated. Royalties (amount to be arbitrated) on videotape recorders, audio cassette decks, and blank audio and video tape should be collected from importers and manufacturers, who, in turn, will pass on their added costs to consumers.

Since 1979, the home taping battle in Congress has been set between the DeConcini move for a clear green light on videotaping against the Mathias move for yellow light on video and audio taping with royalties for the record companies and hollywood studios. High-priced lobbyists for coalitions of video recorder

"...THIS IS CAPTAIN MULHOLLAND - THROW OUT THAT VIDEO TAPE RECORDER AND ALL THOSE PIRATED OFF-THE-AIR VIDEO TAPES!"

manufacturers have worked one side of the street; lobbyists for the record companies and Hollywood studios have worked another. Millions of dollars have been spent on legal fees, parties, press pamphlets, contributions to political campaigns and catered economic surveys.

Each interest group has its own version of the facts. In a year-long series of congressional hearings on home taping, representatives from the movie studios, including Charlton Heston, testified that the five million people who have bought VCRs are illegally taping their programs, and that this activity will sooner or later discourage Hollywood from producing quality films. They said they need a royalty of around $50 on every VCR and perhaps $2 on every blank videotape.

Meanwhile, the record companies and their artists, clamoring for the same consideration that Congress may give the Hollywood studios, claimed that home audio taping has virtually killed their industry. According to a special survey of home taping activities conducted by Warner Communications, 39 million people taped 455 million albums in 1980, record industry executives reported to Congress. American consumers spent over $600 million in 1980 to buy blank tape specifically to record copyrighted albums. "The effect of this gigantic taping explosion has been an annual sales loss of $1 billion," said one exec.

The coalition of audio and video manufacturers countered that, in the case of videotaping, Hollywood is already compensated for home copying and thus is not harmed. Hollywood, they say, charges television stations a fee for the broadcast of a motion picture. This fee is based on the projected size of the home viewing. Since audience rating services such as Neilsen currently monitor home VCR taping when they rate a program's audience size, the studio's fee to television stations already reflects home taping activity. To grant Hollywood studios a royalty will be to pay them twice for the airing of a film.

On the audio side of the aisle, the anti-royalty coalition disputed that home taping was the major cause of the record sales slump. "We are in a recession. Records are not like food, they can be cut back," one electronics industry spokesman told Congress. "But really, the bubble has burst for the record industry. The video revolution is eclipsing audio. We think Warner Communications should examine whether its own Pac-man, rather than home taping, is gobbling up record sales."

The anti-royalty crowd also charged that it would be grossly unfair to place a tax on blank videotape and blank audio tape, as the Mathias bill proposes. What about all those people who buy tape to record noncopyrighted material, such as birthday parties, college lectures, letters to distant friends? Why should they be punished?

While the lobbying war intensified in Congress, the legal front of the conflict advanced to the inner sanctum of American law. The Supreme Court was packed to the gills on a stinging cold Tuesday, January 18, 1983, for presentation of oral arguments in the Betamax Case. Much of the overflow press ("It hasn't been this crowded since the Akron abortion case," quipped one reporter to a friend) was seated within earshot behind thick curtains. At 1:00 PM sharp eight justices walked in and sat down in highbacked chairs. Chief Justice Warren Burger said Justice Brennan was absent due to personal reasons, but that perhaps a videotape of the day's proceedings could be supplied to him. The audience broke into smiles.

First up before the Supreme Court was Sony lawyer Dean C. Dunlavey, a professional type from Beverly Hills. This was his third Supreme Court appearance and he was relaxed. "Your Honors," he said, "there are two issues in the case. Issue number one: is a consumer who copies free programming from television committing copyright infringement? Issue number two: If home taping is infringement, then are the petitioners (Sony, its advertisers, distributors and retailers) who supply video recording equipment contributors to the action?" After asserting that home taping is a "fair use" of copyright in that it is noncommercial, Dunlavey went on to spend the majority of his alloted 30 minutes arguing that Sony et al. are not "contributory infringers" because they did not "induce" home taping by manufacturing VCRs. Sony, he said, is no more liable for home videotaping than pen manufacturer is when a consumer copies a book by hand.

Next up was youngish Stephen A. Kroft, representing Universal and Disney. This was his first Supreme Court appearance and he seemed aggressive. "All this case involves," barked Kroft, "is the unauthorized copying of motion pictures. The only difference between home taping and piracy is that home taping takes place in the home. Consumers have been duped into believing that home taping is legal. It is not."

Both Dunlavey and Kroft were constantly interrupted by peppery questions from the bench—a tradition in Supreme Court oral arguments. Once, while Kroft was maintaining that "fair use" could not reasonably be made to stretch around home video copying, Chief Justice Burger said: "I concede the point of damage [to your clients] when a videotape copy is libraried—if there is such a word. [A home collection, or library, displaces sales.] But . . . if you're going to be out to dinner at seven o'clock and you record a program so you can watch it at 11 o'clock or 12 o'clock the next day, and later erase it, where's the injury?" Kroft, surprised at the bluntness of the question, replied weakly. "Many movies are available on videotape for rental. [My clients] would not be able to rent those pictures if consumers could make copies for convenience." At a later point, Justice Stevens asked if recording music off the radio can be considered copyright infringement. Kroft answered, "Yes, I could make an argument that it is infringement."

After a little more than an hour's time, the bench nodded "Thank you" and the lawyers for Sony and MCA/Disney filed out. A seven-year legal contest that began with William Griffiths' Betamax had come to an abrupt end. Or had it?

In July 1983, the Supreme Court announced without explanation that it wanted to reschedule oral arguments for the Betamax Case in the fall term. This uncommon request, say some court insiders, came about because the justices were divided on the case and one or two swing votes requested a rehearing so more questions could be asked of counsel.

Yet despite the drama of the Betamax legal labyrinth, most followers of the home taping debate tend to limit the impact of the Supreme Court ruling, whenever it comes. Ultimately, the resolution of the home taping issue belongs to Congress, not the courts, they say.

In the meantime, what is a consumer to do? In the video area, the answer is tough. If the Supreme Court says that home taping is illegal, then I would not advise anyone to violate the law, even though enforcement seems to be impractical. Better you should write your legislator and try to get the DeConcini or Mathias bills passed post haste. Both would keep the dogs at bay, although the Mathias measure features a tax while DeConcini does not.

Letters from home tapers to their legislators will be important to the outcome of the home-taping controversy, as Hollywood and Nashville will lean on their friends in Congress for a royalty tax, and electronics and tape manufacturers will push the DeConcini measure.

In the audio realm, the answer is easy: continue taping. The legality of private-use home audio taping off radio, LPs, and even the new digital Compact Discs has never been challenged by the record industry, although it has been charged that home taping of records has had serious effects on sales.

But until some court speaks to the contrary, home audio taping is permitted. The morality of the practice, however, is for your conscience to decide. □

How to Choose a Cassette Deck

By Craig Stark

THREE heads or two? Dolby or dbx? What about Dolby C? Or Dolby HX? How useful are bias-optimization controls? Whether you're seeking better performance than your old deck can provide or looking into cassette recording for the first time, answering these and similar questions before you start shopping will help you find the deck whose combination of features best meets your individual requirements.

The extent to which individual requirements genuinely differ is important, for as the cassette medium has matured even some of the most "obvious" answers of the past have become considerably less certain. The oldest controversy of them all, between two-head and three-head recorders, will illustrate the point.

Tape Heads

Tape heads, which induce a varying magnetic signal pattern on the tape during recording and which detect that pattern and turn it into an electrical signal during playback, are probably the most critical recorder components. Basically, a head is an electromagnet with a microscopically small gap between its pole pieces at the point where the head contacts the tape. The exact width of the head gap is extemely crucial. For relatively loss-free *playback* of a recorded frequency as high as 20,000 Hz at the cassette's normal 1⅞-ips tape speed, the gap width should be less than one micrometer (μm), or 39.37 millionths of an inch. For *recording,* however, a gap width of three to five times as great is generally required to ensure the best signal-to-noise ratio. A deck that uses the same head for recording and playback must compromise—a gap of 1.3 μm is typical in today's better two-head machines. That means a playback loss at 20 kHz of about 6.5 dB, which must be made up by a corresponding treble boost in the playback electronics. Treble boost during playback, however, amplifies tape hiss along with the attenuated high-frequency signals.

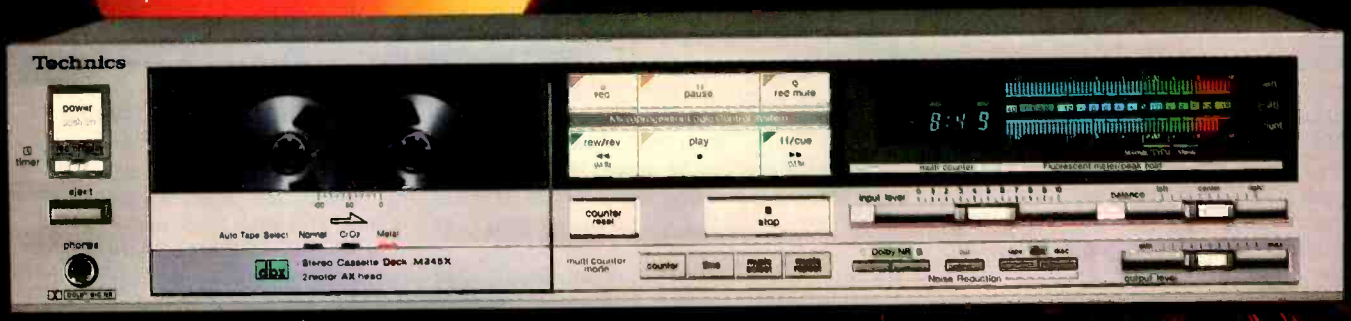
On the other hand, if your interest in high-frequency response doesn't go much over 15 kHz—the limit for stereo FM broadcasts—the playback loss from the 1.3-μm head will be a more easily managed 3.4 dB, and some of the manufacturing savings from using a single record/playback head can be used in making an electronically quieter playback amplifier. Besides, in a three-head deck even the slightest discrepancy in azimuth alignment (the perpendicularity of the head gap to the tape edge) between the record and playback heads can very easily cause a 3-dB loss at 15 kHz (and much more at 20 kHz). This can even happen when separate record and playback heads are placed together in the same physical case, for as the deck ages the case itself can slip out of alignment.

Thus, unless extremely high-quality heads are used, meticulous care is taken to align them (and keep them aligned), and very wide frequency response is demanded—all of which translates into much higher cost—even the theoretical advantages of a three-head design may not be realized. Here, however, another, more personal consideration enters in. How important is it to you to be able to compare the signal going into your tape deck with a near-instanteneous playback of the recorded result? Only a three-head design permits such "monitoring off the tape," which is ultimate quality control for tape recording. To *me,* this feature is a necessity, but, since the great majority of cassette decks sold are of the two-head variety, my priorities must not be the same as most people's.

Whether you pick a two- or a three-head model, head design is of paramount importance, yet only a few manufacturers provide enough information about their decks' heads to give the consumer a reasonable basis for choice. In terms of materials, it's generally agreed that heads made of sendust alloys or ferrites are three to five times as wear-resistant as permalloy-based heads. It's easy to understand how tape can wear down a head—it acts like a very finegrain sandpaper—but except with very inex-

They don't just reduce tape noise. They eliminate it. Technics cassette decks with Dolby* B, C and dbx.®

This remarkable series of Technics cassette decks represents an important technological advance in the fight against tape noise. Because unlike other decks that give you only one or the other, Technics now gives you: Dolby B noise reduction for compatibility with your present tape collection. Dolby C for compatibility with the new "C" encoded tapes. And dbx to eliminate virtually every decibel of audible tape noise. All in one deck.



dbx is effective because it compresses a musical signal so its dynamic range is cut in half. When the tape is played back, the original dynamic range is restored, but the noise level is pushed below the level of audibility.

This allows loud passages to be recorded without distortion and soft ones without hiss.

These Technics cassette decks go on to give you computerized performance: microprocessor feather-touch controls. Music Select to automatically find any song on the tape. Music Repeat to replay a song up to 16 times. And a remaining time display to tell you how much recording is left on a tape.

In addition, there is automatic tape bias and EQ setting, expanded range (−40db to +18db) three-color FL meters to handle all the dynamic range dbx gives you, the accuracy and precision of two-motor drive and more.

Explore all of the Technics cassette decks with Dolby B, C and dbx. After all, why own a deck that just reduces tape noise, when you can own one that also eliminates it. Technics.

* Dolby is a trademark of Dolby Laboratories, Inc.
® dbx is a registered trademark of dbx, Inc.

Technics
The science of sound

CIRCLE NO. 14 ON READER SERVICE CARD

pensive decks this problem is easily overemphasized. Nakamichi, an acknowledged leader in cassette-head design, uses a crystal-permalloy material because it has some superior magnetic properties, and the company's heads are nevertheless rated to last for 10,000 hours of use!

Noise Reduction

After the choice between a two-head or three-head model, the next major choice concerns the deck's noise-reduction system(s). It is a fact of cassette life that the signal-to-noise ratio that can be achieved without some sort of noise reduction—approximately 50 dB (unweighted)—is unacceptable for most hi-fi recordings. (True, if you restrict your taping to highly compressed FM broadcasts of rock, the music may never get soft enough for you to hear residual tape hiss even without a noise-reduction system, but highly compressed sound is itself not high fidelity.) For years the Dolby B noise-reduction system (or JVC's compatible ANRS) has been a standard feature of nearly every good cassette deck, and almost all prerecorded cassettes are Dolby B encoded. The Dolby B system provides 8 to 10 dB of noise reduction, principally in the frequency range where the ear is most sensitive to residual hiss (above 1 kHz). This amount of noise reduction does not render *all* hiss inaudible, however, and as recordings with much wider dynamic range (the spread between the loudest and softest sounds) have become available, the limits of Dolby B have become more apparent. At present the weighted signal-to-noise ratios of high-quality decks with Dolby B are typically in the 65- to 68-dB range, and for serious music listeners this is not quite enough.

The Dolby Corporation now offers a more powerful system, Dolby C, which provides 20 dB of noise reduction instead of 10 dB, and you can expect to find this on many of the newer cassette decks. In (over) simplified terms, Dolby C is essentially two Dolby B systems working back to back, extending the range of frequencies treated down to approximately 200 Hz. Dolby C also offers a potential improvement in high-level high-frequency response by reducing the treble boost during recording. With Dolby B, this boost sometimes drives tapes beyond their saturation limit. A deck equipped with Dolby C will always have a switch postion for Dolby B, so that recordings you've already made or purchased can be played back properly. Because the Dolby C system involves twice as much processing of the signal as Dolby B, however, its tolerance of variations in tape sensitivity and frequency response is correspondingly lessened, and potential overall frequency-response errors are increased. Nevertheless, except when considerable ultrasonic energy was present in the signal being recorded (for instance, in synthesizer music), which can "fool" the noise-reduction system, the decks with Dolby C that I have tested have behaved perfectly, and the audible improvement in recording quality is spectacular.

The only serious alternative to the two Dolby noise-reduction systems is dbx. Available both as an outboard accessory and in a number of tape decks from Teac, Technics, Yamaha, and Luxman (and probably in more to come), the dbx system is not limited to 10 or 20 dB of noise reduction but instead uses a 2:1 compressor/expander. This gives it the ability to capture a dynamic range greater than 90 dB, which is positively awesome and can be rivaled only by digital recording. Since dbx is not compatible with the Dolby systems, however, recorders that offer it also provide at least Dolby B decoding for playback of previously recorded material. If you need more noise reduction than Dolby C (for dubbing Compact Discs or direct-to-disc or digitally mastered LPs, for example), dbx is clearly the answer. But remember that the compatibility problem works both ways: tapes you record with dbx can be played back only on a dbx-equipped deck (or with an external dbx processor). Some car systems and personal portables have dbx decoders, although this is far from common.

Some Dolby-equipped decks may also offer another feature unrelated to noise reduction although often confused with it. The original version of this feature is known as Dolby HX (which stands for "headroom extension"), but some refinements made by Bang & Olufsen, with Dolby's cooperation, are incorporated in the current version, Dolby HX-Pro. It is currently available in not only B&O's decks but some from NAD and Harman Kardon as well. What the HX-Pro (and HX) system does it to vary the amount of effective bias used during recordings so as to maximize the high-frequency storage capacity of the tape. By lowering the recorder-supplied bias when high-level high frequencies are prominent, the tape can hold more treble before reaching saturation. HX recordings can be played back on *any* tape deck, whether or not it has the HX feature for recording, and the degree of improvement in the high-frequency range very closely approximates the difference that metal tape provides over chrome or ferric tape formulations.

Bias Adjustments

We have long been aware that differences between tape brands of the same nominal *type* (ferric, chrome, ferrichrome, or metal) can create slight differences in frequency response. These differences can effectively be eliminated by "optimizing" the recording bias for each cassette. Attempts to make such fine tuning a user-adjustable control have been relatively unsuccessful, since to do the job properly calls for instruments (specifically, a high- and mid-frequency audio generator and a sensitive meter) that can only be built into rather expensive decks. Nevertheless, manufacturers have incorporated a bias-adjust control into many decks in which the only test instrument is the listener's ear—even in some two-head decks that preclude instant comparison of the signal before and after adjustment. Built-in microprocessors, increasingly common in home cassette decks, allow bias to be fine-tuned automatically, making the process both quick and easy. Such convenience costs more, of course. Frankly, unless you buy either a deck with a built-in microprocessor or one with three heads and built-in or external test instruments—or unless the manufacturer supplies a listing of the proper settings for different tape brands—I would advise ignoring bias adjustments entirely.

Transports and Drives

Tape-transport mechanics provide another set of basic features to choose among. Decks are available with one, two, three, and even four motors, with single or dual capstans, and with a host of automated functions. All else being equal, a dual-capstan drive (also known as a "closed-loop" drive) is preferable to a single-capstan model, for it effectively isolates the important section of the tape—the part passing across the heads—from any disturbances induced by the supply reel. In theory, if you build a closed-loop transport properly you should be able to eliminate the need for the cassette pressure pad, but to date only one manufacturer, Nakamichi, has *that* good a dual-capstan drive, and some good single-capstan models have no more wow and flutter than their dual-capstan counterparts. Dual-capstan drives almost always use a separate motor for driving the reels, however, which generally leads to faster rewind and fast-forward times, and dual-capstan drives are naturally adapted for auto-reverse functions if this feature is important to you. Most auto-reversing decks record in only one direction, but a few will record bidirectionally.

While most transports today use solenoids to release the reel brakes and operate the tape gate mechanism (a great improvement over the mechanical "piano key" controls or yore), the most advanced transports use a servomotor for these tasks. This refinement eliminates both the noise and the shock induced by solenoid action and is certainly worthwhile in the "no-compromise" decks that employ it.

Record-Level Meters

The pseudo-VU meters that once were used for setting recording levels have now all but universally given place to peak-reading fluorescent or LED displays. These not only eliminate needle overshoot or undershoot but also read the peak rather than the average value of the signal, and it's the peaks, not the averages, that cause distortion. At the same time, however, these displays show only discrete values, not the continuous range that can be conveyed by a meter. In terms of potential accuracy, then, look at the number of *segments* in each channel's display (twelve segments are usual, sixteen are better) as well as the intervals (in decibels) between segments. Some displays are deceptive in this respect, since what may look like three distinct segments is only one electronically. You can test this by slowly increasing the input level and checking how many indicator lights turn on at once.

Counters and Timers

Electronic control has also all but eliminated mechanical tape counters on top-of-the-line cassette decks, replacing them with digital readouts. The most useful of these actually display the time remaining on the cassette side. Even if these time indicators are not quartz-crystal accurate, they are certainly a great advance on arbitrary counter readings. Microprocessor control has also increased the number of available transport "memory" functions. Decks are now available that not only permit automatic rewind to (or, alternatively, replay from) a "counter 0" location; some also permit marking a second memory location within the tape itself. And several permit fast winding past a specified number of selections (separated by blank spaces), sometimes with brief pauses to sample the cuts passed over. To me this kind of automation is hardly worth its cost, but then I don't usually record a lot of short selections on the same tape. And while timer-activated recording can be useful to avoid missing something broadcast while you are out, I don't find much appeal in timer-started playback.

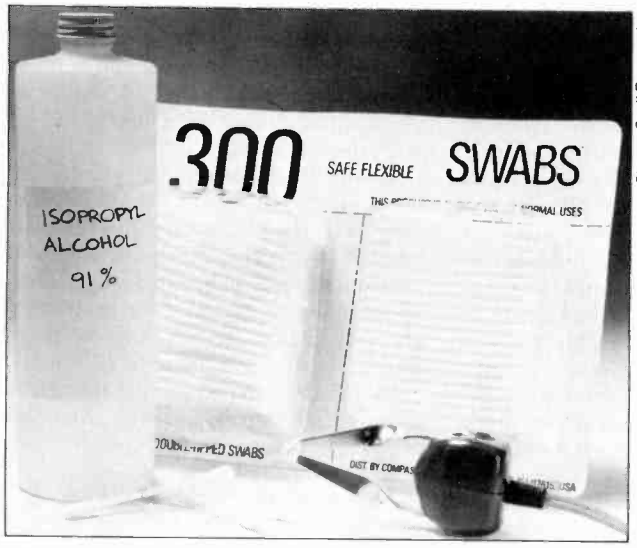
Finally, if you intend to do any recording with microphones, it would be well to check whether your prospective deck has microphone-preamplifier circuits. Several companies have eliminated the microphone input stages entirely on some models, so you may have to buy an active mixer to record live music or speech.

By the time you've studied the merits of all these features, deciding what you need or want and what you don't, there will undoubtedly be several new ones on the latest decks in the showrooms. Remember, however, that every additional "convenience" feature will cost you, either directly or in terms of what the manufacturer may sacrifice in performance to keep the total price down, so choose with care. □

Taking Care of Your Tape Deck

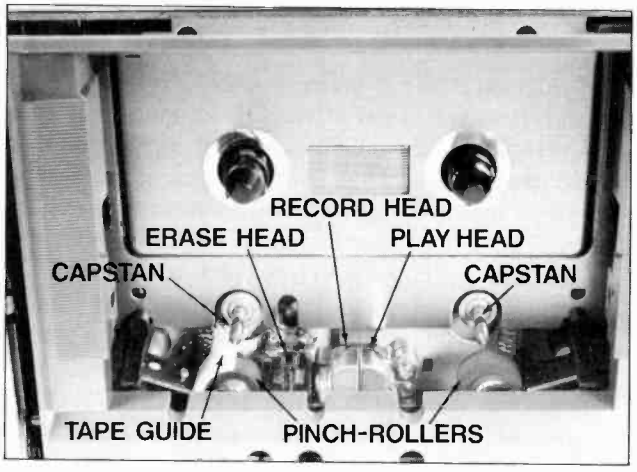
By David Ranada

Do your cassette tapes sound noisier than they used to? Has your deck's wow and flutter apparently increased? Are the high frequencies of your tapes attenuated? Has your cassette deck been "eating" tapes lately, even those C-90's made by reputable companies? If you answered yes to any of these questions, then your deck probably needs to be cleaned and demagnetized, the two most basic and necessary procedures for keeping a tape machine in good condition. Cleaning a deck removes oxide particles that tapes inevitably shed. In addition to accumulating between heads and tape, thereby reducing high-frequency response, these particles also build up on capstans, pinch-rollers, and tape guides, creating uncontrolled and varying amounts of friction that can lead to uneven tape movement. Demagnetization simply means removing any residual magnetic fields from the magnetizable parts that contact the tape. This residual magnetism can, in extreme cases, partially erase tape recordings. Both cleaning and demagnetization are simple and inexpensive, and they should be done at least every 8 to 10 hours of deck use (certainly before any critical recording session). The pictures that follow demonstrate an effective way to perform these procedures on a cassette deck, but there's no reason you can't use the techniques on pocket cassette players, "boom boxes," and open-reel decks as well. There are also specialized products you can buy to clean and demagnetize tape recorders.

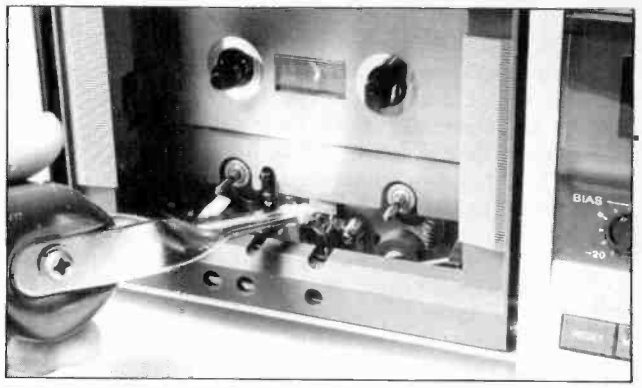


Photos: Geoff Rosengarten

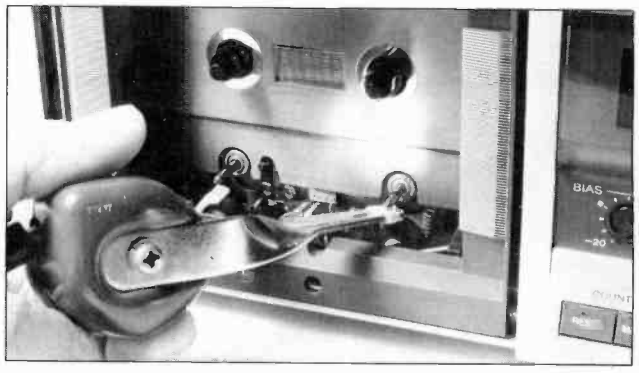
1 If you do not have specially designed products (and *if* your instruction manual says nothing to the contrary), you can still clean your tape deck. I use inexpensive "generic" cotton swabs and concentrated isopropyl alcohol (a 91 per cent "bathing compound") available from a drug store. Other liquids suitable for recorder cleaning are denatured alcohol (from hardware or paint stores) and special varieties of Freon (sold as a recorder-cleaning fluid or aerosol). *Do not* use commonly available "rubbing alcohol" since, in addition to being more diluted, such mixtures contain compounds that might damage recorder pinch-rollers. The demagnetizer I use is an old probe type suitable for reaching all the parts of interest in the cassette well. The tip is covered with a rubber compound to prevent scratches to the heads. It also has a convenient line-cord switch so that it can be turned on and off easily. Look for these features in any demagnetizer you buy. There are a few battery-powered, electronically controlled head demagnetizers available that are quite convenient for use in on-location, live-recording situations.



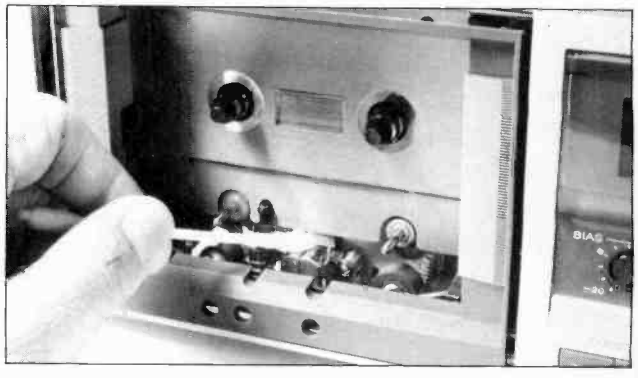
2 The battle zone. The objectives in the operation will be to remove any oxide particles from *all* parts of the deck that touch the tape during use and to demagnetize *all* parts of the machine that might become magnetized by the passing tape (including capstans and tape guides as well as tape heads). Not every cassette cleaning or demagnetizing device will reach all the parts that should be treated, a fact to remember when shopping for such products. The picture is of the cassette well in a dual-capstan tape deck with separate record, playback, and erase heads. Some three-head machines are constructed so that the record and play heads make contact with the tape through separate openings in the cassette shell. Personal-portable units usually have only one capstan and no erase or record heads. They also usually have unremovable cassette-well doors.



3 To demagnetize your tape recorder, first turn it *off*. Remove any recorded tapes from the vicinity (they should be at least a foot away from the path of the demagnetizer). While the demagnetizer is *at least* one foot away from the deck, turn the demagnetizer on. Bring it slowly and steadily—one foot every three to five seconds—up to the heads. Pass the tip over the heads very slowly. The tip needn't touch the heads, but it should come within a sixteenth of an inch of the entire tape-touching surfaces of all of them. Do *not* turn off the demagnetizer yet.



4 While the demagnetizer is still in the cassette well, demagnetize any other metal parts that contact the tape (like the capstan shown here). This is really necessary only if the other parts can become magnetized at all. Since there is no easy way of finding this out, why take chances? When you have finished, slowly and steadily withdraw the demagnetizer unit until it is *at least* a foot away from the deck. *Then* turn it off. Moving the demagnetizer too quickly or turning it off too soon will leave magnetic fields on the heads much stronger than the ones you're trying to remove. The whole demagnetization process need not take more than a minute. You can turn the deck back on now.



5 Clean the heads with a swab lightly moistened in alcohol. The swab need not be dripping to do the job. Rub it across the entire surface of all tape heads. If one head is particularly dirty, change swabs before cleaning the next one. Don't leave any fibers from the swab stuck to the heads or their attached tape guides.

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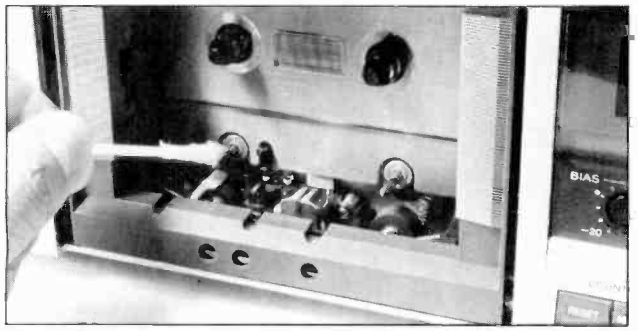
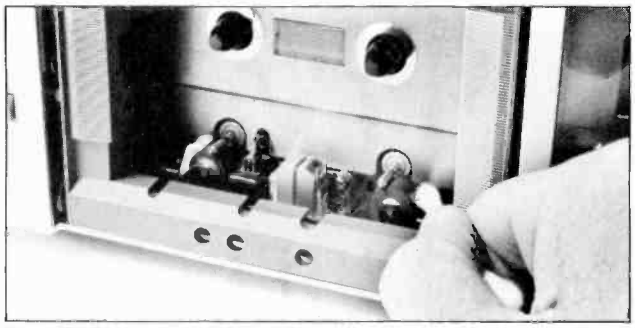
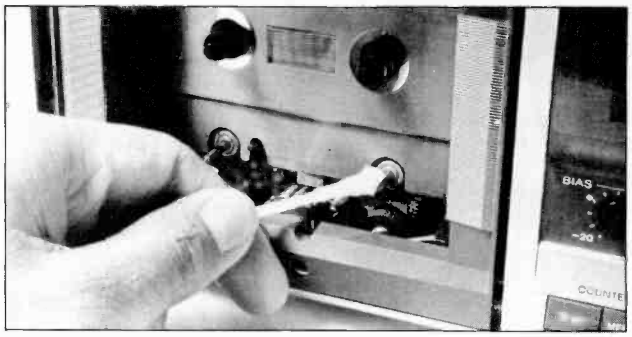


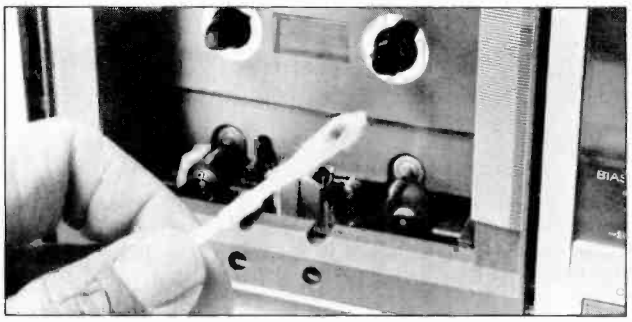
6 Clean other tape-contacting parts (guides, flutter filters, etc.) with the other end of the swab, or a new one, in order not to transfer any tape debris from one part of the machine to another.



7 Use a new swab to clean the pinch-roller. You can either dab at the roller with your moistened swab or put the deck into play mode and hold the swab up to the rotating roller. Place the swab to the right of the capstan so that the swab fibers are not caught by the capstan.



8 Clean the capstan last. Try not to let any alcohol seep into the capstan bearing. Make sure you remove any swab fibers from the capstan and pinch-roller.



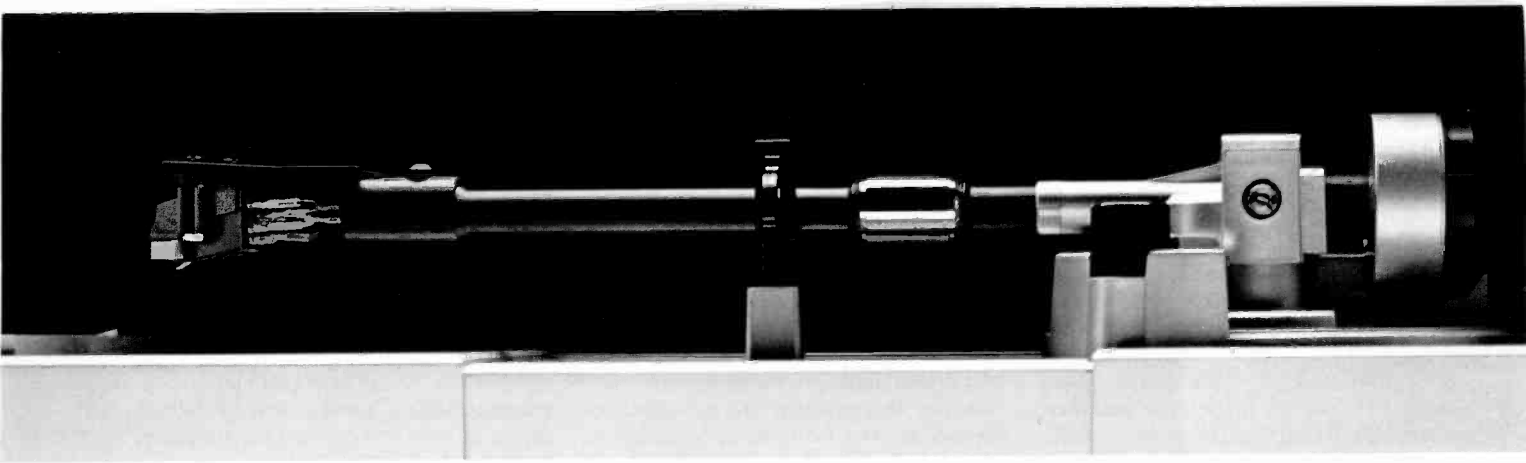
9 Sign of a job well done: dirt on the swab. Do not reuse a dirty swab. A good test for your cleaning technique is to do it all over again. Each part should leave no oxide traces on the swab if the initial cleaning was sufficient. Wipe away any fluid residue with a dry swab.

The Basics of Live Recording

By David Ranada

Anyone can make a live recording. Just throw a cheap portable cassette recorder with a self-contained microphone near the performers and let it loose. The results from such an exercise will generally be quite poor, however, especially compared to what can be done with even a minimal investment in microphones and connecting cables.

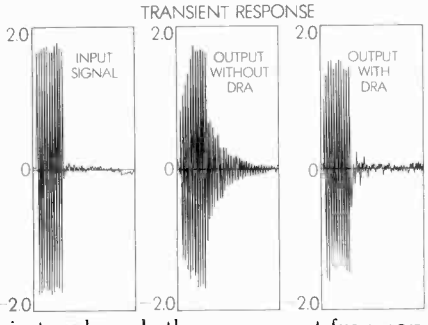
The greatest challenge for any recordist is a live recording session. You get to choose everything that determines the ultimate sound quality: the recorder, tape, and microphones and their placement. And that ultimate sound quality can be superb—better than nearly everything



HERE'S A TECHNOLOGY STORY THAT'S TRULY ABSORBING.

Every story has a protagonist and an antagonist. And this one's no different.

The hero, in this case, is an unassuming, little technological breakthrough from Pioneer called the Dynamic Resonance Absorber™ (DRA).



And the arch-villain, the ever-present Resonant Tonearm Vibration.

What the Dynamic Resonance Absorber does, to make a long story short, is to absorb the resonant frequency of the tonearms on all of our new turntables.

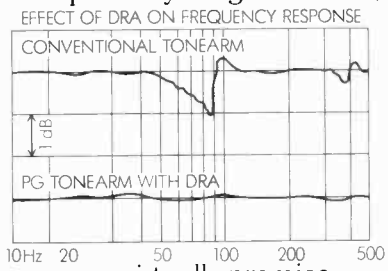
Thereby eliminating distortion which causes music to lose clarity and accuracy of reproduction.

As if this weren't thrilling enough, there's also an exciting subplot. The DRA eliminates acoustic feedback that results when the turntable is too close to speakers played at high volume.

How the Dynamic Resonance Absorber causes all this to happen is actually quite simple, as most acts of genius usually are.

The DRA is composed of a damper made of extremely dense butyl rubber enclosed in a weighted collar on the tonearm.

Working within the precisely weighted collar, the butyl rubber acts just like a spring. When the pipe of the Polymer Graphite™ (PG) tonearm vibrates, the "spring" compresses and simultaneously soaks up vibrations.



That's why Pioneer can virtually promise that muddy reproduction is an out-of-date story. And why transient response is far more accurate. In fact, as you can see on the chart, the cartridge output (with DRA) closely resembles the original input.

Furthermore, frequency response, as you can also see, is tremendously flat.

But, while the Dynamic Resonance Absorber is a real blockbuster, it's not the only story here.

Every Pioneer turntable also features a Stable Hanging Rotor™ that improves stability by reducing friction which decreases wow and flutter.

A zero-clearance dust cover allows you to place the turntable flush against a wall, yet still open it all the way.

And another convenience item: all controls are located outside the dust cover.

In addition, the PL-S70 (shown here) has two other ease-of-operation features: an automatic disc size selector (ADSS) and auto repeat function.

Naturally, you'll want to audition each new Pioneer turntable with Dynamic Resonance Absorber at your earliest convenience.

If only to convince yourself that this story falls in the non-fiction, not the science-fiction category.

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available on either disc or tape—without the expense of "professional" equipment.

If you are someone who might be asked to tape a school recital, play, or concert; if you are a musician who needs tapes for auditions or as "sonic mirrors;" this article will take you through the basic decisions confronting anyone making a live recording. While this article is too short for a complete explanation of modern multi-track and multi-microphone techniques, the principles outlined here can easily be applied to more complex productions.

Tape Recorders. Selecting a tape recorder for live recording is fairly easy, at least at the start. Those who will have to edit the tapes they produce will need an open-reel recorder, period! If compatibility with radio-station and recording-studio tape formats is required (for possible broadcast or duplication of the master tapes), then the ½-track (or 2-track) open-reel format is necessary, preferably running at 15 ips. Such open-reel recording consumes great quantities of rather expensive tape, but this is the only way to go with analog equipment if you want the widest frequency response, widest dynamic range, and lowest noise. Many cassette recorders, especially those equipped with advanced noise-reduction systems, can equal or exceed the dynamic range capabilities of some "unaided" open-reel recorders. But don't forget that noise-reduction systems are available for open-reel machines, too. A properly set-up and utilized open-reel recorder equipped with an advanced noise-reduction system can rival the dynamic range of a digital audio recording system.

As of this writing, digital-audio recorders are just being made available at prices the well-heeled audiophile can afford. These machines are usually adapters for use with a videocassette recorder (VCR). They turn two channels of audio into a digital signal that is, in turn, transformed into a video signal, which is something a VCR can cope with. On playback of the videocassette, the video signal is converted back to a digital audio signal which is converted into an analog signal that's extraordinarily close to the original signal.

Though expensive, digital-audio adapters (or VCRs containing them) are not that much more costly than high-end open-reel recorders. Tape costs can be *lower* than for analog open-reel recording, and most critical listeners would agree that the sound is far superior (no wow or flutter, no print-through or modulation noise, and low noise and distortion). The only problem with the digital audio approach is that of compatibility with other tape media. Most recording studios are not equipped to handle a digital-audio videocassette, and certainly few home users will be able to do so. Perhaps the best bet is to rely on a digital recorder to make the master tape (with an analog-recorder "safety"), and to make whatever copies as may be necessary on an analog open-reel or cassette machine.

If for reasons of expense or convenience you must use a cassette recorder, get the best you can afford. Three-head units not only have playback heads optimized for extended high-frequency response, but the third head permits you to monitor the recording a fraction of a second after it has been made. Catching a defective cassette before a recording is ruined is made much easier.

Tape choice is more of a factor in cassette live recording than with open reel, though it is important in both. Live signals can have very wide dynamic ranges and greater high-frequency content than either records or FM broadcasts. Capturing live signals with normal cassette fer-

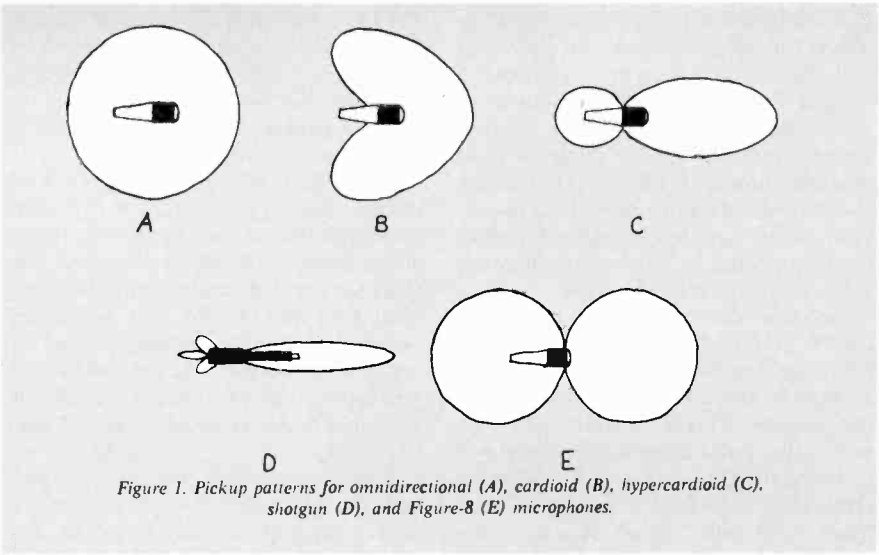


Figure 1. Pickup patterns for omnidirectional (A), cardioid (B), hypercardioid (C), shotgun (D), and Figure-8 (E) microphones.

ric tapes is straining at the boundaries of both theory and technology. Ferric and chrome or chrome-equivalent tapes may be fine to record limited-range material, but getting the most from live music will require metal tape used in conjunction with an advanced noise-reduction system for highest fidelity. Dolby HX-Pro can also extend recording headroom.

Microphones. The selection and placement of microphones is a major portion of a recording engineer's skill, for a recording can be no better than the original signals, and it is the microphones which provide them.

There are two basic types of microphones in common use: directional and omnidirectional. Taking the simple case first, an omnidirectional mic is equally sensitive to sounds arriving from all directions. Most omni mics have a slight rolloff of the very highest frequencies for all directions other than "on-axis," however. (Off-axis coloration is a major contributor to the "sound" of a particular microphone—and why some models are preferred for certain applications and not for others.)

Directional microphones, as their name implies, do not pick up sounds as efficiently from some directions as from others. The most common directional microphone is called the "cardioid," presumably because its sensitivity pattern is somewhat heart-shaped (Figure 1). From that figure—which shows the pattern of equal sensitivity around the microphone, with the farther the curve from the microphone meaning greater sensitivity in that direction—you can see a cardioid mic is most sensitive to sounds coming from straight ahead. This sensitivity is maintained until the sounds come from the side and back of the microphone. Sounds arriving from the sides and rear *are* transduced, but at a substantially lower level than they would have been had they arrived from the front.

Other directional microphones in com-

mon use include hypercardioid, shotgun (named for the shape of the mic), and figure-8 or bidirectional configurations. All of them feature directions in which sounds are preferentially attenuated. Those microphones with rear lobes (hypercardioid and figure-8) invert the phase of the sounds arriving from the rear.

Both omnidirectional and directional microphones are available in two common technologies: dynamic and "condenser" or electrostatic. Like their loudspeaker namesakes, dynamic microphones use a coil moving in a magnetic field. Generally, the coil is attached to the microphone diaphragm and the magnet to the body of the mic. As the diaphragm vibrates, the coil moves in the magnetic field, generating a voltage. Condenser microphones are much like electrostatic speakers or headphones in reverse. Both the microphone diaphragm and a fixed nearby metal plate are given high electrostatic charges (in an "electret" microphone these charges have been fixed in place so a source of polarizing voltage is not required). As the diaphragm vibrates in the sound field, its distance from the fixed plate changes. This is sensed by the mic's internal circuitry as a change in capacitance between the plate and the diaphragm. An output voltage is then generated proportional to the vibration of the diaphragm.

Condenser mics are generally preferred by professionals for their extended high-frequency response and low distortion. Dynamic microphones are preferred where extremely high sound levels are to be recorded, where great ruggedness is required, where extremes of environmental conditions are expected, and where cost is an important consideration.

The best microphones are expensive—a professional engineer can expect to pay several hundred dollars for a high-quality condenser mic. But an amateur can obtain extraordinarily good results with much less expensive equipment. Some electret condenser mics of high sound quality are available at reasonable cost as accessories. What you generally give up with these less-expensive models is flatness of frequency response, low self-noise levels, lowest distortion, and deluxe packaging. What matters most with microphones of reasonable quality (and there are many of those) is not how good they are, but how they are used.

Microphone Placement. This is the core of the recording engineer's art. Even with mediocre equipment, proper microphone placement can result in a stunningly lifelike recording. This, of course, assumes that you want to make a lifelike recording. Many record producers nowadays, especially in pop and jazz, try to create new musical sounds and dazzling sonic effects through innovative mic placement and the use of various signal-processing devices like delay lines and vocoders. These effects, often musically effective, are generally out of the range of most amateur home recordists. Duplicating the "sound" of today's top selling pop albums would require a substantial number of microphones, a multi-channel mixer, and a multi-track tape recorder.

For this article the sonic alternative will be examined: making a high-fidelity recording, one which attempts to recreate accurately the sonic effect of the original performance. This is relatively easy to do with only two or three microphones and a conventional stereo tape recorder. (Note that "high-fidelity" makes no judgment as to how "good" the recording sounds, only as to its ability to give an illusion of the original.)

The first consideration in mic placement is distance from the performers. In general, microphones must be placed much closer to the performers than a "live" listener for the same sonic effect upon playback as the "live" listener received. Also, mic distance should vary with the size of the auditorium (at least for nonamplified instruments); the larger the auditorium the more distant can be the microphones.

If the performing ensemble is deep, with some musicians much farther from the mics than others, the microphones might have to be raised on stands to reduce the differences in distance. Raising the mics has the beneficial effect of reducing sound coloration caused by reflections from a nearby floor.

If you have no idea where to put the microphones, try a location 6 to 10 feet back from the performers and 6 to 10 feet above them, and "adjust to taste." Too close a placement can sound unnaturally analytical, too distant can sound too "washed out" and reverberant. Too low can overemphasize the nearer instruments, too high can remove all sense of ensemble depth in addition to sounding too echoey.

There are several "canonical," tried-and-true methods of deploying microphones for a stereo recording. They are usually called "minimal-microphone" or "purist" techniques. On playback, each of these positionings is claimed to provide an accurate and stable stereo image of the original performing forces. In truth, each distorts sonic reality a little bit, some techniques altering different aspects of the image than others.

The simplest and perhaps least troublesome minimalist technique was developed by the French broadcasting system and takes its name from the initials of that organization: ORTF (Figure 2). The ORTF system of two cardioid microphones with their diaphragms 17 centimeters apart (around 6¾ inches) and angled apart by 110° has survived listening tests as the best compromise of image placement accuracy, directionality, and sense of hall ambience. An ORTF pair, placed as outlined above is a good starting point for experimentation.

Some theorists and audiophiles prefer "coincident" microphone techniques. These place two directional microphones (pointing in different directions) with the diaphragms as close together as possible. Among the variations of this technique are "X-Y;" (two cardioid mics, tips together, 90° angle); "M-S" (a figure-8 plus an omni or cardioid feeding a special matrixing circuit), and "Blumlein" (two figure-8 mics, 90° angle).

Aside from any theoretical advantages, coincident techniques have (they are very amenable to mathematical modeling), their primary real-world advantage is exceptionally good campatibility with monophonic broadcasting and stereo-disc cutting. This is because coincident placement effectively eliminates any phase differences between the two stereo channels, the only differences being those in signal intensity. Beware, however, of claims that coincident techniques, particularly the Blumlein system, are the be-all and end-all of stereo mic techniques. They are just tools, like the ORTF technique, and require equal amounts of ex-

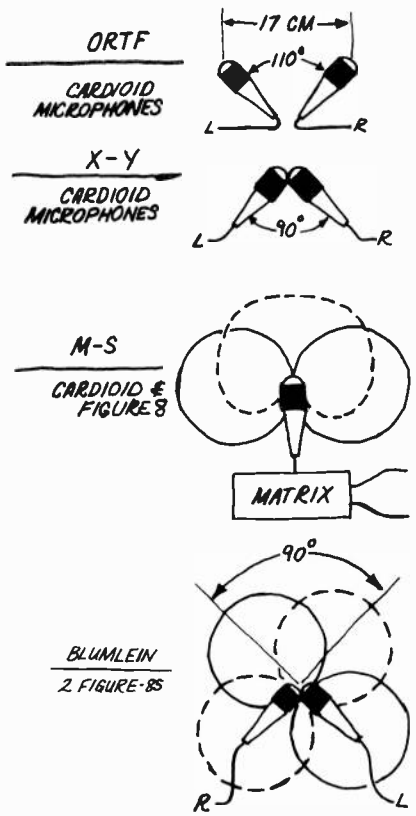


Figure 2. Microphoning techniques.

perimentation with exact placement for good results.

You can often get stunning results with just two *omnidirectional* microphones placed 6 to 10 feet apart at the distances recommended above. This technique has less good mono compatibility than the systems outlined above, however. Also, a "hole-in-the-middle" effect can occur if the mics are too widely spaced and disturbing phase effects can happen if they are too closely spaced. Adding a third omnidirectional microphone midway between the original spaced pair (and moving the original pair apart a few feet more), is mixed equally loud in both stereo channels and is adjusted to slightly lower than the original pair in level solves the hole-in-the-middle problem.

Remember that all these recommendations are just that, and that there are no hard and fast rules. If you are not too concerned with "high fidelity," you can experiment with placing mics over, under, and even inside instruments for new effects. Try to avoid widely spaced directional microphones (though figure-8s can sometimes be used like omnis) and closely spaced omni mics. Otherwise, experimentation is the name of the game.

On Location. If you are taping a live concert, the first order of business, once you unload all the equipment, is to set up the microphones. Stands are the most convenient means of supporting mics, though sturdy, large models can be outrageously expensive. If you use stands, make sure they aren't in anybody's way and aren't blocking sight lines between musicians or to the audience (if any). The floor on which stands are placed should not resonate too much nor be pounded or hit during the performance, or you might end up with a tape filled with unexplained bumps and grinds. Inexpensive shock mounts are available for isolating microphones from external vibrations. An alternative approach is to suspend the mics from a cable, either their own cables or attached to a clothesline or a long length of "zip-cord" lamp wire. Make sure the mics, if hung, point in the right directions and don't move during the performance.

Microphone cables should be strung and positioned so as not to interfere with the performers. All cables should be taped down and otherwise secured from flopping around and being safety hazards. Use "gaffer's" or "duct" tape, which is strong and removable. Masking tape will do in a pinch.

When interconnecting cables, make sure all connections are firm. If you are not using self-latching XLR-type connectors, it's a good idea to tape together the plugs and jacks of any connections along a cable run. When stringing cables in a theatre, try not to lay them too close to any stage lighting; some light-dimming systems emit high levels of electrical interference that sound like a hum or buzz in the microphone outputs. Keep cable lengths as short as possible. When hanging mics by their cables, make sure that the cables can support both the microphone and their own weight.

Once the mics and cables are set up, see if all of them are working as soon as you can. Change on or above a stage may not be possible in the last minutes before a concert. After you're sure that all the mics are operating correctly and repositioned properly, set up the tape recorder.

Most of the tape-machine set-up procedure should be done beforehand, when time and space are available. Proper set-up includes checking head alignment (usually not possible on nonprofessonal recorders), cleaning and demagnetizing the heads and all other parts contacting the tape, and making a short test recording of a known signal source (like FM interstation hiss). Some recorders allow home adjustment of bias and equalization controls. These should be set for the specific type of tape to be used.

With the recorder (and any external noise reduction system) and mics connected and operating, the last remaining task is to set recording levels. If your taping experience has been with only discs and broadcasts, the first thing you'll notice is the wide dynamic range of live music, the softs (if there are any) will be very soft, the louds very loud. Fitting that range on a tape can be a problem for all except digital and open-reel analog recorders with noise-reduction systems.

There are engineers who take the "gain riding" approach to solving the problem, and those who have a "hands off" policy. Gain riders will raise the recording level as a very soft passage is approached and slowly lower it before a loud crash hits. Of course, it helps to be able to follow the printed music, to memorize the score, and/or to record a rehersal. With very-wide-range music, like a full orchestra, the hands-off method will mean that sometimes the signal will sink dangerously near the noise level of the tape and/or be straining "in the red" for substantial periods during loud passages. With analog tape recorders, the latter course is to be preferred. Analog recording overloads "softly" and is not too audibly objectionable until gross overload is reached. However, running such "hot" levels increases the risk of print-through.

If you have to go into a live recording session "blind" (deaf?), with no idea where to set record levels, you can take a hint from the audience applause that greets the artists as they troop out on stage. With nonamplified instruments and the microphones placed as noted above, the audience's applause should read between –5 and –10 on the recorder's meters.

Monitoring. Unfortunately, a live recording session usually means you have to monitor on headphones. Sealing headphones are rare (most headphones nowadays are nonisolating), and those that are available sometimes have inferior sonic characteristics. Still, they are usually the only way to judge the effects of mic placement, recording levels, and tape quality before it's too late. A good stereo image, by the way, should sound slightly too wide on headphones; speaker playback will reduce the apparent separation.

If possible, arrange to have a separate room sonically isolated from the main performing area since it is very difficult, even with isolating headphones, to hear all the details going on during a live performance. If you can, bring along a small amplifier and speakers for playback before the performance or during breaks. Even mini-speakers not ideally placed will tell you much about how the stereo image is being picked up.

Behaving Yourself. If you decide to get into what could be a personally and financially rewarding hobby, the making of live recordings places more obligations on you than just those involved in making a master tape. For example, you should be as unobtrusive as possible during a live concert recording, both visually and logistically. Don't make noises when they can be picked up by the mics or heard by the performers. An open-reel tape should not rub against the reel flanges as the recording is being made. Not only does this damage the tape edge, but is also very noisy.

Plan your equipment hookup to take as little time to set up and take down as possible. You can get into trouble with the backstage crew if you don't. A rehearsal always helps.

If you plan to duplicate and/or sell the tapes you record, get *written* permission to do so from the artists involved. If the music you sell is under copyright, you must also obtain permission from the copyright holders. If you get this far, you might be able to go into business.

Impedance, Unbalanced, Balanced. Microphone impedances and the ins and outs of balanced and unbalanced operation are two subjects that still confuse even professional recording engineers. Many are stymied by the thought that mic impedance and output configurations have something to do with the specific microphone technology (condenser, electret, or dynamic). Others confuse mic impedance and output signals with mic output level, believing there is a neces-

sary connection between them. The fact is that condenser or dynamic mics can have either high or low-impedance outputs, and those outputs can be either balanced or unbalanced.

Let's tackle the less complicated of the two aspects of mic outputs first: impedance. A microphone's impedance is theoretically the *output* impedance (*not* the *input* impedance of the amplifier to which it is connected). A mic's output impedance is what you would encounter if you were to try to feed a signal into the microphone. However, according to common usage, a microphone's impedance means the impedance the mic can be assumed to have while designing a circuit to amplify it, not necessarily the actual microphone output impedance. Low-impedance microphones are desired in critical recording work because, while their output levels are generally lower than those of high-impedance microphones, a cable hooked up to a low-impedance mic is far less likely to pick up electrical interference. In addition, long lengths of cable attached to high-impedance microphones roll of high-frequency response. Most microphone inputs in consumer tape decks will accept and amplify the outputs of most common high- or low-impedance microphones. When in doubt, try it out.

Most consumer-type audio connections are "unbalanced," meaning there are only two wires leading to each connection: a "hot" or signal-carrying lead, and a ground or "shield" lead. Most professional-type audio connections are "balanced." In this case there are three conductors: two hot leads carrying *one* audio signal in anti-phase (when one lead's voltage rises, the other's falls by the exact same amount), and a ground lead. The purpose of this arrangement is to reduce the effects of long cable runs. An interfering signal is likely to be picked up *in phase* by the two signal-carrying leads so that the interfering voltage rises and falls in the same direction, and with the same level in each hot lead. When the noise signals reach the microphone inputs, the signals on the two hot leads are subtracted, the result is the interference gets cancelled. If you want to use professional microphones, you'll have to convert their balanced outputs to unbalanced ones, and you'll also have to use three-conductor cable and 3-pronged XLR-type connectors.

The least expensive way to get the balanced output of a professional mic into the unbalanced mic input of a consumer tape recorder is to use an adapting transformer. They can be purchased with a 3-prong XLR-type jack on one end and a standard $\frac{1}{4}$-inch phone jack on the other. Many of these transformers also convert a low-impedance mic output into a high-impedance one. While this is not essential for many of today's mic inputs, the bonus is that it increases the output voltage of the microphone by a substantial amount and thereby lessens the noise requirements of the microphone amplifiers. Such impedance-matching transformers should be kept as close as possible to the tape recorder. Some electret and most condenser mics require a power supply for proper operation; connect the power supply between the microphone output and the adapter transformer.

To sum up then, there are three common combinations of mic impedance and output configuration in general use:

1. low-impedance, balanced output (professional equipment)
2. low-impedance, unbalanced output (semi-professional and much consumer equipment).
3. high-impedance, unbalanced output (low grade consumer equipment).

The best bet are low-impedance, balanced-output microphones used in combination with the necessary multi-conductor cables, connectors, and matching transformers. □

How to Make Good Tape Recordings

By David Ranada

Making an accurate recording of a disc, a radio broadcast, another tape, or live music isn't difficult. Many home recordists fret unnecessarily over this process, which can, after a little experimentation and practice, become second nature. (On the other hand, home recordists should be concerned over the questionable ethics of recording copyrighted material in order to avoid buying the original.)

The steps outlined below take you through all the procedures needed to make a cassette dub. Lest they sound too much like "Stereo Review's Guide to Excruciatingly Correct Cassette Recording," keep in mind that they are just suggestions, that experimentation is the rule. Feel free to adapt the procedures to your

situation or to reject them altogether. In making a recording, you can rarely damage anything by any reasonable experiment you might try. After all, a tape that turns out badly can always be erased and used again.

Clean the tape deck. Dirty tape heads can cause a loss of high frequencies and subsequent noise-reduction-system mistracking. Capstans, pinch-rollers, and tape guides gummed up with tape-coating particles can create audible wow and flutter and, in very dirty conditions, can even damage the tape itself (by scoring or creasing the oxide surface). Cleaning a tape deck is so simple that it can be done before making any crucial recording. There are many deck-cleaning products available which can help in this basic first step. You can even use the old-fashioned alcohol (91 per cent isopropyl) and swab method presented in "Taking Care of Your Tape Deck" (page 18).

Select a tape, one appropriate for the music and the recorder. The simplest way to choose a suitable tape is to follow the tape-deck manufacturer's recommendations or to use the same tape types used in setting up and calibrating the deck in the first place. STEREO REVIEW'S tape-recorder test reports list those tapes that were found to give good performance with each machine tested.

If these initial guidelines are not available for your recorder, there's still no need to worry. A top-of-the-line ferric, chrome or high-bias, or metal tape fom one name-brand manufacturer is usually very close in performance characteristics to a similar tape from another manufacturer, close enough to give essentially equivalent audible performance. If you find a tape that sounds marginally better on your machine, stay with it. The main practical differences may lie only in the prices.

As to which category from which to choose a tape (ferric, chrome or high-bias, or metal), the selection depends primarily on the characteristics of the deck, the music to be recorded, and its source (tape, disc, mikes, etc.). Metal tape is necessary for most live music recording or for taping prerecorded material with substantial (high-level) high-frequency content. You might get by with a less expensive grade of tape for live recording by usng a deck with the Dolby HX headroom-expansion system.

Advertising claims to the contrary, there is often little audible benefit to using a chrome or chrome-equivalent tape over a top-of-the-line ferric tape *provided* your tape deck is set up for optimum performance with each type of tape (see next section). If you are using a wide-dynamic-range noise-reduction system (Dolby C or dbx), the differences in tape-noise levels are lessened in importance. And if you are recording a limited-dynamic-range source, the distinctions between tapes become even less important.

A good way to shop for tapes is to buy a sample of each of the types you are considering. Make test recordings of various types of music and choose the tape that gives the most *accurate* reproduction of the source, the one that changes the sound quality the least. Typical changes you can expect on a cassette recording are increased hiss levels, a slight rolloff of high frequencies (or a boost if the tape is underbiased), and a slight loss of "clarity" (from wow and flutter, distortion, and/or modulation noise). Choose the tape that suffers the least from these problems in your machine.

Match the deck to the tape. You cannot expect to get accurate cassette dubs unless the deck is matched to the magnetic requirements of the tape in use. Among the degradations resulting from a mismatch are higher distortion, high noise levels, rolled-off or boosted high-frequency response, and improper output levels. The last three problems can cause mistracking of a noise-reduction system, thus further worsening the sound quality.

Luckily, matching a recorder to a tape is relatively easy nowadays: just switch the bias and qualization controls on your deck's front panel to match the settings recommended by the deck manufacturer for the type of tape in use. (This assumes the manufacturer has correctly calibrated the settings. Otherwise, lab instrumentation is necessary for proper machine set-up.) Some recorders have automatic, computer-controlled tape-matching functions while still others contain built-in test oscillators. If you have them, use them!

There are tricks you can use in *playback* to "distort" the sound quality to taste. For instance, playing back a chrome/metal tape with the ferric equalization settings or playing a Dolby B encoded tape without Dolby B decoding will produce an artifically elevated high end, which may be desirable during playback in an automobile. Comparable tricks, though possible, are *not* a good idea while recording, however. If nothing else, they will make the tape you record sonically incompatible with other tape decks.

Select the noise reduction. Some program material, such as spoken word records or highly compressed rock music, may not need any noise reduction. In fact, recording without noise reduction produces a tape that is "compatible" with all cassette decks of any vintage. In general, however, cassette recordings made without a noise-reduction system are unbearably hissy.

If you intend to make recordings that are also playable on a car stereo, on a pocket cassette player, or on any other deck having no noise-reduction system, the system to use on your home deck is Dolby B (or JVC's essentially equivalent ANRS). When played back without decoding, Dolby B encoded tapes have a boosted high-frequency response. This can be acceptably tamed, though not correctly decoded, by turning down the treble.

Dolby C encoded tapes produce much the same effect when played back on Dolby B only decks. Tapes encoded by the dbx system cannot be acceptably played back on other than dbx-equipped recorders or decks with attached dbx decoders. For faithful recordings of wide-range material (audiophile records, digital-audio discs, live music), a suitable wide-range noise-reduction system—Dolby C or dbx—is almost mandatory.

Dolby HX is not a noise-reduction system but a means of increasing the level of high frequencies that can be recorded on a cassette tape. It is a record-only process and does not require decoding; HX-processed tapes can be played back on any machine. The system could, in theory, be used in conjunction with any or no noise-reduction system. Practically, however, Dolby HX seems to be available only on decks containing Dolby B or Dolby C noise reduction and operates only when the Dolby noise reduction is turned on also. The extra high-frequency headroom Dolby HX provides may let you get by with a less expensive grade of tape. From metal you may be able to move down to a chrome or high-bias formulation, or from a top-of-the-line ferric down to a middle-of-the-line ferric, depending on the music. I'd recommend the constant use of Dolby HX on all recorders equipped with it.

Set levels. This is the trickiest step in all types of audio recording and one which is best performed after some experimentation with each recorder/tape/music combination. As a first approximaton, follow the deck manufacturer's recommendations as to where the peaks of the signal should read on the deck's meters. The recommended maximum level may vary with the type of tape used. Generally, I'd recommend setting as high a level as possible which does not result in either distortion or a perceived dulling of the high frequencies (due to tape saturation).

For lower noise in playback, it's perfectly okay to run recording levels higher than the recommended settings if there are no audible drawbacks. Experiment to see just how high you can get the levels with each different combination of tape

and machine. Write down the highest allowable meter reading. Very short, very high peaks may sometimes go "into the red" with no ill effects on machine or tape. Print-through problems, however, are exacerbated with very high recording levels.

Try not to change recording levels while making a dub; it's just bad form unless absolutely necessary. Party tapes of dance music assembled from different LPs, for instance, may require some level adjustment between selections. Not only do dancers not like widely varying playback levels, but every disc-cutting engineer has his own idea about what constitutes a good disc-cutting level. If you must change too-low levels drastically, boost them during a pause in the music (between cuts or movements). If the levels are slightly too high, it's okay to rescue the recording by slowly turning down the record levels. However, the best solution for grossly inappropriate recording levels is to start over.

There are a few tricks you can use that will enable you to set levels more quickly. They vary according to the medium you are dubbing from.

FM broadcasts. The maximum output level for a tuner or FM section of a receiver is *fixed.* Any station broadcasting a 100% modulated signal will produce the same output level from a tuner's or receiver's output jacks. This being the case, you can set and forget levels for recording FM broadcasts simply by finding a station broadcasting high peak levels and setting the record-level controls on the recorder so that the meters indicate peaks at your experimentally determined maximum recording level.

Many stations broadcasting classical music hit peak modulation levels only rarely. Many rock stations, however, hit maximum legal levels quite often by using heavy compression of the musc. Even if you tape only classical music, use a heavily compressed rock broadcast to determine where to set recording levels, then tune to the classical stations with your levels preset.

Although it is considered bad practice, many FM stations broadcast monophonic recordings without switching off the stereo pilot signal that activates a receiver's or tuner's stereo decoding circuit and front-panel stereo-FM light. If you are dubbing a mono recording being broadcast in "stereo," switch your receiver or tuner into mono. You can gain more than 20 dB in signal-to-noise ratio. Playing the tape back in mono will also reduce the apparent noise levels by several decibels. This also applies to mono disc dubs.

If you know for sure that your tuner has good suppression of the 19-kHz stereo multiplex pilot signal, you can safely turn off the multiplex filter in your tape deck (if possible) when recording FM broadcasts. The two multiplex filters working in series could reduce the deck's record-playback response at 15 kHz by several decibels. Unfortunately, a reliable information on stereo-pilot rejection is usually available only in test reports on specific components, such as those published in STEREO REVIEW. The best solution is to experiment.

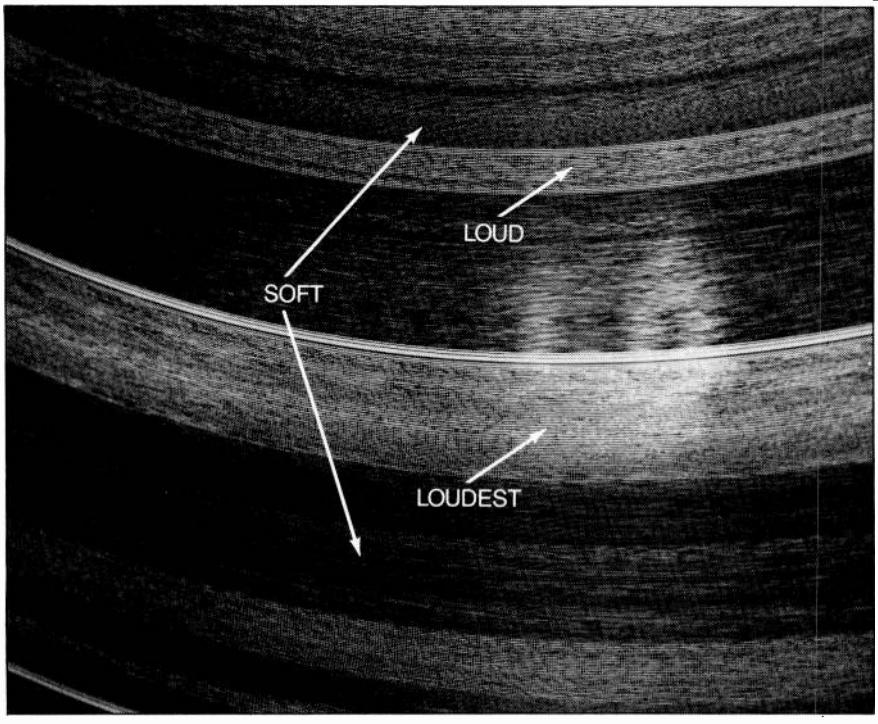
Discs. Setting levels with stylus-in-a-groove recordings is simple once you learn how to tell loud portions of a disc from soft protions. The texture of the surface of a stereo disc is rougher during loud passages. These passages also sparkle more when held up to a light. Soft signals on a disc appear smoother and darker under a light (see photo below). Play the loud portions and set your levels accordingly.

Unless the only loud portions of a record are at the start of the sides, try to find loud passages about halfway into the disc. This keeps beginning-of-the-disc infrasonic rumble from influencing the readings on the meters. By the time a stylus reaches the innermost grooves of a disc, the cutting process has already slightly rolled off the high frequencies and possibly slightly compressed the signal. Unless the loudest portions of the disc are known to be in the inner grooves, try not to use them as level-setting guides. (Infrasonic rumble, by the way, can cause extraordinarily high levels of infrasonic signals to be fed into a tape deck. If you are getting distortion in your dubs that seems to be synchronized with the passage of a small warp under the stylus, you might need to install an infrasonic filter between the amplifer and the tape deck.)

When disc-cutting engineers cut discs, they usually try to set a constant overall level between disc sides and between discs in multiple-record sets. This obviates changing the playback volume at every side change. It also means that there is only one optimum recording level for the two sides of a disc or for all sides of a multidisc album. To avoid what could be annoying changes of level, try to find the single loudest passage and use it to set the recording level *for the entire tape.*

Prerecorded tapes. Because tapes have definite overload (saturation) limits, the comments about FM recording above generally also apply to the copying of prerecorded tapes. High-speed-duplicated cassettes tend to be recorded at too-high levels, so you might want to reduce the recording level on any dubs you make of them.

Live music. Recording live music is simple if you can record a rehearsal or run-through. Even one loud chord can be enough. If not, then as a first try (with classical music, and with microphones placed 3 to 15 feet from the performers) set the level of applause that greets the musicians at 5 to 10 dB below the maximum acceptable recording level. For rock music, the first few notes will generally tell you whether your levels are set correctly. (See the previous article.)



Showing not the rings of Saturn but the surface of a stereo LP, this photograph indicates how the varying loudness of the music changes the appearance of the disc surface.

EVEN AT FACE VALUE, THERE'S NOT ANOTHER DECK LIKE IT.

AKAI flies in the face of convention.

Again. This time with the incomparable GX-F91. A bold new design that looks—and performs—like no other cassette deck in the world.

It is literally the face of the future. No knobs. No keys. And no clutter. Instead, a polite presentation of just the basics.

But press the "door" button and, almost by magic, the faceplate automatically lowers to reveal the main control panel.

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Two microcomputers take charge, first automatically setting the bias. Then, executing a 64-step "tape tuning" analysis that makes sure the GX-F91 gets the maximum from any tape.

For superior frequency response and dynamic range, the GX-F91 is also endowed with a 3-head design,

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In short, it's the proud flagship of our entire 10-deck AKAI family. A family that now includes three outstanding auto-reversing record/playback designs.

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Use all your deck's features. You paid for them, so you might as well take full advantage of their capabilities. The most useful feature in a cassette deck is probably the PAUSE control. It can be used to good advantage in making a recording with lower perceived noise levels.

Steady noise (such as hiss, record noise, or rumble) is more easily perceived when it comes and goes and when the transitions between noise and no noise are rapid. Many people don't realize that simply recording on a blank or bulk-erased tape raises the tape's background-noise level even when there is no signal recorded. This noise is called bias noise and is an inherent part of analog magnetic recordings. The objective when making a dub is to introduce as few changes in background noise level as possible while mkaing the necessary changes smoothly and slowly.

From these considerations comes the following procedure for dubbing a disc:

a. Fully rewind the tape to the leader.

b. Place the deck in RECORD, with the RECORD-LEVEL controls turned down.

c. Let the tape roll for about 10 seconds to skip over the leader and to leave some blank tape at the end in case the leader should break.

d. Place the deck in PAUSE.

e. Place the stylus on the disc a few turns before the music starts (either in the lead-in groove or at the end of the band before the one you want to record). Make sure the stylus has settled into the groove.

f. Release the deck from PAUSE.

g. Bring the RECORD-LEVEL controls up to their appointed settings fairly slowly. Make sure you get there before the music starts, however.

h. If, when the music ends, you are going to record some more (the other side, perhaps), *do not* fade down the record level. Just wait an appropriate period, with the stylus still on the disc, and then put the recorder back in PAUSE.

i. Cue up the next selection or side to be recorded.

j. Release the deck from PAUSE. This procedure creates a constant level of disc and tape background noise between the two selections.

A RECORD MUTE switch, which puts a "blank" segment on the tape, can also be useful in making a "low noise" dub of a disc. After Step **d** above, turn up the RECORD-LEVEL controls to their preset positions. Activate RECORD MUTE during Steps **e** and **e**; skip Step **g**. As close as possible to the start of the music release the RECORD MUTE. This will take some practice so as not to cut off the initial sound. It also works best with music that starts loudly.

An AUTOMATIC PROGRAM SEARCH feature on a deck allows you to fit on one cassette recordings that might, on first calculation, seem too long. It may be possible, for instance, to start the cassette with the end of the album. The first side of the album will thus start midway through the first side of the cassette with the rest of the music "wrapping around" the second side. The auto-search lets you start playback at the true beginning of the program without tedious searching or tape-counter watching.

A TIMER-RECORD feature allows you to make unattended recordings of broadcasts (remember that levels can be set for FM dubs beforehand). Unfortunately, unless you have a quick-reverse bidirectional-recording deck, the recording time is limited by the length of one side of a cassette, making a timer feature useless for recording whole operas or rock concerts.

Document the recording. If you do a lot of dubbing, it's best to write down what you are recording while you are recording it. (Properly set levels will never need watching while the recording is in progress.)

If you don't mind the vocal interruptions it might be a good idea to record the intro or "out-tro" of a piece being broadcast. This gives an on-the-tape record of what the piece is, who the performers are, possibly the record number, and, if you are good at recognizing announcers' voices, what station it was broadcast over.

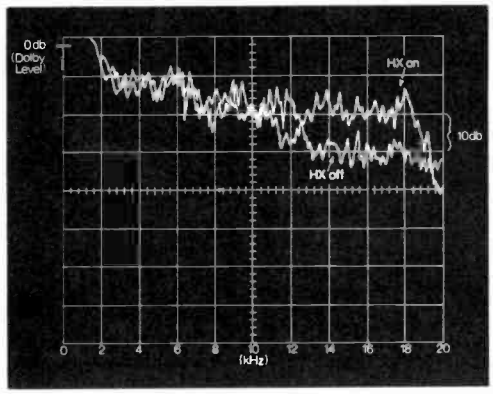
Protect your recordings by punching out the protection tab in the cassette shell as soon as you have finished recording the appropriate side of the tape. Doing this, in fact, is more important than sticking a label on. You can always put a piece of tape over the holes if you want to erase and rerecord on the tape.

Use accessories. Many "outboard" accessories connected between the amplifier and the deck can improve the sound or convenience of making tape copies. Companders (which can compress or expand an audio signal's dynamic rage) may help make a poorly recorded tape of a conversation, speech, or telephone call more intelligible when used in "compress" mode. Dance tapes sometimes benefit from a slight compression. Equalizers can tame some of the shrill high frequencies sometimes found on discs. If your deck's inherent noise level is low enough and it doesn't already contain a wide-range noise-reduction system, Dolby C and dbx processors are available as accessories. An inexpensive mixer will enable you to make DJ-quality party-music tapes. The best way to use all these devices should be explained in their owners' manuals. □

"That's the way it is, Mac. If you want us to do it with only two mikes, we're going to have to charge you our higher audiophile rate."

Dolby® HX Professional

Dolby HX Professional is a program-adaptive bias technique which can significantly improve the quality of cassette recordings. High-level high frequencies can be recorded more accurately, without sacrificing signal-to-noise ratio, while such side effects of tape saturation as distortion are reduced. For both the home recordist and the duplicator of pre-recorded cassettes, Dolby HX Professional improves the performance of good conventional tapes to match that of costlier, more exotic formulations.



Spectral analyses of two high-speed (32 times) cassette recordings of the same selection of rock music show the highest levels accumulated over time at each frequency. Both recordings were made on conventional iron oxide tape of the type favored for commercial cassette duplicating; in this example, the high-frequency headroom improvement provided by Dolby HX Professional is as much as 10 dB.

The problem of self-bias

Even when a cassette deck is adjusted for the nominally optimum bias for a given tape, performance is nevertheless compromised under some signal conditions. In particular, music which is rich in high frequencies has what's called a self-biasing effect. The musical high frequencies act in and of themselves as recording bias on the tape, effectively adding to the external bias supplied by the recorder's bias oscillator. The net result under such signal conditions is momentarily too much effective bias, which leads to the familiar symptoms of tape saturation. The highest frequencies don't get recorded at all, and considerable IM distortion is generated at lower frequencies.

How Dolby HX Professional deals with the problem

Dolby HX Professional is a special circuit which constantly monitors the total effective bias — a combination of bias from the recorder's oscillator and self-bias contributed by the musical signal — while the recording is being made. If it senses the total bias increasing beyond the optimum level as a result of high frequencies in the music, it instantly compensates for the increase by lowering the bias from the recorder's oscillator, thus keeping the total effective bias constant. Even on music with a great deal of high-frequency energy, the tape remains optimally biased, and so tape saturation and its side effects are significantly reduced. The improvement in high-frequency headroom can be 6 dB or more, depending on the particular tape formulation.

Improve both the cassettes you make and those you buy

Dolby HX Professional, which was developed by Bang & Olufsen with the assistance of Dolby Laboratories, is provided along with Dolby noise reduction in home cassette deck models from Aiwa, B&O and Harman-Kardon. Just as important, Dolby HX Professional is being applied to high-speed cassette duplication, where its ability to improve good conventional tape formulations is economically, as well as sonically, significant. The first commercial duplicating facilities have now been equipped, and the first pre-recorded cassettes made with Dolby HX Professional (as well as Dolby noise reduction) are expected in the near future.

DOLBY HX PRO

A 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 or she needs buying guidance more than ever. Since knowing the lingo is at least half the battle, the definitions in the basic tape-recording vocabulary are written in layman's language as much as possible.

Words in italics are defined elsewhere in the glossary.

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 whcih 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, CrOz, Crolyn)—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. There are several closed-loop geometries regularly used with open-reel recorders, but *dual-capstan* drive is the most popular for both open-reel and cassette tape recorders.

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 erase 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 highs. Anomalies in the record-playback process (involving 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 syste 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.

Dolby C—Similar to two Dolby B circuits in a row, Dolby C can reduce noise by up to 20 dB at 1 kHz and above. Dolby C's noise reduction begins at 100 Hz, compared to 500 Hz for Dolby B.

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 *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 formualtions. Cassette playback equalizations (70-microsecond "*chrome*" and 120-microsecond "*ferric*"), along with open-reel playback EQs (NAB, CCIR), have been standardized to assure intermachine compability 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 (Fe_2O_3). Also see *cobalt doped, chromium dioxide.*

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.

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.

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 of human hearing) with a $\pm$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 you are comparing record-play specifications, make sure that the recording and playback 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 helps determine the *frequency response* and *noise* of the playback system being used.

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.*

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 (MRL)—The magnetization level of a tape which results in a specified level of distortion. The MRL varies with applied *bias* level and frequency: as the MRL 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 *retentivity,* leading to improved high-frequency performace. Special circuitry and heads are needed to record on metal tape. Most current decks are metal compatible.

Multiplex (MPX) filter— 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 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, and use of a *noise-reduction system.*

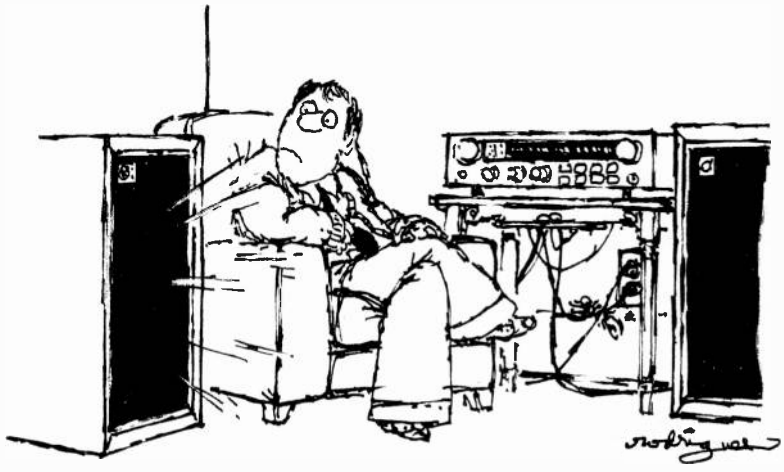
Noise-reduction system—An electronic circuit that attempts to achieve a reduction of noise level without changes in musical content. There are two basic types of noise-reduction systems: *companders* (complementary record-playback systems) and single-ended (playback only) system. A compander is used for noise reduction during the record-playback cycle, while a single-ended system is used for removing noise from already-recorded material. DNR is an example of a single-ended system.

Pressure pad—A small, felt-like 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 prperties, on the recording level, and on tape-storage conditions. To minimize print-through, use as thick a tape as possible, be conservative with recording levels, and store the recording in a played, "tails-in" condition under stable temperature and humidity conditions.

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

rms (root-mean-square)—A method of mathematically averaging an ac 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.



"... To discourage off-the-air taping of this live performance of Verdi's Aida, *we will intersperse fifteen-second recordings of barking seals at random intervals throughout this broadcast. Thank you."*

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 (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 innumberable 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 similar 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 accounting for the ears' varying sensitivity to 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 referred to as *flutter.* □

Abbreviations

ac—alternating current
CrO_2—chromium dioxide
dB—decibel
dc—direct current
EE—extra efficiency
EIA—Electronic Industries Association
EIAJ—Electronic Industries Association of Japan
EP—extended play
EQ—equalization
F—Farad
FeCr—ferrichrome
FET—field-effect transistor
HG—high grade
HX—headroom extension
Hz—Hertz (cycles per second)
IC—integrated circuit
IEC—International Electrotechnical Commission
IEEE—Institute of Electrical and Electronic Engineers
IHF—Institute of High Fidelity
IM—intermodulation
ips—inches per second
kHz—kiloHertz
LCD—liquid-crystal display
LED—light-emitting diode
LP—long play
L/R—left/right
LSI—large-scale integrated (circuit)
μ—micro (one millionth)
m—milli (one thousandth)
MOL—maximum output level
MOSFET—metal-oxide semiconductor field-effect transistor
mm—millimeter
MPX—multiplex
MRL—maximum recording level
NAB—National Association of Broadcasters
nWb—nanoWeber
NTSC—National Television Standards Committee
NR—noise reduction
PLL—phase-locked loop
P-P—peak-to-peak, push-pull
RF—radio frequency
RIAA—Recording Industry Association of America
rms—root mean square
SLP—super long play
S/N—signal to noise (ratio)
SP—standard play
SPL—sound pressure level
THD—total harmonic distortion
TIM—transient intermodulation
UHF—ultra-high frequency
V—volt
VHF—very high frequency
VHS—Video Home System
VU—volume unit
W—watt
Wb—Weber
Wrms—weighted root mean square

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(Continued on page 53)

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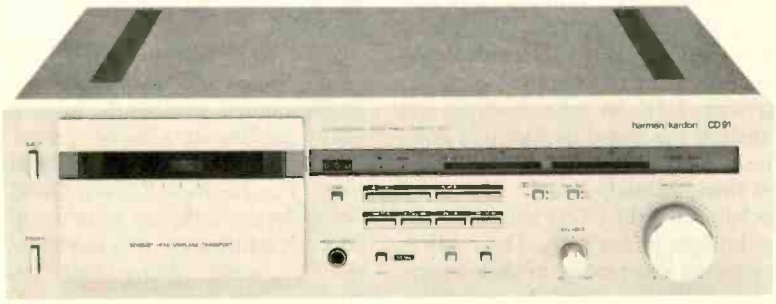


Harman Kardon CD91 Cassette Deck

Modestly priced cassette decks have tended in recent years to compete largely on the basis of their features—"bells and whistles," in industry jargon. The Harman Kardon CD91 is a notable exception to this general design trend. Here the manufacturer has decided to forgo all but such essential features as Dolby B noise reduction in order to use the same tape head and transport mechanism found in some of the company's more costly models. The result is a two-head, single-motor cassette deck whose superior performance belies its budget price.

The Harman Kardon CD91 uses a sendust record/playback head, and its single capstan is belt driven by a dc servomotor that also powers the reels. Cassettes are inserted, tape openings downward, into slides behind the lightly damped cassette-well door. Rear illumination and a transparent strip on the door permit viewing the approximate amount of tape remaining, though the cassette label areas are not visible. The door can be removed easily for routine cleaning and demagnetizing.

Transport operation is solenoid-controlled via transistor logic that permits rapid pushbutton switching from one mode to any other (even from rewind to record) without using the stop button. The record and pause buttons have tiny LED indicators, but in line with its "no frills" design the CD91 has no record-mute button to insert silent spaces between selections, nor is there any memory or timer rewind or memory play. Three pushbuttons set the proper record bias and equalization for ferric, CrO_2-type, and metal tapes. No microphone circuits are included, though it is possible, of course, to connect the outputs of an external microphone mixer in place of the regular line-level inputs. Recording levels are set by a single large control along with a smaller channel-balance knob. There is no playback-level control, so this function must be handled by your amplifier. Pushbuttons are used to switch the Dolby B noise-reduction system and an FM-multiplex filter in or out; an LED lights when the Dolby system is in use. Recording levels, shown by tiny peak-reading, twelve-element LED displays, are calibrated from −20 to +8 dB, with 0 dB corresponding to Dolby level. A three-digit mechanical counter and reset button are provided, along with the customary front-panel headphone jack.

The rear panel of the CD91 contains only the line-in and line-out phono jacks, and there is no provision for timer activation. Overall, the unit measures $17\frac{3}{8}$ inches wide, $4\frac{3}{4}$ inches high, and $13\frac{1}{2}$ inches deep, and it weighs a little over 13 pounds. Price: $250.

• *Laboratory Measurements.* Our sample of the CD91 came supplied with the cassettes used to set up the deck—Maxell UD XL-I (ferric), TDK SA (chrome-equivalent), and TDK MA (metal)—so we used these for our measurements. Other premium formulations from TDK, Maxell, Sony, and BASF gave comparable results, consistent with their own slight characteristic differences. Playback response was checked with BASF's IEC standard calibrated tapes. As the playback graph shows, response was remarkably flat throughout the 31.5- to 18,000-Hz test-tape range. Indeed, the same was true of overall record-playback response, which was within 1 dB of ideal from 40 to 20,000 Hz and within +0, −3 dB from 20 to 20,000 Hz when measured at the conventional −20 dB level. At a 0-dB recording level all three tapes showed the usual high-frequency tape saturation, with response down by 5 dB at 10,000 Hz (SA and UD XL-I) and at 12,500 Hz (MA).

At a 0-dB recording level the third-harmonic distortion of a 400-Hz tone measured 1% with Maxell UD XL-I, 1.45% with TDK SA, and 0.75% with TDK MA. To reach the 3% distortion point used for signal-to-noise measurements required raising the input level by 3.5, 2.5, and 5.5 dB, respectively. Re-

ferred to the 3% distortion point, unweighted signal-to-noise ratios without Dolby B processing measured 49.8 dB (ferric), 53 dB (CrO_2-equivalent), and 56 dB (metal). Adding Dolby B and CCIR/ARM weighting increased the S/N's to 61.5, 64.8, and 66.8 dB, respectively. These values are close to the best that can be obtained with state-of-the-art tapes and Dolby B.

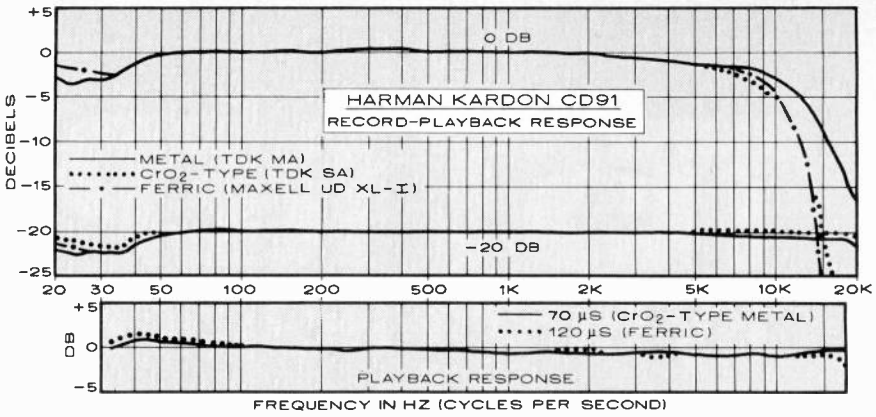
Wow-and-flutter, checked with a Teac MTT-111 test tape, measured 0.04% wrms and 0.06% with the DIN peak-weighted standard, which is very good, though not exceptional, performance. The Dolby calibration was exact, and Dolby B tracking error—the difference in low-level frequency response with and without the Dolby system—was within ±1 dB throughout the frequency range. The multiplex filter affected high-frequency response above 15 kHz and provided 32 dB attenuation at the 19 kHz FM-stereo subcarrier frequency. The input sensitivity of the CD91 was 0.061 volt (61 mV), and its output at 0 dB measured 0.48 volt (480 mV). Fast-forward and rewind times for a C-60 cassette measured 88 seconds, which is about average.

• *Comment.* The CD91 did an extremely good job of playing back top-quality prerecorded cassettes from InSync and Mobile Fidelity. Although its two-head design precluded direct A-B comparison while recording, it did a more than capable job of dubbing from discs and other tapes. The frequency response was outstanding, though on material with a wide dynamic range some background hiss was audible with the ferric Maxell UD XL-I. With TDK SA (chrome-type) and MA (metal) the added background noise (intrinsic in all analog copying) was more sensed than distinctly heard.

Mechanically, the CD91 behaved flawlessly throughout our tests. The controls were positive and precise in their operation, and, while we found the recording-level displays annoyingly small and hard to read accurately, they certainly provided adequate indications for everyday recording.

Some recordists may find the lack of some features, such as Dolby C or microphone inputs, sufficiently important to justify looking at a higher-priced deck. But that's the proper way to regard features. The Harman Kardon CD91 *is* an "entry-level" deck, but in terms of high-fidelity performance it is markedly superior to many decks that cost far more.—*Craig Stark*

Circle 1 on Reader Service Card



The upper curves indicate overall record-playback response at the manufacturer's indicated 0-dB recording level using the tapes designated on the graph. In the center are the same measurements recorded at −20 dB relative to the upper curves, a level conventionally used for tape-deck frequency response measurements. Bottom curves show playback response from calibrated test tapes and indicate performance with prerecorded tapes.

Jensen RE530 Cassette Radio

Jensen's in-dash RE530 cassette radio comprises an AM/FM tuner, an automatic-reverse cassette player, a digital clock, a preamplifier, and a power amplifier that can handle both front and rear speaker pairs. The unit can also be used together with any high-impedance, low-level-input external power amplifier that can be connected to its pair of phono-plug preamplifier outputs.

The RE530's front-panel fader control is connected to a rear-panel FLEX FADER switch. When the FLEX FADER is switched in, the fader control varies the balance between the front speakers and a combination of the rear speakers and whatever external amplifier is connected to the preamp output; when it is switched out, the fader control affects only the RE530's own front and rear speaker outputs. Although the RE530's rear outputs need not be used if an external power amplifier is added to the system, using both makes possible a relatively inexpensive biamplification setup with four satellite speakers and a mono or stereo subwoofer. (For our road tests, we used only the RE530's built-in amplifier connected to four 4-ohm speakers.)

The cassette player features an Automatic Tape Search (ATS) function that seeks the next recorded selection on a tape when either of the two fast-wind buttons and the ATS button between them are pushed simultaneously. A tape-equalization selector sets the player for either normal-bias or chrome/metal tapes. There are two noise-reduction systems, usable either separately or together. Dolby B is for tapes only, while DNR works on all three program sources: tape,

FM, and AM. A hinged dust flap protecting the cassette bay doubles as a read-out for tuner frequency or clock time. When a cassette is inserted, the flap folds back and the read-out cannot be seen. A "soft load" mechanism automatically draws the tape into play position. Both the fast-forward and rewind buttons have direction-indicator lights above them that flank the LED indicating use of the ATS system. Cassettes eject when the car's ignition is switched off or the tuning knob is tapped.

Jensen states that it has incorporated into the RE530 a number of circuits designed to improve FM reception. Pushing the button labeled APC (Automatic Program Control) brings three continuous adjustments to bear on the FM signal: a soft-muting sensor that applies changing amounts of attenuation in fringe areas, a variable high-blend that narrows the stereo separation as the signal degrades, and a high-frequency attenuator to remove the noisiest upper frequencies. The FM section's double-balanced mixer is said to reject interference from adjacent signals. The tuner uses a digitally controlled quartz-crystal-oscillator phase-locked loop.

Manual tuning involves rocking the right-hand knob left or right. Quick flicks advance the running by single increments; holding the knob turned causes a steady upward or downward progression until it is released. (Used in conjunction with the memory button, the same knob adjusts the clock.) Other tuning options are presets (five each for AM and FM), preset scan (tap the tuning knob to sample each preset station in the selected broadcast band for a few seconds, then tap again to lock it in), and normal scan (tap the volume knob to sample receivable stations, tap again to lock in a chosen station). It is also possible to disengage either scan mode by changing the AM/FM selector, inserting a cassette, or rotating the tuning knob.

Each of the knob shafts has three controls. On the left are volume/scan/on-off, treble, and bass. The right has tuning/eject/preset scan/clock adjust, balance, and fader. The RE530 has rear-panel connections for power, memory/clock retention power, unit ground, automatic power antenna sensor, and preamp out. There is a standard antenna jack on a 4-inch cable. All four speakers share a common ground and plug into a connector on the end of a short snake. The top plate of the unit bears a sticker that gives the speaker-wire key—which should be standard practice throughout the industry. The brief, well-written manual includes a more comprehensive wiring diagram, the unit's most complete explanations of how to use the unit.
Price: $499.

Hirsch-Houck Lab Measurements

FM Mono Usable Sensitivity (75-ohm input): 15.3 dBf (1.6 μV)
Mono 50 dB Quieting Sensitivity (75-ohm input): 19.5 dBf (2.6 μV)
Stereo 50 dB Quieting Sensitivity (75-ohm input): 40 dBf (27.5 μV)
Tuner Signal-to-Noise Ratio: mono, 66 dB; stereo, 64 dB
Tuner Distortion at 65 dBf: mono, 0.6%; stereo, 0.48%
FM Frequency Response: +4.5, −0 dB from 30 to 15,000 Hz
Stereo Separation at 100, 1,000, and 10,000 Hz: 30, 30.5, and 35 dB
Capture Ratio at 65 dBf: 2.3 dB
Alternate-Channel Selectivity: 56 dB
Adjacent-Channel Selectivity: 5.2 dB
AM Rejection at 65 dBf: 62 dB
AM Frequency Response: ±6 dB from 20 to 4,800 Hz
Tape-Playback Frequency Response (standard BASF test tapes, −3-dB limits): 120 μs, 50 to 15,000 Hz forward, 48 to 7,300 Hz reverse; 70 μs, 50 to 15,000 Hz forward
Tape Signal-to-Noise Ratio (referred to 250 nWb/m at 1,000 Hz): 53 dB unweighted; 56.7 dB A-weighted; 65.3 A-weighted with DNR; 64.2 A-weighted with Dolby B; 68 dB A-weighted with Dolby B and DNR noise reduction
Flutter: ±0.15% weighted peak (CCIR) at start of cassette, ±0.25% at end; 0.09% weighted rms (JIS) at start of cassette, 0.15% at end
Tape Speed Accuracy: +1.8% at start of cassette, +1.4% at end
Fast Rewind Time for C-60 cassette: 95 seconds
Tone-Control Range: +11, −14 dB at 100 Hz; +10.5, −9 dB at 10,000 Hz

Lab Tests

Extensive use of pushbutton controls gives the feature-laden Jensen RE530 receiver a deceiptively simple appearance—until it is turned on and the colorful display of some fourteen brightly lit yellow indicators gives a more accurate impression of its versatility.

The RE530 has no visible mono/stereo switch, but the APC (Automatic Program Control) button handles that function and more. The APC is a signal-controlled stereo-blend system that progressively reduces channel separation at signal levels lower than 40 dBf (which happens to be the unit's stereo 50-dB quieting sensitivity). The channel separation was still about 10 to 15 dB at a 30-dBf input, but the APC improved the signal-to-noise ratio by about 3 dB. At about 20 dBf, the channels were fully blended and the noise was at mono levels. This system should give the user an optimum combination of stereo separation and low noise level without requiring any attention.

The FM tuner of the RE530 is a rather good one by automotive standards. Its AM tuner is better than good, with one of the widest AM frequency responses we have measured in years on a tuner for home *or* automobile use. The tape deck functioned well, and I liked the automatic tape-handling mechanism. The frequency response of the auto-reverse deck was somewhat different in the two directions of tape motion (this is not at all unusual in bidirectional tape machines).

When the RE530's two noise-reducing systems were used together for playing Dolby-B-encoded cassettes, the signal-to-noise ratio was a most impressive 68 dB. Measurements and listening tests during tape playback revealed a slight loss of high-frequency response with DNR. Since we have used other DNR-equipped car radios that did not appear to sacrifice any highs, this may have been a peculiarity of our particular test sample. —*Julian Hirsch*

Road Tests

As I completed the first circuit of our test route, I began to realize that one word characterizes the Jensen RE530's operation: smoothness. Its ease of operation is in keeping with its quiet, uncluttered look. Frankly, I expect every car stereo unit to succumb, sooner or later, to the demanding conditions of the streets, bridges, and expressways my dauntless Volvo traverses during the tests. Tape burbles, FM hash, or some sort of noisy electrical intrusion into the AM band often show up within a few miles of the start of each trip. With the RE530, I waited in vain for most of these faults.

Though AM reception was usually trouble-free and musical, impulse noises from my purposely loosened #2 spark-plug cable and from a two-cycle moped that pulled up alongside were far louder than I had expected. In fact, my venerable stock Volvo radio was quieter in this respect. Also, adjusting the treble knob often interfered with the bass knob, partially turning it, because the distance between them is small and cannot be shimmed out.

Now for the good news. All units subjected to our road test are clamped to the transmission hump, which affords far less damping of road shocks and vibrations than the average in-dash installation. Nevertheless, the RE530's tape-transport mechanism was never jarred into flutter, chatter, or loss of contact between tape and head. My favorite test spot, a monumental chuckhole near the Brooklyn

Navy Yard, failed to elicit more than a very tiny chirp of disruption at 30 mph. Steel divider plates on the Kosciuszko Bridge approaches got virtually no reaction from the RE530 at either 40 or 60 mph.

The ATS tape program-search system works only for constant-volume music with at least 4-second pauses between selections. This obviously rules out much folk, most jazz, and almost all classical music, but with popular music it worked every time I tried it. Both auto-reverse and manual reverse functioned quietly and instantaneously. The Dolby B and DNR circuits worked as they should, and I found myself using DNR on most music I played. The slight treble attenuation in the quietest passages was not a problem, even with solo vocal music. I played ferric, chrome, and metal tapes with good results, and I was pleased to find that a very "hot" TDK metal tape I recorded live did not overload the playback electronics.

The tuner section gave me even more to rave about. On the notorious Brooklyn-Queens Expressway, multipath interference from numerous light standards, metal-sheathed structures, and bridges never succeeded in causing serious FM hash or other racket. The multipath interference was there, but it seldom got in the way of listening to music. Manual and preset station changes were accompanied by a soft fadeup that was easy on the ears. I did not hear a single FM crossmodulation, which can occur when a signal appears elsewhere on the dial in addition to its allotted frequency. Despite continuing improvement throughout the industry, not everybody has licked this problem, so it was a pleasure to hear absolutely no crossmodulation, even in the treacherous masonry-and-steel canyon of West 35th Street.

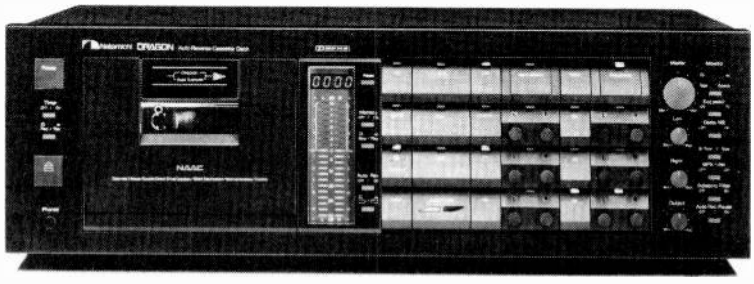
Given good loudspeaker placement, the main tonal changes in a car stereo's performance should be caused only by the tone controls and noise-reduction system(s). I used DNR as well as Dolby with most tapes (metal excepted) and DNR most of the time for both FM and AM. I used the APC feature only in areas with poor FM reception (most of the route in town), since I prefer small amounts of hiss together with realistic-sounding upper harmonics to the slightly less pleasing effect of a high filter and narrower stereo separation. When I needed the APC, though, its operation was totally seamless. When DNR and/or APC removed some highs, a small treble boost restored a degree of sparkle to the music at the expense of a bit more noise. The loudness button appeared to cover the bass and lower midrange, leaving the more delicate upper frequencies alone. I should stress that none of the filters was unsubtle in its effect, nor was the high blend obtrusive as it compensated for bad signal conditions by eliminating the stereo effect for treble frequencies. A live chamber-music broadcast prominently featuring clarinet and viola retained its demanding tonal balance with little noticeable shift of color as I wove through downtown Brooklyn. The imaging was less defined, but the high blend was tasteful and "soft-edged." Even at fairly high listening levels, the tonal balance tended to remain good, and the unit's integral amplifier remained open and musical up to the loudest levels I could tolerate.

I began to realize that one word characterizes the Jensen RE530's operation: smoothness. . . . "

Once again, *smoothness* is the RE530's most noticeable trait. From the very gentle cassette-loading cycle to the softened tuning-in of each station, this is a carefully designed unit that has many useful features in an elegant package.

—Christopher Greenleaf

Circle 2 on Reader Service Card



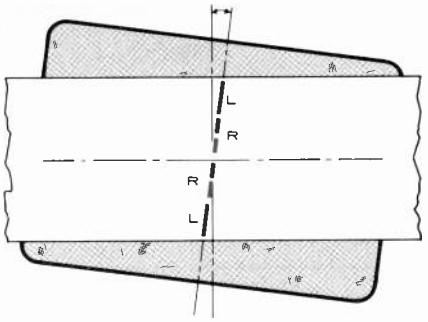
Nakamichi Dragon Cassette Deck

THE Dragon is the first Nakamichi cassette deck to be given a name rather than a model number, and if the intent was to suggest an awe-inspiring creation, the technological innovations it embodies make "Dragon" a wonderfully apt designation. It is the company's first recorder to feature auto-reverse playback and the first from any manufacturer with continuous automatic playback-head azimuth alignment.

The Dragon's record and playback heads are made of Crystalloy, and they are entirely separate units whose gap widths (3.5 and 0.6 micrometers, respectively) are optimized for their different functions. The three-head design also permits immediate comparisons between the incoming signal and the recorded result. The near and far edges of the head faces are slotted so that no "wear groove" can develop during their lifetime, and the playback head is fitted with a lifter that pushes the cassette's pressure pad out of the way when the heads engage the tape. Removing the influence of the pressure pad eliminates a potent source of scrape noise but requires an unusually precise dual-capstan drive system.

All these head-design features have been incorporated in Nakamichi decks for several years, though the use of a four-track playback head (two tracks for each direction of tape travel) is new. Overall, however, the Dragon's playback-head design is utterly unique in our experience and sets an example we hope other manufacturers will emulate. Understanding this tape head and the NAAC (Nakamichi Auto Azimuth Correction) mechanism that goes with it requires a little explanation.

Ideally, all tape heads, whether for recording or playback, should be aligned so that their head gaps (where the magnetic action takes place) are exactly perpendicular to the axis of the tape. The recording and playback gaps are then parallel to each other. When this condition is not met there is an "azimuth error," the result of which is a loss in high-frequency



Drawing (not to scale) shows split right channel playback-head gaps (red) that provide tha azimuth-angle error signals.

response. In the cassette format, an azimuth error of only a quarter of one degree, while having no measurable effect at 1 kHz, causes a 14.6-dB loss at 15 kHz and a 25.5-dB loss at 17 kHz, so its seriousness is obvious.

Even if a deck's head gaps are perfectly aligned, cassette shells are notoriously imperfect; they all physically skew the tape to some degree, creating azimuth errors. This skewing is not consistent from one cassette to the next and, indeed, even varies somewhat as the tape plays through a single side. The most obvious skew-induced azimuth errors, however, tend to be between the two sides of the same cassette. No matter how carefully you align the playback head for one side, there is likely to be an appreciable treble loss on the other. To minimize skew-induced azimuth error in cassettes recorded and played back on the same deck, a number of Nakamichi (and some other) decks have for some years provided either manual or automatic recording-head azimuth adjustments, so that no matter how the playback head is aligned, the recording head will lay down a matching track. But this system, though effective, requires recording a test signal and thus cannot help with prerecorded tapes. And the cassette shells used by tape duplicators tend to be far worse in all respects than those you get with a premium blank tape.

The Nakamichi solution, embodied in the Dragon, starts by splitting the inside tracks of the playback head (which provide right-channel signals for each direction) into two electrically separate halves with their own playback gaps. Instead of only one gap "scanning" the 0.021-inch-wide right-channel tracks as on a conventional tape deck, there are two. As long as the playback head and the tape are correctly aligned, with no relative azimuth error, the output from these two gaps will be identical. But if the playback head is at all tilted relative to the recorded track, the signal on the tape will arrive at one of them before the other. This creates a phase difference between the two gaps, which is amplified within the Dragon and used to control a motor that pushes or pulls a flexible stainless-steel band inside the deck. This band, in turn, drives a mechanism that adjusts the head azimuth so as to eliminate the phase error and thereby match the playback head's azimuth with that of the tape. The correction process is continuous during the recording or playback of a cassette. (Only the inside tracks are used in this process since the signals from the outside, left-channel tracks can be too unreliable due to tape damage.)

The construction of such a head and the automatic servomechanism that goes with it is an engineering tour de force, although, like all good engineering solutions, it is elegantly simple in concept. The playback head simply automatically adjusts its azimuth to compensate for any error it finds, whether it stems from the recording head next to it or from one in a tape duplicator's plant, from a shift in tape direction or from cassette-shell imperfections or tape-path variations during the playing of a cassette.

If less dramatic than the automatic azimuth adjustment, the drive system in the Dragon is no less sophisticated. There are two direct-drive motors with a unique, constant-torque design in a closed-loop, dual-capstan arrangement. Constant tape tension is achieved be a 0.2 per cent speed differential between the supply and the take-up capstan motors, which are governed by a quartz-referenced phase-locked-loop circuit. The intent is to lower wow and flutter almost to the vanishing point—and our measurements indicate that the attempt is spectacularly successful.

Cassettes are inserted, opening downward, into the familiar cassette-well-door slides. When the door is closed a momentary drive pulse is supplied to take up any slack in the tape winding. The well is accessible for head cleaning and is illuminated, though label visibility is poor. Transport controls are arranged somewhat like rows of shingles on a roof, making for easy operation. A motor replaces the conventional solenoids to activate the various modes, resulting in smoother, quieter operation. In the fast-winding modes a CUE button slows the tape to about a third of its normal fast-wind speed and brings the heads close enough to it to pick up the program material faintly. Depressing one of the fast-winding controls a second time while cueing slows the tape still further and permits you to jockey the tape back and forth to find the beginning of a recorded selection. The memory-rewind feature backs the tape a counter unit or so beyond the 0000 indication on the LED readout, then advances it to the selected spot. All transport controls have indicator LED's, and additional tape-direction indicators are provided on the cassette-well door. (The latter flash as the NAAC system corrects a large error.)

Recording level is shown on a twenty-segment peak-indicating fluorescent display calibrated from −40 to +10 dB. During tape adjustments the meter's dynamic range is reduced and its resolution increased. The adjustments themselves utilize built-in 400 Hz and 15 kHz test-tone generators and are designed to ensure optimum bias and consistent sensitivity for ferric, chrome-type, and metal tapes. The adjustment system has illuminated LED's to indicate the proper knobs to be turned, and it was easy to use and accurate.

Pushbuttons are provided to select between tape and source monitoring, 120 or 70 microsecond playback equalization, and Dolby B, Dolby C, or no noise reduction, as well as to activate an FM-multiplex filter and an infrasonic filter designed to eliminate the effects of turntable rumble. There is an automatic record-pause switch that causes the deck to stop about 15 seconds after the end of the music you are recording, in case you are otherwise occupied at the time. Other pushbuttons control the memory-rewind/play and auto-reverse features. An output-level control (which also affects the signal at the front panel's headphone jack) is provided, and the combination of separate left-and right-channel record-level controls with a master record-level control facilities level setting. In addition, an automatic 2- or 6-second fade up or down can be activated during recording. As is now customary on Nakamichi recorders, however, there are no microphone jacks or controls; an external mixer is needed for this kind of recording. Timer activation in either record or play mode is also switch-selectable.

The rear panel of the Dragon contains the line-in and line-out jacks, a jack to power an external microphone mixer, and another jack for a remote-control accessory. The deck measures $17\frac{3}{4}$ inches wide by $5\frac{5}{16}$ inches high by $11\frac{13}{16}$ inches deep, and it weighs approximately 21 pounds. Price: $1,850.

• *Laboratory Measurements.* Our sample of the Dragon was supplied with the three Nakamichi tapes used in its original setup and checkout: EX-II (ferric), SX (chrome-equivalent ferricobalt), and ZX (metal). These are the tapes we used for all our record-playback measurements. Because of the Dragon's excellent bias and sensitivity adjustment systems, however, we were able to obtain virtually identical response curves from a variety of premium tape formulations, including: Maxell XLI-S, TDK AD, Fuji FR-I, and Memorex MRXI (ferrics); TDK SA,

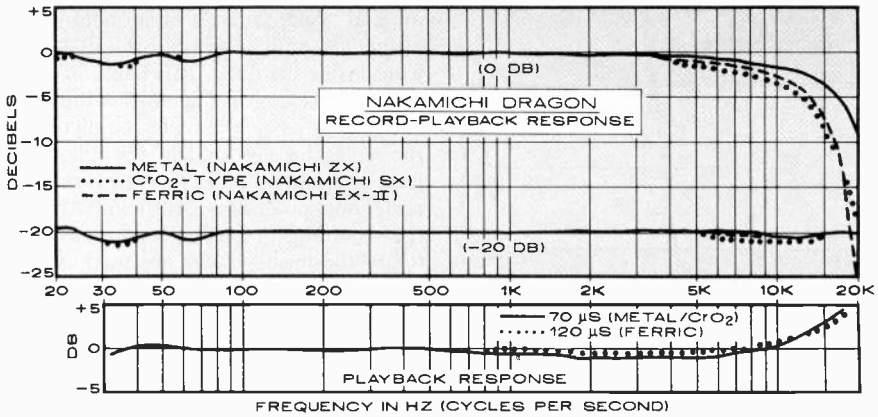
Maxell UDXL-II, BASF Professional II, and Sony UCXS (CrO_2-equivalents); and TDK MA, Sony Metallic, Fuji AR Metal, and the new Scotch XSM IV (metal).

Playback frequency response was checked with our IEC standard ferric (120-us and chrome (70-us) calibrated tapes. Differences between forward- and reverse-direction response with either tape were so slight that we could simply take an average to arrive at the curves shown in the graph. Up to 10 kHz both are within 1 dB of standardized response from the 31.5 Hz lower limit of the test tapes; above 10 kHz, however, there is a clearly rising response (+3.7 to 4.2 dB at 18 kHz), which we have found characteristic of Nakamichi decks. This may make some prerecorded tapes sound sightly over-bright, but it can easily be corrected with a treble control.

Overall record-playback response, measured at a −20-dB level, was within ±1 dB from 20 Hz to beyond 20 kHz with all three tape types, which is truly remarkable cassette-deck performance. Dolby tracking error—the difference in frequency response with and without the noise-reduction system—was within 1.5 dB from 20 Hz to 20 kHz using either Dolby B or Dolby C. Even at the 0 dB level, where all cassette tapes run into saturation at the highest frequencies, response did not drop to −6 dB until 13.2 kHz for the ferricobalt SX, 14 kHz for EX-II (ferric), and 18 kHz for ZX (metal). Indeed, though not shown on the graph, with metal tape and Dolby C, the Dragon's response at a 0-dB recording level was down only 2 dB at 20,000 Hz!

Wow-and-flutter in the Dragon was the lowest we have ever measured in a cassette deck. With our Teac MTT-111 flutter test tape the readings were 0.016 per cent (weighted rms) and 0.024 per cent (DIN peak-weighted) in either direction. We suspect this must be the residual level on the test tape itself. On an overall record-rewind-playback basis, however, wow-and-flutter was only 0.017 per cent wrms (0.028% DIN peak-weighted) in the forward direction, 0.022% wrms (0.03% DIN peak-weighted) in the reverse mode.

At a 0 dB recording level the third-harmonic distortion of a 315-Hz tone measured 0.35, 0.88, and 0.4%, respectively, for the Nakamichi EX-II, SX, and ZX tapes. To reach the 3% distortion point used to calculate the signal-to-noise ratio (S/N) required increasing the recorded level by 5.8, 3.8, and 8.4 dB, respectively, and the Dragon's manual suggests that for ferric and CrO_2-type tapes peaks should be allowed to reach a +5-dB indication, +8 dB for metal. Using the 3% distortion reference, S/N's for EX-II, SX, and ZX measured 50.7, 52, and 55.6 dB, respectively, with no noise reduction and no weighting. With Dolby B and CCIR-ARM weighting, the S/N figures were 64.3, 66.2, and 68 dB, and Dolby C increased them all the way to 73.9, 75.5, and 77.5 dB. As with many of our other measurements on the Dragon, these noise figures simply define the current state of the art in cassette-deck performance.



The upper curves indicate overall record-playback response at the manufacturer's indicated 0-dB recording level using the tapes designated on the graph. In the center are the same measurements recorded at −20 dB relative to the upper curves, a level conventionally used for tape-deck frequency response measurements. Bottom curves show playback response from calibrated test tapes and indicate performance with prerecorded tapes.

The 0 dB output level of the Dragon was 1 volt and required a line-level input of 55 millivolts. Fast-forward and rewind times were very rapid, averaging 51 seconds for a C-60 cassette and 73 seconds for a C-90.

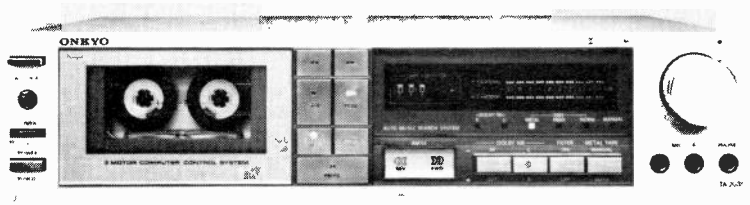
• *Comment.* We found that the Nakamichi Dragon sounded every bit as good as it measured, and it handled as well as it sounded. With prerecorded tapes from In-Sync, Mobile Fidelity, and Nakamichi's own concert hall in Japan, there was a kind of transparency and brilliance (which survived even after we turned our treble control down a trifle) that we almost never hear from cassette recordings. Because it operates continuously, the effect of the NAAC circuit with its split-section playback head is usually subtle; except for when a flashing tape-direction light indicates that a large misalignment is being corrected, you have to listen very carefully to note the restoration of the high frequencies. But the difference in high-end response with prerecorded material between the usual fixed azimuth of another top-rated Nakamichi deck and the Dragon's adaptive azimuth system is both measurable *and* audible, and it is on such small, yet real, improvements in the state of the art that Nakamichi's reputation is founded.

As for the deck's overall record-playback performance, perhaps the best word is impeccable. Using metal tape and Dolby C, there was only one test source with which we could hear a clear difference between the input and recorded output: a pure but musically boring, 1-kHz sine wave from an audio generator. Not even a 15-ips analog mastering recorder with Dolby A can pass this test.

True, we could pick nits. The viewing area in the cassette-well door is too small to be able to read the label, and, like all segmented recording-level displays, that of the Dragon is annoyingly imprecise when one is trying to measure differences within 1 dB. It also would have been interesting to have some indication as to the degree of misalignment in our prerecorded tapes, not just a flashing light telling us that an azimuth correction was taking place.

Overall, however, the Nakamichi Dragon is simply the finest cassette deck we have yet tested. No doubt there will be challengers for that title, but they will be up against a real fire-breathing champion when they appear.—*Craig Stark*

Circle 3 on Readers Service Card



Onkyo TA 2035 Cassette Deck

THE Onkyo TA-2035 is a two-head, single-capstan cassette deck with Dolby B and Dolby C noise reduction and a microprocessor that controls both the transport functions and an automatic music search system. The record/playback head of the TA-2035 is made of hardened permalloy. The capstan is belt-driven by a servo-controlled dc motor. A second dc motor is used for the supply and takeup hubs, and a third is used to operate the head assembly in order to eliminate the jarring shock usually caused by solenoid action. Cassettes are inserted, tape openings downward, into slides on the back of the mildly damped cassette well door, which is easily removable for head cleaning and demagnetizing. A transparent window in the door provides a clear view of the tape hubs.

Transport modes may be changed without going through STOP, and the light-touch record, playback, and pause keys have LED indicators. An AUTO SPACE key can be used to record a blank section of approximately 5 seconds (longer if held down) between selections; after recording each blank section the deck automatically switches into the record-pause mode. The automatic music selection system, which operates in either tape direction by use of a rocker switch, permits quick location of the beginning of each recorded selection. The selection is then played for 15 seconds, after which the deck automatically skips to the next selection unless the PLAY button is pressed, which returns it to normal operation. There is also a record/playback TIMER switch that keeps the tape mechanism from being activated until a remote timer applies power.

Four large pushbuttons switch the noise-reduction circuitry in or out, select Dolby B or Dolby C, insert an FM-multiplex filter, and select either manual or automatic tape type bias and equalization setting. When the last switch is in the AUTO position the deck uses the standard cutouts on the rear of the cassette to set bias and equalization for ferric, CrO_2-type, or metal cassettes. Since a number of metal cassettes do not have such cutouts, the MANUAL switch position is used to set the deck to operate with such tapes. An adjustable ACCUBIAS control permits optimizing recording bias for nonmetal tapes, but since no built-in testing facilities are provided, users without extensive test equipment should probably not move this control from its detented center position except with tapes for which recommended settings are listed in the owner's manual. LED indicators below the meters show the type of tape in use, the status of the AUTO/MANUAL selector switch, and whether Dolby B or Dolby C noise reduction is operating.

The TA-2035 has a three-digit mechanical tape counter, and a peak-reading fluorescent display is used to indicate recording level. The display has only ten segments per channel and is calibrated from −20 to +6 dB. Dolby level is not specifically marked, but we found that it coincided with the 0 dB indication. A large dual-concentric knob is used to set recording level for both line-level and microphone inputs. (Plugging microphones into the front-panel phone jacks disconnects the high-level inputs in the rear.) There is a headphone jack and a switch for external timer-controlled operation, but there is no playback output-level control.

The rear panel contains the usual line-level input and output jacks as well as a DIN-type socket for attaching an optional remote-control unit (the RC-5T, $49.95, which has a 13-foot cable and duplicates all of the tape-transport controls). The TA-2035 is 16½ inches wide, 4 inches high, and 9⅝ inches deep, and it weighs approximately 10 pounds. Price: $300. Onkyo USA Corp., 200 Williams Drive, Ramsey, N.J. 07446.

• *Laboratory Measurements.* Both the owner's manual and the tapes supplied with our test sample of the Onkyo TA-2035 indicate that it was factory optimized for Maxell UDXL-I (ferric), Maxell UDXL-II (chrome-equivalent), and Maxell MX (metal) cassettes, though the range of the ACCUBIAS control (±5 dB at 15 kHz in our measurements) and the table of recommended settings for other formulations ensure that comparable performance can be obtained with many well-known brands. For our measurements, however, we used the specified Maxell tapes at the detented center position of the ACCUBIAS control.

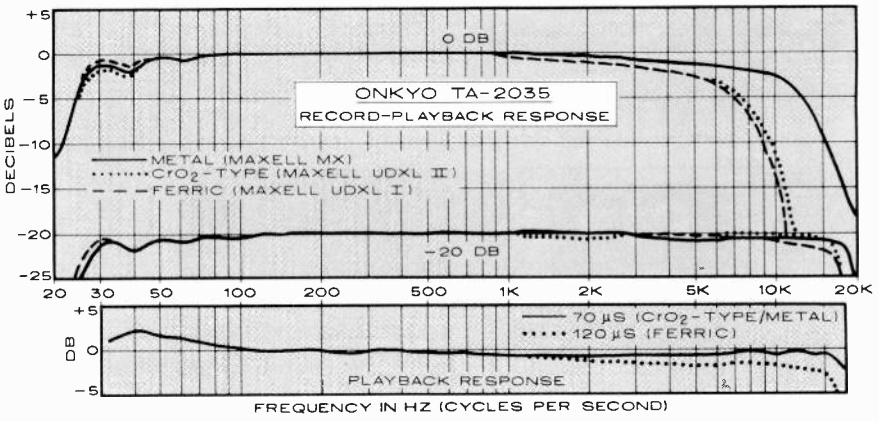
Playback-only response was measured with our IEC standard BASF 120-microsecond (ferric) and 70-microsecond (chrome and metal) test tapes. Frequency response was +2.5, -2 dB between the 31.5 Hz and 18 kHz test-tape limits in the chrome/metal equalization position; with the ferric test tape response fell to -3 dB at approximately 16 kHz (-6.5 dB at 18 kHz), though it remained within the manufacturer's specifications. A somewhat similar difference between the ferric and CrO_2 record-playback frequency response (measured at the customary -20 dB level) is also shown in the graph for the Maxell UDXL-I and UDXL-II tapes. At the 0 dB (Dolby) level, the greater high-frequency capacity of metal-particle tape—nearly a full musical octave—is clearly shown, though at the -20 dB level the response is only slightly extended.

Third-harmonic distortion of a 315-Hz tone at an indicated 0-dB input level measured 0.5, 1.1, and 0.7% with Maxell's UDXL-I, UDXL-II, and MX tapes. Raising the distortion to the 3% point used for signal-to-noise ratio (S/N) measurements required increasing the input levels to +6.2, +4, and +5.3 dB, respectively. Referred to the outputs at the 3% points, the unweighted S/Ns without Dolby were 55 dB (UDXL-I), 53.6 dB (UDXL-II), and MX tapes. Raising the distortion to the 3% points, the unweighted S/Ns without Dolby were 55 dB (UDXL-I), 53.6 dB (UDXL-II), and 55.5 dB (MX). Using IEC A-weighting and Dolby B increased these figures to 66.8, 65.8, nd 67.3 dB, respectively; Dolby C and CCIR/ARM weighting brought the S/N readings for the three tapes up to 75.1, 74.5, and 76 dB, very impressive figures indeed.

Using our TEAC MTT-111 test tape, wow-and-flutter measured 0.32% and 0.45% DIN peak-weighted. The Dolby systems tracked within +0, -2 dB (-2.5 dB for Dolby C) out to the high-frequency limits of the deck, though the dropoff in response started about 2 kHz lower (1 kHz lower for Dolby C) than is shown in the -20 dB record-playback response curves. Fast-forward and rewind times averaged 75 seconds for a C-60 cassette and 112 seconds for a C-90. At the line-input jacks a signal level of 0.056 volt (56

mV) was required to obtain a 0-dB reading; output at this level was 0.5 volt. The microphone inputs required 0.26 mV for 0 dB and overloaded when the input exceeded 26 mV, which is typical for cassette-deck microphone preamplifiers.

• *Comment.* The single record/playback head of the TA-2035 precluded the kind of direct input/output listening comparisons we like to make, but it was certainly clear that the deck could make excellent dubs of all but the most sonically demanding material using either ferric or CrO_2-type tapes. Program material with extended high frequencies called for metal tape. The additional noise reduction provided by Dolby C was immediately audible when we dubbed musical material with a wide dynamic range. With prerecorded cassettes the frequency response needed a little treble boost from our preamplifier, but this was noticeable only in direct comparisons with our reference cassette deck. Tape handling was quiet and positive, though we found the transport buttons a little harder to manipulate than on some other machines. The absence of the usual tape-type selector switches was a bit disconcerting at first, but most users should find the TA-2035's automatic selection system very convenient. For those who like to listen only to certain selections on a cassette or to jump around from one selection to another, the automatic music search system is also a great convenience. Overall, we found the Onkyo TA-2035 a very good example of how much performance and operating ease can be built into even a quite modestly priced cassette deck today.—*Craig Stark*



The upper curves indicate overall record-playback response at the manufacturer's indicated 0-dB recording level using the tapes designated on the graph. In the center are the same measurements recorded at −20 dB relative to the upper curves, a level conventionally used for tape-deck frequency response measurements. Bottom curves show playback response from laboratory-standard test cassettes and give an indication of the tape deck's frequency response with prerecorded cassettes and tapes made on other decks.

Circle 4 on Reader Service Card

Revox B710 MkII Cassette Deck

Like many other cassette decks, the Revox B710 MkII is a three-head model with both Dolby B and Dolby C noise-reduction systems. It is unlike other cassette decks in its appearance and operating features, however, and its performance is essentially at the highest levels that have yet been achieved in the cassette medium.

The B710 is a large, rugged, and relatively heavy machine. A rigid die-cast frame supports the tape-transport mechanism, which uses no fewer than four direct-drive motors. Its dual tape-drive capstans are driven by individual Hall-effect motors locked to a common quartz-crystal reference oscillator. The tape hubs are driven by individual dc motors with tachometer feedback control. The B710 has no belts or clutches, all tape motions being handled directly by the drive motors under control of a microprocessor. Even the head assembly (which contains a configuration of three sendust heads that permits monitoring from the tape while recording) is moved into place by a solenoid, and the motion is smoothed by pneumatic damping.

The microprocessor also controls the B-710 MkII's nonvolatile control memories, tape counter, and digital clock. The built-in timing facilities of the deck not only allow unattended recording or playback, starting and stopping at preset times, but permit the tape playback to be stopped and started at any desired settings of the tape-index counter, so that any part of the tape or one whole side may be repeated indefinitely. The index counter is a large four-digit, seven-segment LED numerical display. The same digits show the time in the clock mode, which can be selected at any time by a front-panel button and is available continuously while the machine is turned off.

The cassette snaps into an open well on the front panel and cannot be removed unless the tape is stopped. The cassette opening has a removable (and easily misplaced) plastic cover. To the left of the cassette opening is the time/tape-index display, below which are six square momentary-contact buttons. All internal switching is done by FETs close to the affected circuits, so that the control buttons handle only low-level dc voltages.

The buttons are for pause, fast forward and rewind, play, stop, and record. A logic system permits the transport to be

switched from any mode to any other without damage to tape or mechanism. To enter the record mode, both record and play buttons must be pressed simultaneously, but "flying start" recordings can be made while in play by pressing record and tapping the play button. The use of the record mode is shown by a red light on the right side of the digital display window. The pause control works as expected when recording, but it is inoperative during playback. The stop control can be used instead during playback, even for temporary interruptions, since the tape transport starts almost instantly and without an audible transient.

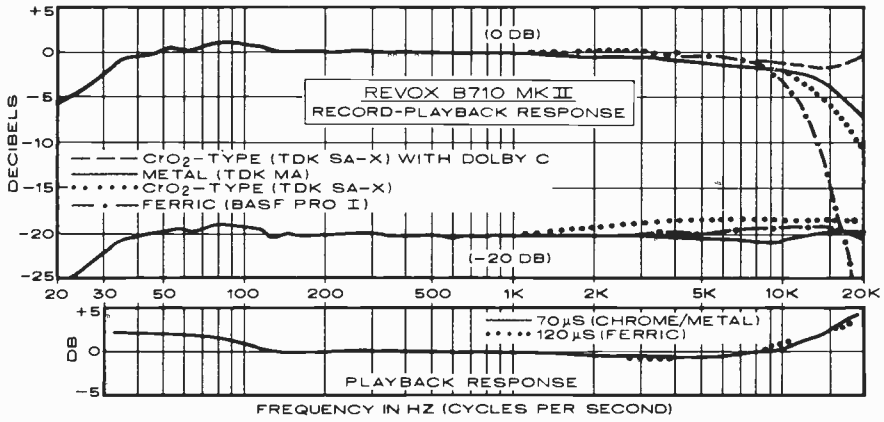
Similar buttons to the left of the numerical display are marked MODE, RUNUP, and ZERO. The MODE button switches between clock and index displays, ZERO resets the index reading to 0000, and RUNUP is used when setting index readings for repetitive playback or for changing the clock or timer settings. Toggle switches along the lower part of the panel control power, tape or source monitor, and Dolby noise reduction. One switch turns on the noise reduction, and another selects either the Dolby B or Dolby C system.

On the right side of the panel, opposite the time/index display, are the level "meters." They consist of two parallel twenty-four-element rows of red LEDs corresponding to program levels from −30 to +8 dB (0 dB being at the Dolby reference level of 200 nWb/m). The LEDs respond virtually instantaneously to level increases, but the response decays over a period of about two seconds. Their readings do not include the effect of recording equalization.

Two sets of concentric knobs below the meters (for left and right channels) adjust recording levels for the line and microphone inputs (which can be mixed). Standard ¼-inch phone jacks below the knobs are used for the left and right microphone inputs (plugging a microphone into the left jack feeds its signal to both channels for mono recording) and for a pair of stereo headphones. The headphone output is designed for driving medium-impedance (200- to 600-ohm) phones, and a small knob next to the jack adjusts the headphone volume level.

A brushed-aluminum strip across the top of the panel hinges down to reveal a number of infrequently used controls. Four small buttons marked SET, START, STOP, and CLEAR are used to set the index points for automatic start and stop operation of the machine and to enter the clock time. A three-position timer-mode slide switch sets the machine for unattended playback or recording under the control of its own clock. Four small buttons at the right of the group set up the equalization and bias for various types of tape. Three are marked for IEC Type I (standard ferric oxide), Type II (chromium dioxide or chrome equivalent), and Type IV (metal) tapes, respectively. The fourth button (AUTO) can be used with most recent cassettes having notches on the top edge for automatic setting of the bias and equalization. Manual selection must be used with older cassettes that lack these notches. A slide switch inserts a 19-kHz filter in the signal path for recording from FM tuners with inadequate suppression of the pilot carrier signal (which could interfere with the operation of the Dolby circuits).

On the rear apron of the Revox B710 MkII are phono jacks for the line inputs and outputs, with screwdriver adjustments for setting the playback output levels (normally used at maximum settings). When the B710 is used with a Revox B739 or B780 receiver, the two can be connected via DIN sockets on the recorder, permitting remote switching of one by the other. The Revox B710 MkII is about 17⅞ inches wide, 13⅞ inches deep, and 6 inches high. It weighs 23 pounds. Price: $1,995.



The upper curves indicate overall record-playback response at the manufacturer's indicated 0-dB recording level using the tapes designated on the graph. In the center are the same measurements recorded at −20 dB relative to the upper curves, a level conventionally used for tape-deck frequency response measurements. Bottom curves show playback response from calibrated test tapes and indicate performance with prerecorded tapes.

• *Laboratory Measurements.* We measured the record-playback frequency response of the Revox B710 MkII with a number of different types of tape (including samples of the IEC Type-I and Type-II reference standards) to determine if any were particularly suitable or unsuitable for use with this machine. For the most part, the response curves were so nearly alike that we would consider all the tapes equally compatible with the B710. The similarity of the curves also suggests to us that most current tapes conform so closely to IEC standards that user-adjustable tape bias or equalization, either manual or automatic, is a much less important feature for a top-of-the-line cassette deck now than it was only a couple of years ago.

We selected BASF Professional I Super as our Type I (ferric) tape, since it appeared to be closest to the IEC Type I in its response. For Type II (chrome) we chose TDK SA-X. The B710 is not designed to use Type III (ferrichrome) tape. For a Type IV (metal) tape we chose TDK MA, which we understand is essentially the standard IEC Type IV tape.

The playback response of the machine was measured (for both 70- and 120-microsecond characteristics) with the appropriate BASF IEC standard test tapes. Both tapes gave similar results, with a response flat within ±1 dB from 80 to 12,000 Hz, rising to +3 or +4 dB at 18,000 Hz and to +2 dB at 31.5 Hz.

The 0-VU marking on the deck's front panel corresponded to the Dolby reference level as claimed. The overall record-playback response was essentially the same with all of the selected test tapes at a −20-dB recording level. It was typically flat within approximately ±1 dB from 35 to 20,000 Hz, rolling off to about −5 dB at 20 Hz. The "head bumps" in the low-frequency playback response were very small. At a 0-dB recording level, the playback output was −6 dB at 11,800 Hz with BASF Professional I, 15,500 Hz with TDK SA-X (Type II), and 18,000 Hz with TDK MA tape.

The "tracking" of the Dolby encode and decode circuits was measured at recording levels from 0 to −40 dB (using Type II tape, which was marginally flatter in its response than the others). For the Dolby B system, the change in overall response when the system was switched on did not exceed 1 dB at any level over the full frequency range except between 15,000 and 20,000 Hz, where there was a

1.5- to 2 dB change at −30 dB. With Dolby C, the tracking errror was about the same up to 10,000 Hz, with a change of 1.5 dB between 10,000 and 20,000 Hz at most levels. All these response changes are inaudible in normal use with music as program material.

However, a striking benefit of Dolby C could be seen in the 0-dB record-playback response curve made with the noise reduction on. The high-frequency saturation, above 10,000 Hz, was virtually eliminated, resulting in the astonishing 0-dB response of +1, −1.5 dB from 32 to 20,000 Hz. This is a relatively unpublicized feature of Dolby C, which employs a "spectral skewing" circuit to attenuate frequencies in the 10,000- to 20,000-Hz octave during recording and boost them in playback. The process greatly reduces high-frequency tape-saturation effects at the expense of about 12 dB of noise reduction in that octave. Since Dolby Labs has determined that the ear is relatively insensitive to low-level noise in the uppermost octave, the trade-off of noise reduction for headroom is highly beneficial.

The required input signal for a reference-level recording (at 400 Hz) was 62 millivolts (mV) for the ferric and chrome-equivalent tapes and 70 mV for metal tape. In each case, the maximum playback output from a 0-dB recording level was 0.81 volt. The third-harmonic playback distortion from the reference signal was 0.5% for ferric and 1% for chrome-equivalent and metal tapes. At 10 dB below reference level, the respective playback distortions were 0.13, 0.1, and 0.2%. To obtain a playback distortion of 3%, the recording level for the tapes was +5 dB for ferric, +4 dB for chrome-equivalent, and +5.5 dB for metal. The A-weighted signal-to-noise (S/N) ratio without noise reduction was approximately 55.5 dB for all three tapes. With Dolby B and CCIR/ARM weighting, the S/N readings improved to 64.8, 67, and 66.3 dB. With Dolby C, they were 75.2, 74.5, and 74.8 dB, respectively.

The microphone input's sensitivity was 0.3 mV, and it overloaded at 37 mV. The noise level through the microphone input increased by 17.5 dB over the line-input noise level at maximum microphone gain, but only by 3 dB with a center setting of the mic-gain control. Although we did not measure the headphone output, its adequacy can be inferred from the fact that the acoustic output of 600-ohm phones could be heard throughout the room even at partial volume settings.

The tape speed was 0.3% fast. Flutter was ±0.065% weighted peak (DIN) and 0.043% weighted rms (JIS). The predominant flutter rates were 8 and 35 Hz. In fast-forward and rewind modes, the B710 MkII handled a C-60 cassette in only 47 seconds. In spite of this exceptionally fast tape handling (or, more likely, because of it), the tape was stopped with unusual gentleness, slowing down perceptibly in the final seconds of the process to avoid undue stress on either tape or leader. The meters were accurate and as readable as their calibration intervals allowed.

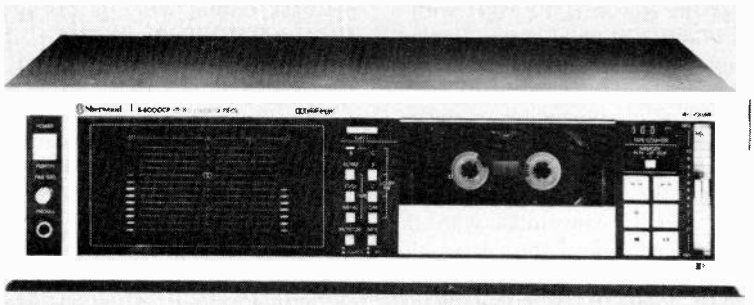
• *Comment.* The statement that we could find no significant flaw in the Revox B710 MkII should not be interpreted as meaning that it is perfect, but merely that it is so surpassingly well designed and constructed that even an occasional operating idiosyncrasy was easy to ignore. It should hardly be necessary to point out that this machine can record almost any program likely to be connected to its inputs with absolutely no audible degradation of signal quality. True, with interstation FM tuner hiss recorded at levels close to 0 dB, we could hear (barely) a minute change in the spectral balance when the playback was compared with the incoming signal. Not a very serious flaw, to be sure. Dubbing some wide-dynamic-range CX-decoded records, we found (as expected) that Dolby B noise reduction left an audible residue of hiss on the tape during quiet passages. However, the quiet background with Dolby C was very nearly the equal of the CX residual noise level, and the tape hiss could be heard only on a critical source/tape comparison at a very high volume level.

The mechanical operation of this machine was a joy to experience. Instead of the usual "clunk" of solenoid operation, pressing any of the control buttons produced only a subdued and muffled click that never became obtrusive. The recorder is actually easy to use after one has carefully studied the manual (a well-written, trilingual, spiral-bound book with numerous illustrations and a complete functional block diagram of the recorder). A little practice may be needed to master the techniques of setting the clock and using the programmed or timed-repeat modes, but for normal use the machine is as simple as any we have seen.

The Revox B710 MkII is a superlative machine by any standard that can be used to judge a cassette deck. The only nit we can pick about its design is the absence of a switched ac outlet. The accurate and convenient built-in clock/timer worked well, but it cannot switch on an associated tuner or receiver for unattended recording. As it is now designed only the fortunate owner of a Revox receiver can fully utilize this capability of the recorder.—*Julian D. Hirsch*

Circle 5 on Reader Service Card

Sherwood S-6000CP Cassette Deck

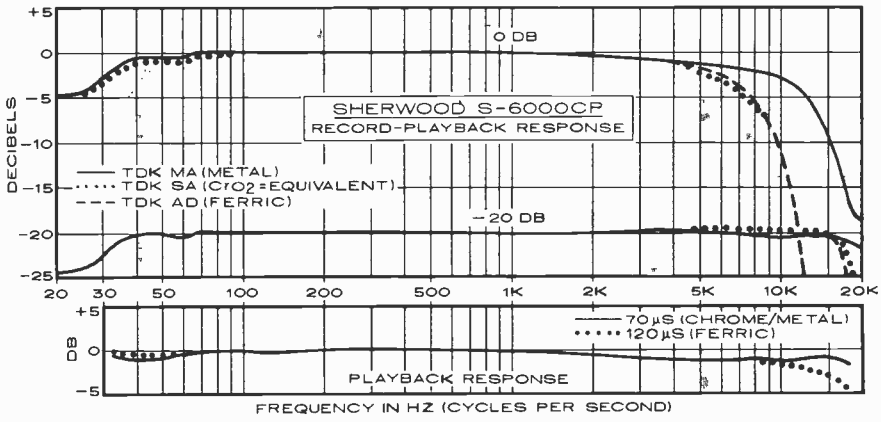


Heading the line of moderately priced Sherwood cassette decks is the Model S-6000CP, which features three heads, Dolby B and Dolby C noise-reduction systems, and a logic-controlled, solenoid-operated transport. The recording and playback heads are made of wear-resistant sendust bonded into a single structure. Because the recording and playback heads are separate elements, the user can instantly compare the signal going to the tape with the recorded result, and the head-gap widths can be optimized (during manufacture) for their respective functions. A single dc motor with electronic-governor speed regulation drives both the capstan and the reel hubs.

The cassette well is rather unconven-

tionally located on the right-hand side of the front panel; it is illuminated, and its door hinges are mildly air-damped. Cassettes are mounted, tape openings downward, into the customary slides behind the door. Twelve segment peak-indicating fluorescent displays show the recording and playback levels, and they are calibrated from −20 to +8 dB, with 0 dB corresponding to the Dolby level. The FAST FORWARD, REWIND, RECORD, PLAY, and PAUSE buttons have built in LED indicators and operate with a light touch slightly below their centers. Small pushbuttons select between tape and source monitoring, set bias and equalization for three tape types (ferric, CrO_2, or metal), and control an FM=multiplex filter recommended for dubbing stereo broadcasts. Three similar pushbuttons are used to select either no noise reduction or the Dolby B or Dolby C systems; LED indicators are provided for the latter two. Vertical slider controls set the recording level, but there is no separate playback-level control. A three-position slide switch, in conjunction with the three-digit mechanical counter, provides for optional memory rewind and replay functions. A FINE BIAS control is provided, and the manual indicates recommended settings for a number of popular cassettes. For unlisted tapes, the procedure for using interstation FM hiss for fine-bias adjustment is also described. A front-panel jack is provided for a pair of stereo headphones.

The rear panel of the S-6000CP contains the microphone jacks and the usual line-level input and output connectors. There is no provision for remote control or timer activation. Overall, the deck measures 17½ inches wide, 14 inches deep, and 5 inches high, and it weighs about 15 pounds. Price: $399.95.



The upper curves indicate overall record-playback response at the manufacturer's indicated 0-dB recording level using the tapes designated on the graph. In the center are the same measurements recorded at −20 dB relative to the upper curves, a level conventionally used for tape-deck frequency response measurements. Bottom curves show playback response from calibrated test tapes and indicate performance with prerecorded tapes.

• *Laboratory Measurements.* Sherwood supplied the actual cassettes—TDK MA (metal), TDK SA (Cro_2-equivalent), and TDK AD (ferric)—that were used for factory setup and checkout of our sample of the S-6000CP, so we used these for our own measurements. However, the FINE BIAS control had a range more than adequate to achieve comparable results using Maxell, Sony, Fuji, and BASF formulations of all types. Playback equalization was checked using our IEC standard BASF calibration tapes. In the chrome position (70-microsecond), tape-replay accuracy was within +0, −1.6 dB over the entire 31.5 Hz to 18 kHz test-tape range. With the ferric (120-microsecond) tape, the playback response curve was virtually identical up to 10 kHz, above which it gradually declined to −4.5 dB at our 18-kHz limit. Overall record-playback frequency response, measured at the customary −20-dB level, was extremely flat with the metal tape; response at 20 kHz was down by less than 2 dB. The high-frequency −3-dB points for the CrO_2-type and the ferric-oxide formulations were 18 kHz and a little over 17 kHz, respectively. All tapes reached −3 dB at approximately 27 Hz on the bass end. At a 0-dB recording level, response was down by 10 dB at 10 kHz with TDK AD (ferric) and TDK SA (CrO_2-equivalent); it did not drop off by this amount until a little over 15 kHz with the metal TDK MA.

Third-harmonic distortion of a 400-Hz tone at 0 dB (200 nWb/meter, the Dolby level) was very low: 0.38, 0.64, and 0.68% with TDK AD, SA, and MA, respectively. To reach the 3% distortion point used for signal-to-noise measurements required increasing the input levels by 6.9, 6, and 6.4 dB for the ferric, chrome equivalent, and metal tapes. On an unweighted basis, with no noise reduction, signal-to-noise ratios were between 55 and 56 dB for all three tapes. With Dolby B and CCIR/ARM weighting, signal-to-noise ratios ranged from 68 to 69 dB, and with Dolby C (CCIR/ARM-weighted) they increased to 77 dB (metal), 77.2 dB (chrome type), and 77.7 dB (ferric).

Wow-and-flutter, measured with a Teac MTT-111 test tape, was 0.04% wrms and 0.06 per cent with DIN peak-weighting. The Dolby calibration was exact, and Dolby tracking was within 1 dB thoughout the frequency range, using either the Dolby B or the Dolby C system, at recorded levels of −20, −30, and −40 dB. At the line inputs a signal level of 64 millivolts (0.064 volt) was required for a 0-dB indication, which produced an output level of 0.46 volt. Microphone sensitivity was 0.36 mV with a 600-ohm input (recommended input is 600 to 6,800 ohms), and the overload point of the microphone circuitry measured 200 mV, which represents a healthy margin. Fast-forward and rewind times for a C-60 cassette were somewhat slow, averaging 108 seconds.

• *Comment.* Direct source-*vs.*-tape comparison produced virtually no audible degradation in copies of most program material, though music with extremely demanding high-frequency content did require the use of metal tape to preserve the treble range fully. When we compared the S-6000CP with our reference deck, using top-quality In Sync, Mobile Fidelity, and JVC prerecorded cassettes, our listening tests confirmed that our sample of the Sherwood unit was a close competitor when playing material meant for 70-microsecond equalization, though the extreme highs suffered somewhat with demanding material requiring 120-microsecond equalization. During our record-playback test, Dolby B provided adequate noise reduction for most musical selections, though the improvement made by Dolby C was distinctly audible during the quietest passages of music having a very wide dynamic range. Mechanically, the deck was extremely quiet in operation. Any criticism we might have would probably concern the closely spaced pushbuttons, which occasionally invited pressing the wrong one, but except for lab-testing purposes these would not often be pushed during normal recording and playback. All in all, the Sherwood S-6000CP cassette deck represents a highly attractive value for the audiophile in terms of both appearance and performance.—*Craig Stark*

Circle 6 on Reader Service Card

Sony SL-5200 Beta Hi-Fi VCR

Even though the frequency response of a home videocassette recorder (VCR) has to extend to several megahertz in order to store video information, its audio frequency response (like its other audio properties) usually falls far short of meeting even minimal hi-fi standards. This anomaly exists because of the different techniques used to record video and audio signals.

In order to store several hours of video programming on a single cassette, a VCR operates at a very slow tape speed. Depending on the system (Beta or VHS) and the optional speeds available, the tape speed may range from about 0.5 to 1.3 inches per second, considerably slower than the 1.875-ips speed of an audio cassette. The high relative speed between the tape and the magnetic head necessary for storing and playing back the high video frequencies is obtained by wrappng the video tape halfway around a cylindrical rotating "head drum." The rotating drum contains two heads that sweep across the tape at an angle to the direction of tape motion. This puts the picture information on adjacent diagonal tracks on the tapes. Because of the rapid rotation of the head drum (1,800 rpm), the effective rate of tape movement past the rotating heads' gaps is far higher than that of any audio recorder (almost 23 *feet* per second), and the necessary record-playback bandwidth for video signals is obtained.

In a typical VCR, however, the *audio* is recorded on a narrow track along one edge of the tape by a conventional fixed head as in an audio cassette deck. The bandwidth of the audio portion of a video recording may thus reach 7 kHz or higher, especially at the higher tape speeds, but in no case has it approached the performance of even a low-priced audio cassette deck. Since the audio tracks accompanying most TV broadcasts, movies, or commercially recorded videocassettes usually have no pretensions to high-fidelity status, the average user of a VCR is not disturbed by its audio limitations. A few deluxe VCRs are equipped for recording and playing back stereo audio programs (in the conventional longitudinal record-playback mode), which requires two extremely narrow adjacent tracks in the space formerly used for a single mono audio channel. This produces relatively low channel separation and degrades the signal-to-noise ratio (S/N). Even with Dolby B noise reduction, the S/N of such a system is unlikely to exceed 46 dB.

Now Sony has introduced a radically different system, called "Beta Hi-Fi," for recording true high-fidelity stereo audio on a VCR. The audio channels are recorded through the rotating video heads in the form of frequency-modulated subcarriers located *between* the chrominance (color) and luminance (brightness) components of the video signal. (The subcarriers and their sidebands lie within the range of approximately 1 to 2 MHz.) Simultaneously, a mono signal formed from the mixed-down stereo channels is recorded on the normal longitudinal track of the tape, making a Beta Hi-Fi tape compatible in playback with any standard Beta-format VCR.

The first Sony VCR to feature Beta Hi-Fi is the SL-5200, which will be generally introduced in the U.S. in May. Externally it looks much like other current Sony VCR's, although closer examination reveals parallel lines of LED audio-level indicators and two horizontal slider controls for setting recording levels. Most VCRs have only automatic record-level controls. The tape is loaded through a slot at the upper right of the panel, and a row of TV-channel selector buttons occupies the upper left. The front-panel controls peculiar to the Beta Hi-Fi system are an AUDIO MONITOR slide switch, which sets the machine either to record in stereo or to record one of the two audio channels on both tracks, an on/off pushbutton for the Beta Hi-Fi circuits (with adjacent signal light), and an AUTO REC LEVEL button with signal light. Below the panel area are the less often used controls, such as those for tape speed (Beta II and Beta III for recording and playback, Beta I for playback only) and tracking (matching the exact tape path to that of the machine that made the recording), a video input for use with a TV camera or another VCR, a stereo headphone output (for a stereo mini-phone plug), and two standard phono jacks for auxiliary audio inputs selected by a pushbutton. The front panel also contains a sensor for the supplied infrared remote control, which activates only the tape-transport function. In addition to the usual antenna inputs and outputs, the rear of the SL-5200 contains a video output jack (presumably for an external monitor) and two line-level audio output jacks. There is also an MPX jack for a stereo-TV adaptor once stereo broadcasts begin.

Normally, a Beta Hi-Fi recording will be made in stereo from an external source (such as the audio portion of a TV/FM simulcast). A recording of a TV broadcast will normally be in mono, with the Beta Hi-Fi system activated at the user's option. At all times, the audio signal is also recorded longitudinally in mono, as on any ordinary VCR. During playback of a tape, the presence or absence of the Beta Hi-Fi carriers automatically switches the SL-5200 to the correct playback mode.

The key performance specifications released by Sony for the Beta Hi-Fi system are most impressive. The rated frequency response is 20 to 20,000 Hz with harmonic distortion of less than 0.3% at 400 Hz, channel separation of more than 60 dB, a dynamic range of 80 dB, and wow-and-flutter of less than 0.005% (wrms)—an incredible figure. These specifications apply to both the Beta II and Beta III recording speeds. The Sony SL-5200 is 18 inches wide, 15¼ inches deep, and 6½ inches high. It weighs approximately 32 pounds. Price: "under $1,000."

• *Laboratory Measurements.* Our measurements on a very early production sample of the Sony SL-5200 were made through the AUX inputs and line outputs by recording signals on a Sony L-500HG videocassette at Beta II speed. In general, we followed the procedures applicable to testing any audio-only tape recorder (no measurements were made on the video portion of the unit).

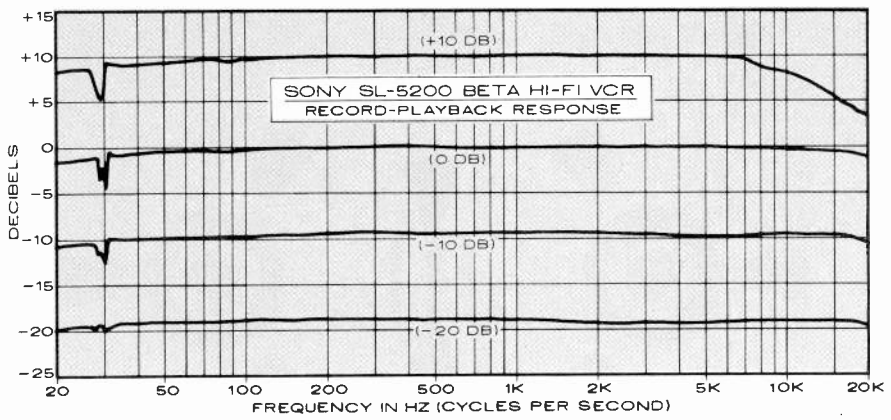
The record-playback frequency response at a 0-dB recording level (based on the LED level indicator) was flat within +0, −1.5 dB from 20 to 20,000

Hz (and down only 0.5 dB at 35 and 15,000 Hz). The response change at lower levels (down to −20 dB) was negligible. At +10 dB (above the range of the indicators, which extended from −20 to +8 dB) the response was flat to 7,000 Hz, falling off at higher frequencies to −7 dB at 20,000 Hz. The playback response curves showed a slight irregularity at 30 Hz, apparently caused by a beat with an internal video frequency. (This effect was never audible with music.) We noted that the recording-level LED's had a "peak hold" feature, displaying the highest level reached for a couple of seconds after the program level has dropped.

The 1,000-Hz playback distortion at 0 dB was 0.32%, approximately as rated. It was only 0.69% at +10 dB, reaching the reference 3.2%, approximately as rated. It was only 0.69% at +10 dB, reaching the reference 3.2% at +14 dB. Relative to that recorded level, the S/N was 64.5 dB unweighted, 80.5 dB with A-weighting, and 71 dB with CCIR/ARM weighting. When playing back test tones, dropouts from the videotape turned into slight bobbles (much less than 1 dB) in the test-tone amplitudes. These short-term output-level variations were not audible and were no worse than those normally accompanying analog open-reel or cassette recording. For comparison, we also measured the frequency response in the longitudinal recording mode. At 0 dB it was +0.5, −1.5 dB from 115 to 6,000 Hz. In this mode, the recorder's automatic recording-level control system replaces the manual controls, making it impractical to measure the response at different signal levels (since the recorder's internal circuits constantly change the gain to try to compensate for input-level changes). We did determine, however, that the longitudinal-track playback distortion from a 0-dB recording at 1,000 Hz was 1.5%.

In the Beta Hi-Fi mode, an input of 22 millivolts (mV) was needed for a 0-dB recording level. With the AUTO REC LEVEL turned on, 280 mV was needed for a 0-dB indication. The line-output level from a 0-dB recording was about 285 mV. The channel separation at 1,000 Hz was 70 dB, dropping to 50 dB at 20,000 Hz.

The flutter measurements produced the most startling results because they surpassed Sony's already remarkable specifications by a comfortable margin. In the Beta Hi-Fi mode, the weighted-rms flutter was 0.0015%, less than one-third of Sony's rating. Even the more stringent CCIR (quasi-peak) reading was only +0.003%. Again, for comparison, we also measured the flutter of the longitudinal track of the SL-5200. It was surprisingly good 0.1% wrms and 0.18% weighted peak. This comparison dramatically points up the hundredfold improvement in short-term speed stability afforded by the Beta Hi-Fi system.



Apparently because the FM discriminator of the SL-5200 has a very wide bandwidth, extreme changes in tape speed had *no* effect on the performance of the system. Switching between Beta II and Beta III during either recording or playback caused no change in pitch or other characteristics of the reproduced audio signal. We were fascinated to find that using the "X2" fast-speed mode of the VCR (intended to advance the video tape rapidly while permitting the picture to be seen) did not affect the pitch of the audio signal—it merely doubled its tempo!

The tape speeds were exact (the frequency of the playback tone was exactly equal to that of the recorded signal). In fast-forward, an L-500 cassette was run through in 3 minutes and 41 seconds. If these times seem long, keep in mind that an L-500 cassette will hold *3 hours* of audio/video program at the Beta III speed.

• *Comment.* The audio performance of the Sony SL-5200 was so superb that we tended to overlook its video capabilities. We made some subjective comparisons, using commercially recorded tapes, between the SL-5200 and the Sony SL-5000, a conventional VCR with very similar video performance. As far as we could tell, the two were equivalent in their video quality.

Sony provided us with some videocassettes recorded with the Beta Hi-Fi process including a demo tape and samples of Sony "Video 45" releases, short musical video performances with soundtracks recorded in Beta Hi-Fi. Some of the latter provided a convincing demonstration of the potential of the new system, though in others the original program quality did not come up to the capabilities of the recording and playback medium (in other words, background noise or distortions were audible). According to Sony, Beta Hi-Fi duplication equipment is now being used, or soon will be, by such video software producers as Paramount Home Video, Thorn-EMI, MGM/UA, Warner Home Video, and CBS-Fox.

Even if its video capabilities are disregarded, the SL-5200 can justify itself as a superior audio tape recorder, bridging the gap between analog and digital tape recorders. Many of its characteristics (such as flutter and dynamic range) are closer to those of digital machines than to even the finest consumer-type analog open-reel or cassette recorders. Although a PCM adaptor can make almost any VCR into a true digital recorder, the total cost of such a unit would be at least twice that of the SL-5200.

Compared with any audiophile analog recorder, the SL-5200 provides superior sound quality, along with a maximum uninterrupted recording time of 5 hours (at the Beta III tape speed with an L-830 cassette) and (lest we forget) the ability simultaneously to make excellent video recordings! Just about the only limitation of this machine for the tape-recording hobbyist is the inability to edit a videocassette on it other than by the cumbersome method of copying the tape on another machine. On the other hand, a pair of SL-5200's would cost far less than any digital tape editor I know of. I am sure that users of this machine and others to follow with the same technology will have no difficulty in exploiting their capabilities. Beta Hi-Fi may not be quite as revolutionary as home digital recording, but it is more affordable and has video to boot.—*Julian D. Hirsch*

Circle 7 on Reader Service Card

For an explanation of abbreviations, turn to the list on page 35.

Tape-recording terms are defined in the vocabulary on page 32.

Tandberg TD 20A-SE Open-Reel Deck

The Tandberg TD 20A-SE is a two-speed open-reel tape deck designed for the advanced amateur or semi-professional recordist. It is available with quarter-track heads for 7½/3¾- or 15/7½-ips operation (I tested the former, which is the usual home-stereo format). There is also a 15/7½-ips half-track version more suitable for professional applications. All three models accept either 7- or 10½-inch reel sizes.

The transport of the TD 20A-SE is virtually identical to that of the TD 20A (STEREO REVIEW, December 1979). A synchronous ac motor powers the belt-driven capstan, and there are separate motors for each of the reel hubs. A fourth motor replaces the usual solenoids for smooth, quiet operation of the tape gate, capstan pinchroller, and brake mechanisms. Spring-loaded tension arms on either side of the head assembly compensate for any unevenness in tape winding, and a precision "scrape flutter" roller damps out the tendency of tape to vibrate along its length. Separate ferrite heads of Tandberg's own design and construction are used for erasing, recording, and playback. A shield on the playback head lowers hum pickup but also makes it somewhat awkward to mark editing splice points. A conventional mechanical four-digit counter indicates tape position, and an optical sensor stops the deck when the tape runs out.

Light-touch pushbuttons with LED indicators control all transport modes through a logic circuit that automatically prevents any possibly tape-damaging sequence of operations. Simultaneously pressing and releasing the STOP and WIND buttons places the deck in a "free" mode so that the reels can be manually rocked back and forth for editing or threading. If desired, the CUE switch will cause the tape to be held against the heads even during fast winding, though the playback level must be turned down to avoid the possibility of burning out a tweeter. After threading, pressing the STOP button momentarily energizes the reel motors in order to take up any slack in the tape.

The TD 20A-SE incorporates two highly original electronic features: the Dyneq Actilinear recording system and the "special equalization" (SE) from which the deck gets its suffix. The Dyneq (dynamic-equalization) system frequently encountered in slow-speed recording. Normal treble losses at slow tape speeds require a considerable high-frequency boost during recording in order to achieve flat frequency response overall. This boost, or "record pre-emphasis," can lead to high-frequency tape saturation, however, if the treble content in the original signal is itself high in level. Saturation produces distortion and limits the tape's high-frequency response.

The Dyneq system varies the amount of treble pre-emphasis during recording to take account not only of the frequencies in the incoming signal, but of their amplitude as well. If a given treble frequency would be driven into saturation with normal, fixed record equalization, the Dyneq circuit automatically lowers the amount of equalization supplied by just enough to enable the tape to hold as much high-frequency information as it can.

Tandberg's SE circuit addresses another fundamental open-reel problem. Decades ago, when playback-equalization curves (which are usually stated in terms of microseconds for engineering convenience) were standardized for the various tape speeds, the very best available tapes of the time had severe treble losses, well beyond what any reasonable amount of record pre-emphasis could supply. The only place to insert the additional amount of treble boost required was in the playback section, where a 6-dB-per-octave treble boost was an inherent part of the playback head's own operation (a 6-dB-per-octave rising characteristic means that the output from the head doubles each time the frequency doubles). While using this boost certainly helps compensate for treble losses on the tape, it unfortunately *also* increases any tape hiss.

Today's improved tapes do not need nearly the amount of playback treble assistance that is built into the old standards, and now Tandberg has decided to run the commercial risk of providing an alternative set of playback-equalization settings. In brief, the "special equalization" of the TD 20A-SE uses time constants of 50 microseconds (treble boost beginning at 3,150 Hz) for the 3¾-ips speed; the current standard is 90 microseconds (boost beginning at 1,800 Hz). At 7½ ips the SE is 25 microseconds (6,300 Hz) instead of the old 50-μsec (3,150-Hz) standard. And at 15 ips Tandberg proposes 10 microseconds (15,900 Hz) in place of the thoroughly obsolete 50-microsecond boost now mandated. A rather similar approach seems to underlie the "EE" ("extra efficiency") system recently promulgated by Teac, Akai, Maxell, and TDK, except that EE requries a special high-bias (and rather high-priced) tape, while Tandberg's SE is designed for high-quality regular open-reel tapes.

As is almost a hallmark with

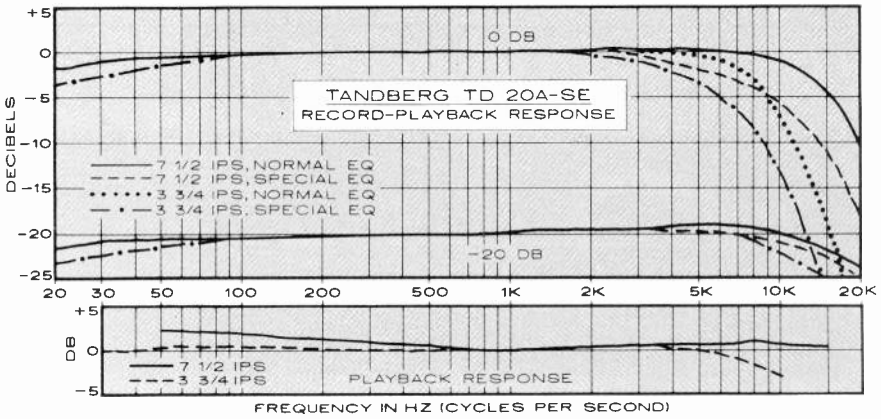
Tandberg, the record-level indicators of the TD 20A-SE are peak-reading equalized meters. They not only register signal peaks, but reflect the record treble preemphasis as well. This facilitates using the meters for their intended purpose, namely recording at as high a level as possible without encountering distortion.

Four separate record-level controls plus an overall MASTER control permit full mic/line or line/line stereo mixing, and an adjustable detented ring on the MASTER control permits easy resetting after a fade-out. As on professional decks, separate record-ready switches are used, and "flying start" recording is possible. Toggle switches also control the selection of standard or special equalization, source/tape monitoring, edit/cue functions, and a SYNC facility that enables a recording made on ne channel to be synchronized with a second recording made on the other. Separate left- and right-channel playback controls are provided, and a switch permits routing either channel to both headphones or regular stereo listening. Pushbuttons are used to select either high or low speed and to set the proper tapé tensions for large or small reels.

The rear panel of the TD 20A-SE contains the normal input and output jacks, which are recessed to permit either vertical or horizontal operation. Hub adaptors for NAB-type 10½-inch reels are provided, and a remote-control accessory is available. The TD 20A-SE measures 17¼ inches wide, 17½ inches high, and 6 inches deep, and it weighs ,37½ pounds. Price: $1,595.

• *Laboratory Measurements.* Tandberg indicated that our sample of the TD 20A-SE had been factory adjusted using Maxell UD-XL tape, so we used it for the tests. We also tried top-line tapes from TDK, Scotch, and Memorex with almost equivalent results. The TD 20A-SE has front-panel access to a pair of bias-trim controls that can flatten out the response of nearly any tape, but the user must supply his own test equipment to take advantage of this feature.

Playback response (using the "normal" equalization, as there are no calibrated tapes available for Tandberg's "special" equalization) was checked using both Ampex and MRL test tapes. Overall record-playback frequency response at a level of -20 dB showed very close tracking between the normal and special equalizations, though at a 0-dB level high-frequency response fell off more sharply when using the SE, which subjects the tape to increased record equalization. At 0-dB, the equalized peak-reading meters deflected far off scale on higher-frequency test tones. In practical use, this would warn a user to reduce the level. Incidentally, the tape overloaded before Tandberg's recording amplifier did.



The upper curves indicate overall record-playback response at the manufacturer's indicated 0-dB recording level using the tapes designated on the graph. In the center are the same measurements recorded at −20 dB relative to the upper curves, a level conventionally used for tape-deck frequency response measurements. Bottom curves show playback response from calibrated test tapes and indicate performance with prerecorded tapes.

Third-harmonic distortion of a 1,000-Hz tone recorded at an indicated 0-dB level measured between 1.1 and 1.2%, and the 3% distortion point was reached at a level of +3.5 dB, just above the highest calibration on the meter scale. While this does not appear to provide the usual "leeway," it is again an intentional part of the Tandberg design for its meter operation. A large differential between an indicated 0-dB and the onset of serious distortion is requried *only* when the meter does not really indicate the exact signal level. With reference to the 3% distortion point we measured unweighted signal-to-noise ratios ratios at 7½ ips of 59.8 and 60.8 dB with the normal and the special equalization, respectively, and IEC A-weighting increased the readings to 67.4 and 70.8 dB. At the 3¾-ips speed the comparable unweighted figures were 56.4 and 58.8 dB, improving to 63.7 and 67.4 dB with A-weighting.

Wow-and-flutter, using the stringent DIN peak-weighted standard, measured 0.08 per cent at the higher speed and 0.12% at the lower speed. High-speed winding time for a 3,600-foot (10½-inch reel) tape was 115 seconds in each direction. An 1,800-foot (7-inch reel) tape could be shuttled from one end to the other in 83 seconds. A 38-mV (0.038-volt) signal was required at the line-1 inputs for a 0-dB indication, with an output level of 1.4 volts. The microphone input required only 0.18 mV and began to show signs of overload with an input of 25 mV.

• *Comment.* As a top grade, innovatively designed recorder the TD 20A-SE left little to be desired. Its tape handling was excellent, and it could make copies of a wide variety of listening material (including a first generation dub from a live digital master) with virtually no degradation.

The special equalization does produce a definitely quieter tape, with far less indication of treble overload than the 0-dB test curves would imply. At the same time, getting the rest of the industry to accept a proposed new standard will not be easy, so at least for now tapes made with the new process will be primarily for playback on one's own machine rather than for exchange with others. Overall, we would rate the Tandberg TD 20A-SE as well worth its price, an excellent deck that should give its owner many years of trouble-free musical satisfaction and fine performance in semi-pro mastering work.—*Craig Stark*

Circle 8 on Reader Service Card

"I am Cyrus Bleyer, attorney, representing the estate of the late Ludwig Van Beethoven. You have unlawfully taped the following compositions from frequency modulation broadcasts. To wit: 'The Ruins of Athens', Sonata No. 21 in C, Opus 53 'Waldstein', 1982...."

Vector Research VCX-800 Deck

The Vector Research VCX-800 is a three-head, dual-capstan cassette deck with both Dolby B and Dolby C noise reduction, the Dolby HX headroom-extension system, and a programmable tape counter whose digital display reads out directly in remaining minutes and seconds per side. It also includes a number of highly unusual features.

The record and playback heads are separate sendust units contained in the same physical casing. This permits optimizing both head-gap widths for their different tasks, and it also allows the user to make an instantaneous comparison between the input and the recorded signals. A phrase-locked-loop (PLL) d.c. servomotor drives the two capstans in a closed-loop configuration, and a second d.c. motor is used to turn the reels. Cassettes are mounted, tape openings downward, into slides on the rear of the cassette-well door. When the door is closed the reels are driven momentarily, taking up any tape slack. The cassette well is illuminated, and the cover is easily removable for head cleaning and demagnetizing.

The transport of the VCX-800 is solenoid controlled, and the buttons for record, rewind, play, fast forward, and pause functions have LED indicators. Pressing the record pushbutton automatically activates the pause function as well; recording actually begins when the pause button is pressed. A record-mute pushbutton, with LED indicator, inserts a four-second silent space between selections; the silence can be extended by holding the button down.

A twenty-segment peak-reading fluorescent display, calibrated from +8 to below -30 dB (the two lowest segments are not marked) is used to show recording and playback levels. Dolby level is set at 0 dB. A pair of associated pushbuttons determine whether the peak level is to be held and, if so, whether the length of the hold will be indefinite or for only a few seconds. Also associated with the display is one of the VCX-800's more unusual features: a properly equipped test generator for making fine bias and tape-sensitivity adjustments. When the TEST button is pressed, a 400-Hz Dolby-level tone in the left channel is used, with a RECORD CALIBRATION control, to compensate for differing tape sensitivities, ensuring minimum Dolby tracking error. At the same time a 400- to 15,000-Hz swept tone, shown on the right-channel indicator, is used for setting the BIAS ADJUST control to flatten the frequency response of different tapes of the same overall type. (The swept tone is, of course, recorded at a low level to prevent high-frequency tape overload, but compensating additional amplification is switched into the right-channel display when the test procedure is used.) Pressing the TEST MONITOR switch permits the tones to be heard.

While most memory rewind/repeat features use a 0000 tape-counter reading as their reference point, the microprocessor that controls the digital counter of the VCX-800 permits two separate locations to be stored in its memory. The SAVE 1 and SAVE 2 buttons can be used to store currently shown remaining times from the realtime counter display, or they may be independently programmed using ten numerical pushbuttons (0 to 9). In either case the location(s) stored can be checked by pressing MEMORY READ or cleared with SAVE CLEAR. Pressing the SEARCH button moves the tape rapidly to the SAVE 1 location, and pressing AUTO REWIND finds the SAVE 2 point. In addition to using the ends of the tape for automatic rewind/replay, therefore, the user can select a specific section of a cassette side for comparable treatment. A little practice in thinking backwards is necessary when programming the display, since its readings constantly decrease to correspond to the remaining time, but this difficulty is quickly overcome. The SEARCH, AUTO REWIND, AUTO PLAY, and SAVE buttons all have LED indicators, as do the C-45, C-60, and C-90 buttons that calibrate the counter. For nonstandard tape lengths a LOCK button, pressed in conjunction with C-90, sets the counter to read in untimed units.

Dolby B and Dolby C noise reduction are switch-selectable, and the VCX-800 adds two more Dolby functions [illegible] found on cassette decks today. One is a Dolby FM switch that automatically provides proper decoding either for recording or for listening to Dolbyized broadcasts. (Rear-panel adjustments are provided for calibrating the Dolby system for such broadcasts, since the normal record-level controls are bypassed in this mode.) Further, the Dolby HX headroom-extension system, which extends tape treble capacity by modifying recording bias and equalization simultaneously in the presence of high-level signals, is also switch selectable. Each of the Dolby functions has its own LED indicator.

A three-position switch sets the proper bias and equalization for ferric, CrO_2-type, or metal cassettes; no provision is made for ferrichrome. The output control affects both the level at the rear jacks and at the front-panel stereo headphone jack, and a dual-concentric input control sets the recording level. Both these controls are multiply detented. Plugging one or two microphones into the front-panel jacks disconnects the line-level inputs automatically. A three-position switch is included for external timer activation, and a pushbutton inserts an FM stereo-multiplex filter.

The rear panel of the Vector Research VCX-800 contains the normal line-level input and output jacks, Dolby-FM adjustments, a socket for plugging in an accessory remote-control device, and an interconnect jack for operation under the control of the matching VRX-9500 receiver. Rack-mounting adaptors are optional. Overall, the VCX-800 measures $17\frac{5}{16}$ inches wide, $5\frac{5}{8}$ inches high, and $14\frac{5}{8}$ inches deep, and it weighs a little under $21\frac{1}{2}$ pounds. Price: $1,000.

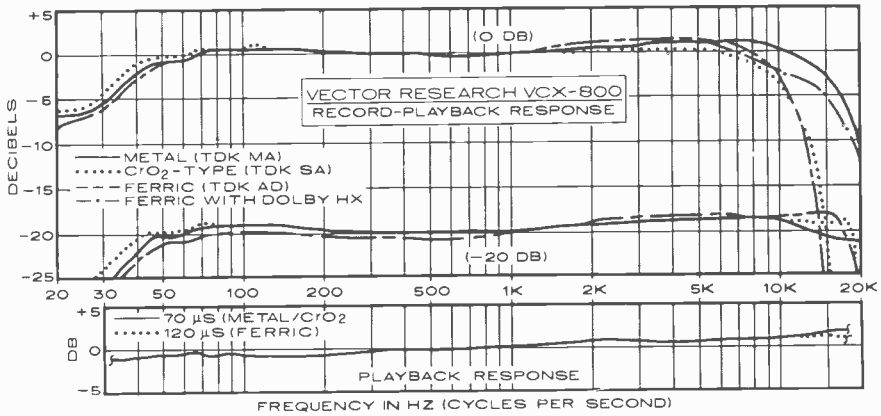
• *Laboratory Measurements.* Vector Research supplied the actual cassettes used in its factory setup of our sample of the VCX-800, and we used them for our primary measurements. These were: TDK AD (ferric), TDK SA (CrO_2-type), and TDK MA (metal). At the same time, however, by using the bias and calibration procedure (which takes only a few seconds), we obtained virtually identical results with some well-known premium tapes from Maxell, Fuji, Sony, BASF, 3M, and Memorex.

Playback frequency response, checked with our BASF New IEC Standard test tapes, was extremely smooth, within +1.5, -1 dB throughout the 31.5- to 18,000-Hz range. The response with ferric tape was so similar to the CrO_2-type response that it is barely possible to sepa-

rate them on the graph. On an overall record-playback basis, measured at -20 dB, high-end response was within +2.5, -3 dB to 18 kHz with the ferric TDK AD, to 19 kHz with TDK SA (CrO_2-equivalent), and slightly beyond our 20-kHz measurement limit using TDK MA (metal). Low-frequency response began to fall off appreciably below approximately 40 Hz. At a 0-dB record level the high-frequency headroom of the metal tape is clearly shown in the graph, but switching in the Dolby HX system improved the treble capability of the ferric AD substantially. Nearly as much improvement was noted with TDK SA, but the HX system did not materially improve the performance of the metal tape.

Third-harmonic distortion of a 0-dB 315-Hz tone measured 1.2, 1.2, and 2%for the ferric, CrO_2-type, and metal tapes, respectively, and the 3% distortion levels were +2.5, +2.75, and +1.65 dB. Unweighted signal-to-noise ratios, without noise reduction, measured 50.2, 52.2, and 51.2 dB for the three tapes, and the addition of IEC weighting increased these figures to 55, 56.2, and 55.3 dB. With Dolby B and A-weighting the ferric, CrO_2-type, and metal tapes had signal-to-noise ratios of 63.7, 63.9, and 63.2 dB, respectively; with the more powerful Dolby C noise-reduction system and CCIR-ARM weighting, the ratios were 71, 71.2, and 70.5 dB.

Wow-and-flutter, measured with a Teac MTT-111 test tape, was 0.034% on the customary wrms basis and 0.06% with the more stringent DIN peak-weighted standard. Dolby calibration was exact, and tracking error, with -20- and -30-dB inputs, was within +1 dB with Dolby B and +2 dB with Dolby C. The addition of the HX system produced a gradually rising response in the upper treble region, amounting to a maximum of about 2.5 dB with Dolby B and 5 dB with Dolby C in the 10- to 15-kHz region with the ferric and CrO_2-type tapes. Although the rise was measurable, the audible effect was negligible with musical material. Fast-forward and rewind times for a C-60 cassette were each 110 seconds, which is somewhat on the slow side. At the line-level inputs a signal of 0.064 volt (64 mV) was required for a 0-dB indication, which produced an output of 0.71 volt. Microphone sensitivity was 0.22 mV, and the mike inputs accepted levels of up to 30 mV before overload—rather typical results.



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• *Comment.* Sonically, the VCX-800 produced no surprises: dubs of FM and discs were extremely clean, and only with certain test signals (such as interstation FM hiss) did the combination of Dolby C and HX make the copy sound slightly brighter than the original. As good as Dolby B is, only with Dolby C were the last vestiges of tape noise eliminated. While we have measured slightly better wow/flutter figures, we found that audibly the VCX-800 was particularly good in this department.

With some forty switches on the front panel it naturally takes a little time to become acclimated to the VCX-800, but the intelligent use of LED indicators at nearly every point eases the task. And the test circuitry particularly appealed to our sense of good engineering, though most people would probably not use it as often as we did. Overall, we found the combination of features and performance of the VCX-800 very impressive, and we suspect it will give the really serious recordist everything he wants—and then some.—*Craig Stark*

Circle 9 on Reader Service Card

DIRECTORY OF MANUFACTURERS

(Continued from page 36)

SCOTCH, 3M Company
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SENNHEISER ELECTRONIC CORP.
10 West 37 St., New York, NY 10018

SHARP ELECTRONICS CORP.
10 Sharp Pl., Paramus, NJ 07652

SHERWOOD, div. Inkel Corp.
17107 Kingsview Ave., Carson, CA 90746

SHURE BROTHERS, INC.
222 Hartrey Ave., Evanston, IL 60204

SIGNET DIVISION, A.T.U.S., INC.
4701 Hudson Dr., Stow, OH 44224

SONY CORPORATION OF AMERICA
Sony Dr., Park Ridge, NJ 07656

SOUNDAIDS
Deer Hill Lane, Briarcliff Manor, NY 10510

SOUND CONCEPTS, INC.
P.O. Box 135, Brookline, MA 02416

SOUNDCRAFTSMEN
2200 S. Ritchey, Santa Ana, CA 92705

SPARKOMATIC CORP.
Milford, PA 18337

STANTON MAGNETICS, INC.
Terminal Dr., Plainview, NY 11803

SUPEREX ELECTRONICS CORP.
151 Ludlow St., Yonkers, NY 10706

SYLVANIA, NAP Consumer Electronics Corp.
Interstate 40 & Straw Plains Pike, P.O. Box 6950, Knoxville, TN 37914

TANDBERG OF AMERICA, INC.
Labriola Court, P.O. Box 58, Armonk, NY 10504

TASCAM by TEAC
7733 Telegraph Rd., Montebello, CA 90640

TDK ELECTRONICS CORP.
12 Harbor Dr., Port Washington, NY 11050

TEAC CORP. OF AMERICA
7733 Telegraph Rd., Montebello, CA 90640

TECHNICS (Panasonic Co.)
One Panasonic Way, Secaucus, NJ 07094

TEKNIKA ELECTRONICS CORP.
1633 Broadway, New York, NY 10019

TELEX COMMUNICATIONS, INC.
9600 Aldrich Ave. S., Minneapolis, MN 55420

TOSHIBA AMERICA, INC.
82 Totowa Rd., Wayne, NJ 07470

UHER OF AMERICA, INC.
c/o Walter Odemer Co., Inc., 1516 W. Magnolia Blvd., Burbank, CA 91506

URSA MAJOR, INC.
Box 18, Belmont, MA 02178

VECTOR RESEARCH, INC.
20600 Nordhoff St., Chatsworth, CA 91311

VIDAIRE ELECTRONICS MFG. CORP.
150 Buffalo Ave., Freeport, NY 11520

WALD SOUND, INC.
1131 Dora St., Sun Valley, CA 91352

YAMAHA INTERNATIONAL CORPORATION USA
6660 Orangethorpe Ave., Buena Park, CA 90620

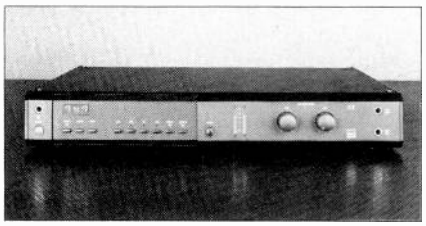
ZIMAG (MAGNETIC TAPE INTL.)
14600 S. Broadway, Gardena, CA 90248

1 Cassette Decks

ADS

Atelier C2 Cassette Deck

Stereo cassette deck with Dolby B and C noise reduction. Features full-logic transport mechanism; one-button selection for bias and equalization; digital counter with memory control; fast-response vertical LED meter; 2 motors with single capstan; memory, repeat, and auto-stop functions; laminated sendust alloy record/play head; dual-gap ferrite erase head. Frequency response at -20 VU 20-18,000 Hz ±2 dB



with normal or chrome tape, 20-20,000 Hz ±2 dB with ferrichrome or metal tape; S/N ratio (ref. to level producing 3% THD at 315 Hz) >74 dBA with Dolby C, >66 dBA with Dolby B, >58 dBA without Dolby; wow and flutter <0.06% DIN peak weighted; speed accuracy ±1%; fast-wind time for C-60 <80 sec; channel separation >35 dB (at 1 kHz), >30 dB (500-6,300 Hz). Power consumption 30 W. 17.52"W × 2.76"H × 14.84"D. 18.3 lbs .. $549

AIWA

AD-F770 Dolby HX Pro Cassette Deck

Stereo cassette deck with Dolby HX Professional circuitry and digital automatic tape adaptation system. Features flat keyboard control design; Dolby B and C; feather-touch IC logic controls; remaining-time display in all modes; fluorescent multifunction display; Intro-play; memory rewind and repeat; micro-grain dual-capstan system; auto demagnetizing system; auto tape selector; auto rec mute; wireless remote-control capability; stereo mic terminals. Wow and flutter 0.25% wrms; S/N ratio 80 dB above 5 khz with Dolby C $495

AD-F660 Dolby HX Pro Cassette Deck

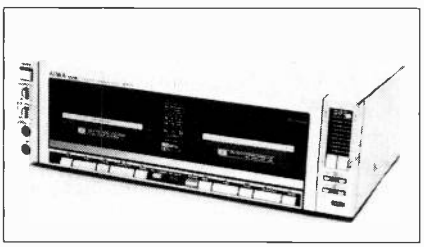
Stereo cassette deck with Dolby HX Professional circuitry and flat keyboard control design. Features Dolby B and C; feather-touch IC logic controls; multicolor peak level indicator; Intro-play; memory rewind and repeat; micro-grain dual-capstan system; auto demagnetizing system; auto tape selector; auto rec mute; wireless remote-control capability; stereo mic terminals. Wow and flutter 0.28% wrms; S/N ratio 80 dB above 5 khz with Dolby C $395

AD-R600U Auto-Reverse Cassette Deck

Stereo cassette deck with quick auto reverse. Features feather-touch IC logic controls; dual-motor drive with DC servomotor mode; direction selector; Dolby B and C; 3-color 12-part LED peak display; auto tape selector; record sync operation. Wow and flutter 0.035% wrms; S/N ratio 65 dB $395

AD-WX110 Dubbing Cassette Deck

Stereo cassette deck with two cassette transports for one-touch synchro dubbing. Features 4-channel dubbing to cut time to ¼ that of conventional decks; con-



tinuous playback; Dolby B and C noise reduction; LH bias fine adjust; auto tape selector; timer standby; music sensor; auto replay; LED peak level meters. Wow and flutter 0.045% wrms $395

AD-3500U 3-Head Cassette Deck

Stereo cassette deck with 3 heads, soft-touch-controlled transport with cue and review, Dolby B and C noise-reduction circuits. Features automatic demagnetizing system; new-style control panel display of function, mode settings; 3-color, 12-LED signal displays with peak hold; LH-bias fine adjust control. Wow and flutter 0.038% wrms $295

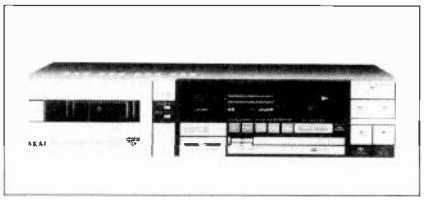
AD-F330 Dolby C Cassette Deck

Two-motor stereo cassette deck with Dolby B and C noise reduction. Features keyboard control panel; IC logic controls; fine bias adjust; auto rec mute; auto tape select; timer standby; oil-damped eject. Wow and flutter 0.035% wrms $225

AKAI

GX-7 Dolby C Cassette Deck

Stereo cassette deck with Super GX combo heads and DC recording and playback amplifier. Features Dolby C noise reduction; feather-touch controls; electronic record-level control; direct-drive capstan; direct lead-in/power eject; Intro Scan; instant program location



system; record cancel; optional remote control; switchable multiplex filter; digital tape counter. Frequency response 20-21,000 Hz ±3 dB (metal); wow and flutter 0.028% wrms; S/N ratio >60 dB; distortion <0.7% $400

GX-R6 Auto-Reverse Cassette Deck

Auto-reverse stereo cassette deck with Dolby B and C noise reduction. Features quick reverse; Super GX twin field head; Intro Scan; digital tape counter; instant program location system; record cancel; remote-control jack; auto mute; auto tape selector; metal-tape compatibility. Frequency response 20-19,000 Hz ±3 dB (metal); wow and flutter 0.04% wrms; S/N ratio 60 dB; distortion 0.7% $400

HX-R5 Auto-Reverse Cassette Deck

Auto-reverse stereo cassette deck with Bidirection Symmetrical Precision. Features feather-touch controls; Dolby B and C; metal-tape compatibility; instant program location system; high-density permalloy head; electronic record-level control; reverse selector; auto mute; auto tape selector; remote-control jack; digital tape counter; auto timer/start. Frequency response 20-17,000 Hz ±3 dB; wow and flutter 0.04% wrms; S/N ratio 58 dB; distortion 0.7% $350

HX-3 Dolby C Cassette Deck

Computer-controlled stereo cassette deck with Dolby B and C. Features HD head; metal capability; auto tape selector; auto mute; memory auto play; auto timer; digital counter; 12-part FL bar meters; remote-control jack. Frequency response 20-17,000 Hz ±3 dB (metal); wow and flutter 0.05% wrms; S/N ratio 56 dB; distortion 0.7% $250

HX-2 Feather-Touch Cassette Deck

Computer-controlled stereo cassette deck with HD head. Features Dolby noise reduction; metal-tape compatibility; auto tape selector; digital tape counter; feather-touch controls; 12-part FL bar meters; timer start function. Frequency response 30-17,000 Hz ±3 dB (metal); wow and flutter 0.05% wrms; S/N ratio 56 dB; distortion 0.7% $200

HX-1 Feather-Touch Cassette Deck

Computer-controled stereo cassette deck with HD head. Features Dolby; metal-tape compatibility; feather-touch logic controls; 12-part bar meters. Frequency response 30-18,000 Hz ±3 dB (metal); wow and flutter 0.04% wrms; S/N ratio 58 dB; distortion 0.8% $180

GT-F95 Stereo Cassette Deck

Stereo cassette deck with concealed cassette well, Dolby B noise-reduction system, 4-digit tape counter, Super GX combination record/play tape head. Features tape/source monitoring; computerized Bias Equalization and Sensitivity Tuning (B.E.S.T.) system for all tape formulations; built-in memory; full-logic feather-touch transport controls; 24-segment 2-color fluorescent switchable peak/VU meters with peak hold; electronic tape/real-time counter; standby blinker. Wow and flutter 0.025% wrms; frequency response 20-21,000 Hz ±3 dB with metal tape; S/N ratio >72 dB A weighted with Dolby on, metal tape; distortion <0.6% at 1 kHz, 0 VU with metal tape; 17.3"W × 14.2"D × 6.4"H; 28.7 lb $795

GX-F91 Stereo Cassette Deck

Computer-controlled stereo cassette deck with Dolby B and C noise-reduction systems. Features Super GX record/play heads; 3-head, 2-motor full-logic transport system; quartz-locked direct-drive, double-capstan closed-loop system; Quiet and Quick mechanism;

DESIGN INTEGRITY:

WHAT MAKES DENON CASSETTE DECKS UNCOMMON IS HOW MUCH THEY HAVE IN COMMON.

Denon has never built multi-thousand dollar cassette decks in order to sell unrelated inexpensive machines. Instead, Denon has concentrated its full engineering effort to produce rationally-priced cassette decks that would impress serious music lovers with their sound rather than their features. Now, the new DR-M4, DR-M3 and DR-M2 cassette decks exceed Denon's previous sonic performance levels, while adding significant technological and convenience features.

Denon's Tape Tension Servo Sensor System has been further refined to provide automatic sensing and correction of tape tension for optimum tape-to-head contact throughout the entire play of each cassette. A new SF combination head extends frequency response to 23kHz (metal) with a 70dB S/N ratio (Dolby C). A new computer controlled silent tape transport mechanism provides entirely quiet and safe tape handling. An electronic computer digital counter using an optical detector system automatically indicates tape used and tape remaining information.

The DR-M Cassette Decks feature Denon's Flat Twin direct capstan drive; non-slip clutchless, beltless, reel drive mechanisms; Dolby B & C noise reduction; direct-coupled amplifier design, and separate amp/mechanical power supplies.

The DR-M3 offers computer tape tuning for bias and sensitivity. The DR-M4 adds programmable random access, stopwatch function and dual-capstan transport. Otherwise, all the Denon DR-M Series Cassette Decks are principally the same—each offering the highest performance and quality at its price in the industry.

Denon products share more than name alone.

For the best results on the new DR-M Series, or any cassette decks, for that matter, try new Denon DX-Series Cassette Tape.

Denon DR-M1 Two-Head Cassette Deck with Dolby C; Non-slip Reel Drive Motors. **$299**

Denon DR-M2 Three Head Cassette Deck
with Dolby C; Tape Tension Servo; SF Combination Head.
(Side panels optional) **$399**

Denon DR-M3 Three Head Cassette Deck
adds Computer Tuning System.
(Side panels optional) **$499**

Denon DR-M4 Three Head Cassette Deck
adds Dual Capstan and Music Search.
(Including side panels) **$599**

Prices for comparison purposes only.

DENON

Imagine what we'll do next.

Denon America, Inc., 27 Law Drive, Fairfield, N.J. 07006

CIRCLE NO. 20 ON READER SERVICE CARD

Cassette Decks

auto tape selector; auto tape tuning with adjustable bias; output and headphone level controls; dc servo amplifier; switchable peak/VU meters; digital real-time tape counter; automatic play; IPLS; Intro Scan; automatic fader; automatic record mute; automatic record cancel. Wow and flutter <0.025% wrms, frequency response 15-21,000 Hz ±3 dB with metal tape; S/N ratio no NR/Dolby B/Dolby C 60/70/80 dB; distortion <0.7% $750

GX-F66RC Stereo Cassette Deck

Computer-controlled auto-reverse stereo cassette deck with Dolby B and C noise-reduction systems. Features automatic reverse in record, play; quick reverse mechanism; automatic play; continuous play; random program search; blank search; Intro-Scan; automatic tape selector; twin-field Super GX head; automatic record mute; 16-segment bargraph meters; electronic digital tape counter. Wow and flutter 0.035% wrms; frequency response 20-19,000 Hz ±3 dB with metal tape; S/N ratio no NR/Dolby B/Dolby C 60/70/80 dB with metal tape; distortion <0.7% $575

GX-F44R Stereo Cassette Deck

Automatic record/play quick-reverse stereo cassette deck with Dolby B and C noise-reduction systems, metal-tape capability. Features continuous playback; random program search; Intro Scan; automatic tape selector; twin-field GX head; automatic mute; 16-segment signal-level bargraph displays; electronic digital tape counter. Wow and flutter 0.035% wrms; frequency response 25-19,000 Hz ±3 dB with metal tape; S/N ratio no NR/Dolby B/Dolby C 60/70/80 dB; distortion <0.7% $475

GX-F71 Stereo Cassette Deck

Computer-controlled stereo cassette deck with Dolby B and C noise-reduction systems. Features Super GX heads; 3-head, 2-motor double-capstan closed-loop system; Quiet and Quick mechanism; automatic tape tuning; automatic tape selector; dc amplifier, automatic monitor; direct-drive; time record with auto tape tuning; Intro Scan; IPLS; automatic fader; power eject/direct lead-in system; auto record cancel; 18 segment FLD bargraph meters; electronic digital time/tape counter. Wow and flutter 0.03% wrms; frequency response 20-21,000 HZ ±3 dB with metal tape; S/N ratio no NR/Dolby B/Dolby C 60/70/80 dB $450

CS-F39R Stereo Cassette Deck

Bidirectional record/play stereo cassette deck with Dolby B and C noise-reduction systems. Features quick reverse; 2 motors; full-logic feather-touch transport controls; automatic play; IPLS; 12-segment FL meters; automatic continuous play; 3-position tape selector with metal capability; automatic record mute. Wow and flutter 0.04% wrms; frequency response 26-19,000 Hz ±3 dB with metal tape; S/N ratio no NR/Dolby B/Dolby C 60/70/80 dB; distortion <0.7% $375

GX-F31 Stereo Cassette Deck

Computer-controlled stereo cassette deck with Dolby B and C noise-reduction systems. Features twin-field Super GX head; automatic tape selector, dc amplifier; direct drive; quiet and quick mechanism; Intro Scan, IPLS; 2 motors; power eject/direct lead-in system; automatic record cancel; maximum input-level indicators; electronic digital tape counter. Wow and flutter 0.035% wrms; frequency response 20-19,000 Hz ±3 dB with metal tape; S/N ratio no NR/Dolby B/Dolby C 60/70/80 dB $300

CS-F21 Stereo Cassette Deck

Stereo cassette deck with Dolby B and C noise-reduction systems. Features automatic play; HD head; metal-tape capability; feather-touch transport controls; record mute; 12-segment FLD bargraph meters; remote-control jack. Wow and flutter 0.04% wrms; frequency response 30-18,000 Hz ±3 dB with metal tape; S/N ratio no NR/Dolby B/Dolby C 58/68/78 dB; distortion <0.8% $250

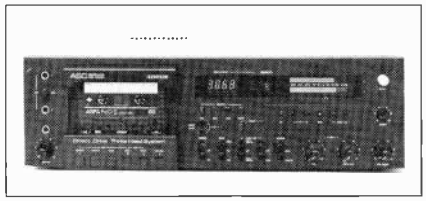
CS-F14 Stereo Cassette Deck

Stereo cassette deck with Dolby B and C noise-reduction systems. Features feather-touch transport controls; metal-tape capability; 12-segment FLD bargraph signal-level displays; oil-damped eject; timer start. Wow and flutter 0.04% wrms; frequency response 30-18,000 Hz ±3 dB with metal tape; S/N ratio no NR/Dolby B/Dolby C 58/68/78 dB with metal tape; distortion <0.8% $200

ASC by HAMMOND

ASC 3000 Stereo Cassette Deck

Three-motor 3-head cassette deck with user-controllable bias and equalization for 6 different tapes. Features Dolby B and C; built-in mixing with individual volume controls for line, radio, and mic; dual capstans; variable pitch; memory rewind; electronic counter memory system; infrared remote control op-



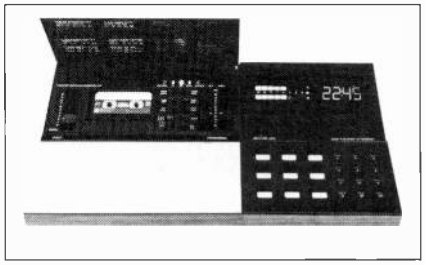
tional. Frequency response 20-20,000 Hz +2/-3 dB; wow and flutter 0.07%; S/N ratio 55 dB without noise reduction, 61 dB with Dolby B, 63 with Dolby C; erase attenuation >70 dB; input sensitivity 1 mV (high mic), 70 mV (line); fast forward/rewind 36 sec for C-60. 5" H × 17⅞"W × 14¼"D $1,895

ASC 2000. Similar to ASC 3000, but lacks user-controllable bias and equalization, memory rewind, pitch control, radio socket, and mic inputs $1,395

BANG & OLUFSEN

Beocord 9000 Stereo Cassette Deck

Top-loading stereo cassette deck with automatic computer-controlled calibration that automatically adjusts for specific tape formulation used. Features Dolby B and C noise-reduction and Dolby HX-Pro (headroom-extension) systems; double sendust/ferrite tape head with separate gaps for record and playback; manual switching system for normal/CrO_2/metal tape formulations; special low-noise playback amplifier; -20 to +6 dB record/playback peak signal-level meters; automatic demagnetization; minutes/seconds tape counter; tape-end indicator; single-motor/capstan drive system. Wow and flutter DIN/wrms <0.1%/<0.045%; frequency response 10-25,000



Hz ±3 dB referred to 250 nWb/m, -20 dB, 20-20,000 Hz ±1.5 dB all tape formulations; S/N ratio Dolby B/C 68/79 dB Scotch Metafine and Sony FeCr, 70/80 dB BASF chrom II, 64/74 dB BASF LHI tape; separation > 40 dB at 1 kHz; input sensitivity/impedance 0.4V/47k ohms radio, 15 mV/22K ohms line, 0.15 mV/3K ohms mic, 40 mV/22k ohms AUX; output level/impedance 500-2000 mV/5/6k ohms radio, 10 V maximum/56 ohms headphones; power consumption 50 W maximum, fast-wind time 70 seconds with C60 cassette; 20⅞"W × 11⅞"D × 5⅛"H; 17 lb $1295

Beocord 8004 Stereo Cassette Deck

Stereo cassette deck with Dolby B and C noise reduction and Dolby HX-Pro headroom-extension system. Features auto normal/CrO_2/metal bias selection; real-time calibaration system that gives index to music in minutes and seconds; auto computer-controled search; single-gap record/play head; auto demagnetizing; stop function that places 4-sec noise-free pause between cuts; timer start/stop function for record and play. Fast-wind time with C60 tape 70 sec. Frequency response 20-20,000 Hz ±3 dB; wow and flutter <0.045% wrms; S/N ratio 78 dB (metal, Dolby C); separation >35 dB. 20⅞" W × 11⅞" D × 5⅛" H; 16.5 lbs $695

Beocord 2400 Stereo Cassette Deck

Top-loading stereo cassette deck with Dolby B noise-reduction system and single sendust record/play tape head. Features memory; bias touch controls; 2 illuminated peak signal-level VU meters; channel balance control; above-surface-mount tape function keys; 3-digit tape counter with memory. Wow and flutter 0.15% DIN; frequency response 30-16,000 Hz ±3 dB; S/N ratio 66 dB with metal tape, Dolby on; separation 35 dB; input sensitivity/impedance 50 mV/47k ohms line, 0.3 m,V/33k ohms mic (DIN); output level/impedance 700 mV/10k ohms; 15¾"W × 10"D × 3¼"H $295

BENJAMIN ELECTROPRODUCTS

Benjamin RAC 10 Mark II Cassette Changer

Automatic cassette changer plays both sides of up to 10 cassettes in succession without interruption for up to 15 hrs; adjustable stereo output; monitor speaker/amplifier with level control; frequency range 25-14,000 Hz; S/N ratio >50 dB; 19.5"W × 8"D × 7"H; 18.7 lb $850

RAC-10 Mark II DNR. Same as Mark II except has dynamic noise-reduction system built in for 60 dB S/N ratio $900

Rondelay 300T Portable Cassette System

Variable speed (±20%) portable cassette player in lightweight molded case. 12" full-range speaker in de-

tachable lid. Separate mic input with level control for public-address/voice-over music. Automatic speed correction when recording. 20 W rms output. 12.5 lbs $249

DENON

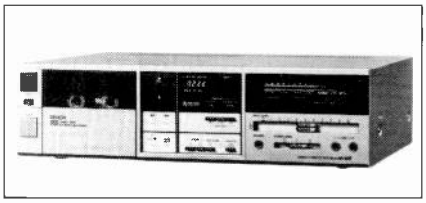
DR-M4 Stereo Cassette Deck

Quartz-lock 3-head cassette deck with direct-drive closed-loop 2-capstan computer servomotor. All functions microprocessor controlled. Features Dolby B and C; infinitely variable auto-bias computer tuning; "silent" transport; flat key controls; peak-hold fluorescent meter; control center display; auto tape select; dc amplifier construction; independent power supplies; MPX filter switch; input/output slide level control; one-touch Rec/Mute and Rec/Pause; digital display; memory counter; computer program search; stopwatch; remaining time countdown. Black with rosewood high-gloss finish end panels included. Fast

forward time 90 seconds for C60. Frequency response 20-23,000 Hz with metal tape; wow and flutter 0.027% wrms; S/N ratio 73 dB (with Dolby C, at 3% THD); power consumption 22 W. 17.4"W × 4.6"H × 11.5"D. 13.2 lbs. $600

DR-M3 Stereo Cassette Deck

Direct-drive 3-head cassette deck with computer servo motor. All functions microprocessor controlled, including tape-tension servo for reliable tape-to-head contact. Digital counter displays index and remaining time in minutes and seconds. Features Dolby B and C; auto tape-type selection; infinitely variable auto biasing; silent flat key transport controls; peak-hold fluorescent meters; dc amplifier construction; independent power supplies. Grey and silver, with wood high-gloss end panels optional $500



DR-M2. Similar to DR-M3 except lacks computer-tuning auto-bias feature $400

FISHER

DD450 Stereo Cassette Deck

Direct-drive 3-head cassette deck with separate tape-hub motor, dual-process Dolby B noise-reduction system, full-logic IC solenoid transport controls. Features 3 sendust heads; normal/CrO_2/FeCr/metal tape switching with separate fine bias control; memory/auto-repeat function; fluorescent peak-level autohold meters. Wow and flutter 0.04% wrms; frequency response ±3 dB 30-14,000 Hz normal, to 16 KHz CrO_2 and FeCr, to 18 kHz metal tape; S/N ratio 62 dB with Dolby on; THD 1.5% at 0 VU; fast-wind time 90 seconds for C60 cassette; 17"W × 10½"D × 4"H; 15.5 lb $580

DD300 Stereo Cassette Deck

Metal-compatible stereo cassette deck with Dolby B noise-reduction system, direct-drive dc servo capstan motor, 2 MX/ferrite heads. Features normal/FeCr/CrO_2/metal tape selector; dual VU meters with 3-LED peak indicators; input-level control with line/mic input selector; output-level control; auto repeat memory; 3-digit tape counter with reset; record mute; electronic solenoid feather-touch controls with LEDs; timer standby with external audio timer. Wow and flutter 0.04%; frequency response 30-18,000 Hz ±3 dB with metal tape; S/N ratio 62 dB with Dolby; 17⅓"W × 9½"D × 5¼" H $300

DD280. Similar to DD300 but minus FeCr tape position, auto repeat memory, output-level control; has separate left/right input-level controls; metal tape frequency response 30-15,000 Hz ±3 dB; optional RC 80 full-function remote control unit available; 17⅓"W × 10½"D × 4"H $250

CR150 Stereo Cassette Deck

Stereo 3-head cassette deck with dual-process Dolby noise-reduction system, power-assisted soft-touch transport controls, bias fine control. Features MPX filter; independent left, right input-level controls; output-level control; normal/CrO_2/metal tape selectors; dual lighted VU meters plus peak-level LEDs; tape/source monitoring, MPX filter. Wow and flutter 0.06% wrms; frequency response ±3 dB 40-14,000 Hz normal, to 16 kHz CrO_2, to 18 kHz metal tape; S/N ratio 62 dB, Dolby on; THD 1.5% at 0 VU; fast-wind time 90 seconds with C60 cassette; 17⅓"W × 10½"D × 4⅞"H; 13 lb $350

DD350 Stereo Cassette Deck

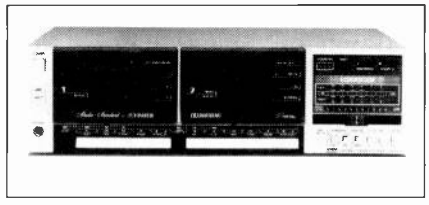
Direct-drive cassette deck with full-logic transport controls, metal-tape-compatibility, Dolby B noise-reduction system, peak indicators, timer standby. Features separate motor for tape reels; normal/CrO_2/metal bias/EQ switches; MX/ferrite heads; 2 large dual-scale VU meters; 3 peak-level LED indicators; timer standby switch; low-impedance microphone inputs. Wow and flutter 0.04% wrms; frequency response ±3 dB 40-14,000 Hz normal, to 15 kHz CrO_2, and metal tapes; S/N ratio 62 dB with Dolby on; THD 1.5% at 0 VU; fast-wind time 90 seconds with C60 cassette; 17⅓"W × 10¾"D × 4"H; 13lb $300

CR155 Double Stereo Cassette Deck

Stereo cassette deck designed for high-quality tape duplication. Features auto search function on playback-only compartment; Dolby B noise-reduction system; dc governor-controlled motors; metal tape capability; LED bargraph meters; separate tape selectors for each cassette compartment; timer standby function; hard permalloy record/playback head; separate drive motors for each compartment; record mute; dual-concentric input-level controls. Wow and flutter 0.06% wrms; frequency response ±3 dB 30-14,000 Hz normal, to 15 kHz CrO_2 and metal tapes; S/N ratio Dolby off/on 52/60 dB; THD 1.5%; input sensitivity/impedance 70 mV/50 ohms line; output-level/impedance 500 mV/5k ohms line at 0 VU; separation/crosstalk 40/70 dB; fast-wind time with C60 cassette 100 sec; power consumption 12 W; 15¾"W × 8¾"D ×4¾" H; 10 lb $230

CRW40 Double Cassette Deck

Double stereo cassette deck designed for high-quality tape duplication. Features sequential play; synchronized one-touch dubbing; Dolby B; soft-touch power-assisted transporrt controls; LED bar meters; separate tape-type selectors for each transport (metal, CrO_2, normal); separate left and right record-level controls; front-panel mic inputs; headphone output. Frequency response 30-14,000 Hz ±3 dB with normal tape, to 15 kHz with CrO_2 and metal tape; wow and flutter 0.06% wrms; S/N ratio 51 dB no Dolby, 61 dB Dolby on; THD 1.2% at 0 VU; line input sensitivity 100 mV; line impedance 50k ohm; output level 440 mV at 0 VU; output level impedance 5k ohm at 0 VU; separation 40 dB; crosstalk 70 dB. C60 fast-wind time 100 sec; power consumption 13 W. 15¾" W × 11¹⁄₁₆" D × 4¾" H; 9.9 lb $200



CRW77. Similar to CRW40, but adds high-speed synchronized dubbing; Dolby C; rec mute; auto tape selection. 15¾" W × 10" D × 4¾" H; 10 lb . $250

CR77 Stereo Cassette Deck

Metal-compatible stereo cassette deck with Dolby B and C noise-reduction systems, dual 7-LED level meters, powered mechanism. Features input-level control; metal/CrO_2/normal tape selector; record mute switch; microphone/line input selector; low-impedance microphone inputs; dc governor-controlled motor; hard permalloy record/playback head; full auto stop; LED function indicators. Wow and flutter 0.06% wrms; frequency response ±3 dB 30-14,000 Hz normal, to 15 kHz CrO_2 and metal tapes; S/N ratio Dolby off/B on/C on 52/60/70 dB; THD 1.5% at 0 VU; input sensitivity/impedance 1 mV/10k ohms mic, 100 mV/50k ohms line; output level/impedance 700 mV/2.2k ohms line; channel separation 40 dB; crosstalk 70 dB; fast-wind time 110 seconds with C60 cassette; power consumption 8 W; 15¾"W × 8¾"D × 4¾"H; 9 lb $200

CR127 Stereo Cassette Deck

Metal-compatible stereo cassette deck with soft-touch transport controls, powered mechanism, LED bargraph displays, Dolby B and C noise reduction. Features 3-position tape selector; hard permalloy record/play head; dc governor-controlled motor; timer standby function; dual concentric input-level controls; 3-digit tape counter. Wow and flutter 0.08% wrms; frequency response ±3 dB 30-14,000 Hz normal, to 15 kHz CrO_2 and metal tapes; S/N radio 52 dB Dolby off, 62 dB Dolby B, 68 dB Dolby B; THD 1.5% at 0 VU; input sensitivity/impedance 1 mV/10k ohms microphone, 70 mV/35k ohms line; output-level/impedance 700 mV/2.2 kohms line; fast-wind time 100 seconds with C60 cassette; power consumption 8 W; 17⅓"W × 10½"D × 4 ¾"H; 11 lb $200

CR356. Similar to CR127 but adds electronic solenoid controls; switchable FM/MPX filter; timer standby. Wow and flutter 0.05% wrms; S/N ratio 54 dB no Dolby, 62 dB Dolby B, 68 dB Dolby C; THD 1.4% at 0 VU; power consumption 22 W. Fast-wind with C60 90 sec. 16 lb $250

CR36 Stereo Cassette Deck

Metal-compatible stereo cassette deck with powered mechanism, Dolby B noise-reduction system, 7-LED bargraph meters. Features normal/CrO_2/metal tape selector; dc governor-controlled motor; hard Permalloy record/playback head; record mute switch; slide-type input-level, balance controls; full automatic stop, soft-eject cassette door. Wow and flutter 0.06% wrms; frequency response 30-13,000 Hz ±3 dB normal, to 14 kHz CrO_2 and metal tapes; S/N ratio Dolby off/on 52/62 dB; THD 1.5% at 0 VU; input-sensitivity/impedance 1.0 mV/10k ohms microphone, 90 mV/10k ohms line; output-level/impedance 5 V/5 kohms line; separation 40 dB; crosstalk 70 dB; fast-wind time 110 seconds with C60 cassette; power consumption 13W; 15¾"W × 8 ¾"D × 4¾"H; 7 lb $130

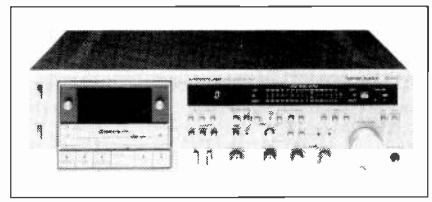
CR113 Stereo Cassette Deck

Metal-compatible stereo cassette deck with Dolby B noise-reduction system, 2-color LED bargraph meters. Features 2-position tape selector; hard permalloy record/playback head; dc governor-controlled motor; full automatic stop; separate input-level controls for each channel. Wow and flutter 0.1% wrms; frequency response ±3 dB 40-11,000 Hz normal, to 12kHz metal tape; S/N ratio Dolby off/on 48/58 dB; THD 1.8% at 0 VU; input sensitivity/impedance 0.2 mV/10k ohms mic, 100 mV/50k ohms line; output-level/impedance 1V/5k ohms; separation 40 dB; crosstalk 68 dB; fast-wind time 100 seconds with C60 cassette; power consumption 11W; 15¾"W × 9"D × 5½"H; 7.9 lb $120

HARMAN/KARDON

CD491 3-Head Cassette Deck

Metal-compatible stereo cassette deck with 3 heads, Dolby B and C noise reduction, switchable MPX filter. Features Dolby HX Professional Headroom Extension System; dual-capstan transport; ultrawideband frequency response with any tape formulation; solenoid-controlled transport; sendust record head, ferrite play head; electronic clock/counter; bidirectional auto



search; auto space; auto repeat; controllable timer; rec mute; dual 16-LED peak-indicating meters; bias/EQ selectors; bias fine trim; mic inputs; output level control; mic/line mixing; input balance; bias and record calibration test-tone generator. Wow and flutter 0.02% wrms (NAB); frequency response 20-24,000 Hz ±3 dB with any tape formulation; 17⁵⁄₁₆"W × 13½"D × 4¹³⁄₁₆"H $785

CD391 Dolby B/C/HX Pro Cassette Deck

Metal-compatible stereo cassette deck with Dolby B and C noise reduction, switchable MPX filter, 2 heads. Features Dolby HX Professional Headroom Extension System; dual-capstan transport; ultrawideband frequency response with any tape formulation; solenoid-controlled transport; sendust record/play head; bidirectional auto search; auto space; auto repeat; controllable timer; rec mute; dual 16-LED peak-indicating meters; bias/EQ selectors; bias fine trim; mic inputs; output level control; mic/line mixing; bias and

Cassette Decks

record calibration test-tone generator. Wow and flutter 0.02% wrms (NAB); frequency response 20-22,000 Hz ±3 dB, any tape formulation; 17 5/16" W × 13½"D × 4 13/16"H $575

CD291 Dolby B/C/HX Pro Cassette Deck
Metal-compatible stereo cassette deck with Dolby B and C noise reduction, switchable MPX filter, 2 heads. Features Dolby HX Professional Headroom Extension System; ultrawideband frequency response with any tape formulation; solenoid-controlled transport; sendust record/play head; auto repeat; rec mute; dual 12-LED peak-indicating meters; bias/EQ selectors; bias fine trim; mic inputs. Wow and flutter 0.05% wrms (NAB); frequency response 20-21,000 Hz ±3 dB with any tape formulation; 17 5/16" × 13½"D × 4 13/16"H $435

CD191 Dolby B/C Cassette Deck
Metal-compatible stereo cassette deck with Dolby B and C noise reduction, switchable MPX filter, 2 heads. Features ultrawideband frequency response with any tape formulation; solenoid-controlled transport; sendust record/play head; auto repeat; dual 12-LED peak-indicating meters; bias/EQ selectors; bias fine trim; mic inputs; input balance. Wow and flutter 0.05% wrms (NAB); frequency response 20-21,000 Hz ± 3 dB, with any tape formulation; 17 5/16" W × 13½"D × 4 13/16"H $345

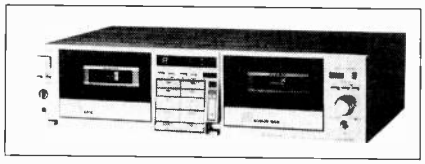
CD91 Dolby B Cassette Deck
Metal-compatible stereo cassette deck with Dolby B noise reduction, switchable MPX filter, 2 heads. Features ultrawideband frequency response with any tape formulation; solenoid-controlled transport; sendust record/play head; dual 12-LED peak-indicating meters; bias/EQ selectors. Wow and flutter 0.05% wrms (NAB); frequency response 20-20,000 Hz ± 3dB, any tape formulation; 17 5/16" W × 13½"D × 4 13/16" H $265

HITACHI

D-2200M Dolby B/C Cassette Deck
Microcomputer-controlled cassette deck with Dolby B and C noise reduction. Features Hitasenrite record and play head; automatic tape response system; metal compatibility; direct-drive unitorque motor; electronic digital counter; dual-capstan transport. Wow and flutter 0.019%; frequency response (±3 dB) 30-18,000 Hz normal and FeCr, 30-20,000 CrO_2 and metal; S/N ratio (A-weighted, metal tape, ref. 3% THD) 61 dB Dolby off, 69 dB Dolby B, 75 dB Dolby C; crosstalk (channel, at 1 kHz) >40 dB; distortion 0.8% (1 kHz, 160 nWb/m). 17 1/8" × 5 7/8" × 11 1/8"; 16 lbs $750

D-E99 Stereo Cassette Deck
Dual-capstan 2-motor stereo cassette deck with ATRS, 3 heads, Dolby B and C noise-reduction systems. Features IC-logic feather-touch transport controls; metal-tape capability; electronic counter with elapsed time; automatic reset memory rewind; 2-color fluorescent meters with peak hold; automatic record mute; facility for optional remote control. Wow and flutter 0.03%; S/N ratio 75 dB with Dolby C on; 17⅛"W × 11⅛"D × 4 15/16"H; 13 lb 14 oz . $520

D-W700 Double Stereo Cassette Deck
Double stereo cassette deck designed for duplicating programs from one cassette to another. Features Dolby B and C noise-reduction systems; IC-logic feather-touch transport controls; random programming;



dubbing/playback; repeat play; 2 dc motors; facility for optional remote control; 17⅛"W × 11⅛"D × 4 15/16"H; 13 lb $370

D-E7 Dolby Three-Head Cassette Deck
Stereo cassette deck with three heads and Dolby B and C noise reduction. Features automatic memory rewind; feather-touch controls; compatible with normal, chrome, metal tapes; remote-control capability. Wow and flutter 0.038%; frequency response (±3 dB) 30-17,000 Hz normal, 30-18,000 CrO_2, 30-19,000 metal; S/N ratio (A-weighted, metal tape, ref. 3% THD) 61 dB Dolby off, 69 dB Dolby B, 75 dB Dolby C; crosstalk (channel, at 1 kHz) >30 dB; distortion 0.8% (1 kHz, 0 VU). 17 1/8"W × 4 5/16"H × 10 11/16"D; 10 lbs $350

D-RV7 Auto-Reverse Cassette Deck
Stereo cassette deck with auto-reverse mechanism that provides independent azimuth alignment for each side of a cassette. Features Dolby B and C; 3 motors; IC logic control; infrared tape-end sensor; continuous play; playing selections in any order; automatic sampling of each selection; auto bias and EQ; electronic tape counter; feather-touch controls; remote-control jack. Wow and flutter 0.04%; frequency response (±3 dB) 40-14,000 Hz normal, 40-15,000 CrO_2, 40-17,000 metal; S/N ratio (A-weighted, metal tape, ref. 3% THD) 60 dB Dolby off, 68 dB Dolby B, 74 dB Dolby C; crosstalk (channel, at 1 kHz) >30 dB; distortion 0.8% (1 kHz, 160 nWb/m). 17 1/8"W × 4 15/16"H × 10 11/16"D; 10 lbs... $300

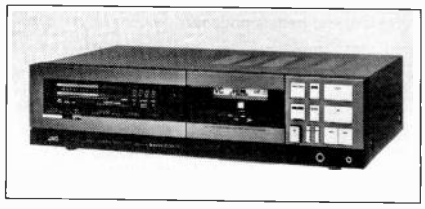
D-E3 Dolby B/C Cassette Deck
Stereo cassette deck with Dolby B and C noise reduction and feather-touch controls. Features 12-part LED meters; auto rec mute; metal compatibility; optional remote control (RB100); timer capability; output-level control. Wow and flutter 0.04% wrms; S/N ratio 72 dB with Dolby C. 17 1/8"W × 4 5/16"H × 8 5/8"D; 8 lbs $200

D-E2 Dolby B/C Cassette Deck
Stereo cassette deck with Dolby B and C and soft-touch mechanism. Features metal compatibility; rewind auto play; 12-part LED meters; timer capability; output level control. Wow and flutter 0.05% wrms; S/N ratio 72 dB with Dolby C; 17 1/8"W × 4 5/16"H × 8 5/8"D; 7 lbs $170

D-E1 Soft-Touch Cassette Deck
Stereo cassette deck with soft-touch mechanism and Dolby B noise reduction. Features metal compatiblity; rewind auto play; master rec level control and independent rec balance control; timer capability; auto stop; mic jacks. Wow and flutter 0.05%; frequency response (±3 dB) 30-14,000 Hz normal, 30-15,000 CrO_2, 30-16,000 metal; S/N ratio (A-weighted, metal tape, ref. 3% THD) 58 dB Dolby off, 66 dB Dolby B, crosstalk (channel, at 1 kHz) >30 dB; distortion 1.0% (1 kHz, 0 VU) 17 1/8" × 4 3/8" × 8 5/8"; 7 lbs $140

JVC

DD-V9 Auto-Reverse Cassette Deck
Three-head stereo cassette deck with "Flip Reverse" auto-reverse swivel head. Features Dolby B and C; Sen-Alloy recording head; 3 motors; Pulse Servo direct-drive capstan motor; auto bias and equalization; auto sensitivity; index scan; blank search; digital display for remaining time, tape used, time elapsed and



program display; FL meters with peak hold; music scan; auto rec mute; optional remote control . $800

DD-V7 Auto-Reverse Cassette Deck
Stereo cassette deck with "Flip Reverse" auto-reverse swivel head. Features Dolby B and C; Sen-Alloy recording and play head; multi-function counter; index scan; blank search; block repeat; multi-music scan; 12-part LED meters with peak hold; auto rec mute; auto tape selector; optional remote control ... $500

KD-D55 Stereo Cassette Deck
Metal-compatible front-loading stereo cassette deck with Dolby B (ANRS) and Dolby C noise reduction. Features 3 heads, electronic digital counter; full-logic transport controls; digital multifunction counter that counts tape, shows elapsed/remaining tape time, music scan countdown; multiple music scan system that allows up to 20 selections to be skipped; 7-LED multi-peak meters; record mute; output-volume control; timer function; gear/oil-damped cassette door. Wow and flutter 0.05% wrms; frequency response ±3 dB 30-16,000 Hz metal and CrO_2, to 15 kHz normal tape, S/N ratio Dolby C off/on 58/78 dB with metal tape; THD 1.0% with metal tape at 0 VU, 1kHz; input sensitivity/impedance 0.2 mV/600-10k ohms mic, 80 mV/100k ohms line; output level/impedance 500 mV/5k ohms line, 0.6 mW/matching impedance 8-1k ohms; power consumption 20 W; fast-wind time 110 seconds with C60 cassette; 17⅛"W × 11"D × 4 5/16"H; 12.1 lb $380

KD-W5 Double Cassette Deck
Stereo cassette deck with two full-logic tape transports for dubbing. Features double-speed dubbing; Synchro Start mechanism; continuous play; tape/mic and line/mic mixing; music scan; Dolby B (ANRS) noise reduction; pitch control on deck A (±10%); 7-LED multi-peak meters; auto rec mute $340

KD-V44 Auto-Reverse Cassette Deck
Stereo cassette deck with "Flip Reverse" auto-reverse swivel head. Features Dolby B (ANRS) and C noise reduction; 2-motor full-logic tape tranport; Sen-Alloy recording and play head; music scan; 7-part LED meters with peak hold; auto rec mute..... $330

D-M3 Stereo Microcassette Deck
Two-speed (2.4 and 1.2 cm/second) stereo microcassette deck with 2-motor, full-logic transport. Dolby B (ANRS) noise reduction, compact cabinet design. Features 7-LED multi-peak signal-level displays; music scan; record mute; timer standby; gear/oil-damped cassette door; headphone jack. Wow and flutter 0.08% wrms; frequency response ±3 dB at 2.4 cm/sec 40-12,500 Hz metal, to 10 kHz normal tape; S/N ratio Dolby off/on 52/62 dB with metal tape; input sensitivity/impedance 0.2 mV/600-10K ohms mic, 80 mV/100K ohms line; output level/impedance 300 mV/5k ohms line, 0.3 mW/matching 8-1k ohms headphones; power consumption 19 W; fast-wind time 120 seconds with MC60

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.

microcassette; 13⅛"W × 10³⁄₁₆"H × 2⁵⁄₁₆"H; 8.8 lb $330

D-E3 Stereo Cassette Deck
Compact stereo cassette deck with motor-driven drawer cassette compartment. Features full-logic transport; single music scan; 7-LED multi-peak signal level meters; Metaperm record/play head; metal-tape capability; 2⁵⁄₁₆"H $300

KD-V40 Auto-Reverse Cassette Deck
Stereo cassette deck with "Flip Reverse" auto-reverse swivel head. Features Dolby B (ANRS) and Dolby C noise reduction; 2-color FL spectro-peak meters to show peak levels at 5 frequency ranges, left and right levels, and overall level; logic control mechanism; soft-touch controls; music scan; SA record/play head; electronic counter; rec mute $290

KD-V33 Auto-Reverse Cassette Deck
Stereo cassette deck with "Flip Reverse" auto-reverse swivel head. Features Dolby B (ANRS) and Dolby C noise reduction; 7-part LED multi-peak meters; logic control mechanism; soft-touch controls; music scan; rec mute $220

KD-V22 Dolby C Cassette Deck
Stereo cassette deck with Dolby B (ANRS) and C noise reduction. Features full-logic controls; Metaperm head; 6-LED multi-peak indicator; metal-tape compatibility $180

KD-V11 Dolby B Cassette Deck
Stereo cassette deck with Dolby B (ANRS) noise-reduction. Features full-logic controls; Metaperm head; 6-LED multi-peak indicator $140

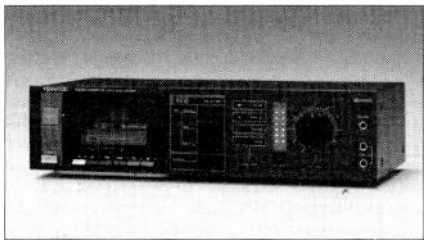
Remote-Control Unit
R-70E. For DD-V9 and DD-V7 ..... $50

KENWOOD

KX-71R Cassette Deck
Auto-reverse cassette deck with electronic full-logic controls. Features Dolby B and C noise reduction; full repeat and cue music repeat; permalloy head with sendust guard erase; 7-LED peak level meters; metal tape compatibility. Available in silver or black $320

KX-41 Cassette Deck
Stereo cassette deck with soft mechanical logic controls. Features Dolby B and C; permalloy head with sendust guard erase; 7-LED peak level meters; metal tape compatibility. Available in silver or black $225

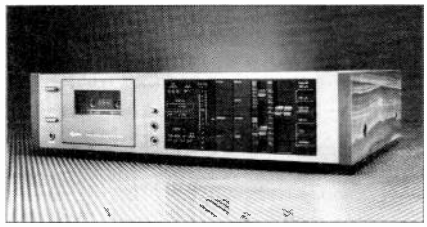
KX-31 Cassette Deck
Stereo cassette deck with soft mechanical logic controls; Dolby noise reduction; permalloy head with



sendust guard erase; 7-LED peak level meters; metal tape compatibility. Available in silver or black $180

KYOCERA

D-801 Stereo Cassette Deck
Stereo cassette deck with Dolby B and C noise-reduction systems. Features normal, CrO_2, metal bias/equalization tape selector; fine bias control; 3-motor, 2-capstan drive system; automatic program mute recording; sendust-alloy record/play head; soft-touch transport controls; 3-function electronic digital counter (elapsed time/time remaining/stopwatch); bar-graph level meters with peak hold; auto memory stop/replay/repeat. Wow and flutter 0.02% wrms, frequency response 20-22,000 Hz±3 with metal tape; S/N ratio (A-weighted) 68 dB with Dolby B,78 dB with Dolby C $590



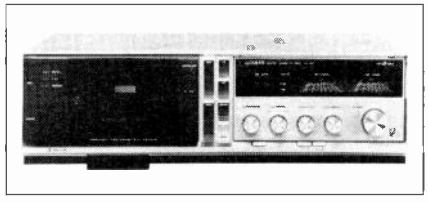
D-601. Similar to D-801 except no auto search, no dual capstan, mechanical tape counter. Wow and flutter 0.035% wrms $450

Cybernet DD-701 Dubbing Cassette Deck
Stereo high-speed copy dubbing cassette deck with mic echo mixer, automatic tape select. Features 2-speed dubbing capability; adjustable echo effect, full automatic stop; Quick Start and Automatic Recording Stop; timer standby with optional timer; automatic program jump system; external processing loop capablity; rec mute, cue and review; Dolby B noise-reduction system bargraph signal-level meters. Wow and flutter 0.04% wrms; frequency range 30-20,000 Hz with metal tape; S/N ratio 64 dB with Dolby on $425

LUXMAN

KX-102 Stereo Cassette Deck
Computerized ServoFace stereo cassette deck with dbx noise-reduction system. Features 3-head design; double dbx circuitry for both tape and disc playback; Duo Beta circuitry for minimum negative feedback, elimination of transient intermodulation distortion; 15% bias control; peak-level flourescent meters; Dolby B noise-reduction system; computerized tuning system that selects best bias level for tape used; automatic repeat, rewind, play; facility for using wireless remote controller. Wow and flutter 0.04% wrms; frequency response ±3 dB 20-22,000 Hz with metal tape; S/N ratio Dolby B/dbx 68/94 dB; THD 0.7% with LH tape at 400 Hz, 0 dB test level $1000

KX-101 Stereo Cassette Deck
Full-logic, solenoid-controlled stereo cassette deck with Dolby B and C noise-reduction systems. Features fluorescent indicators; Duo Beta circuitry; 2 sendust heads; metal-tape capability; ServoFace design. Wow



and flutter 0.04% wrms; frequency response ±3 dB 20-22,000 Hz with metal tape; S/N ratio with Dolby C on, metal tape 73 dB; THD 0.7% with LD tape at 400 Hz, 0 dB test level $500

K-118 Stereo Cassette Deck
Stereo cassette deck with Duo Beta circuitry, dbx noise-reduction and disc-decoder systems, Dolby B noise-reduction system. Features fluorescent tape counter; normal/CrO_2/metal tape selector; full-logic solenoid-controlled transport with remote-control capability; fluorescent peak-level indicators automatic rewind/play/repeat; switchable MPX filter. Wow and flutter 0.04%; wrms; frequency response ±3 dB 20-17,000 Hz normal, to 18 kHz CrO_2, to 20 kHz metal tape; S/N ratio with metal tape, no NR/Dolby/dbx 58/67/93 dB; overall distortion 0.6% with LH tape at 1 kHz, 0 dB; input sensitivity 60 mv line, 0.3 mV mic; power consumption 33 W; 18¼"W × 10½"D × 5¼"H; 13.2 lb $500

NEED MORE INFORMATION?

Write directly to the manufacturer or distributor. A list of names and addresses starts on page 36.

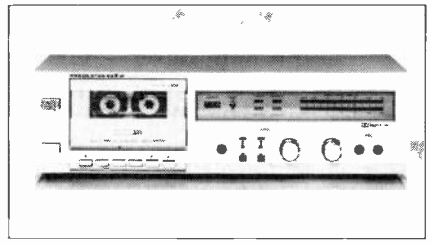
MARANTZ

SD-530 Dolby B/C Cassette Deck
Dolby B and C stereo cassette recorder with 2-motor feather-touch operation. Features automatic quick-wind reverse, record, and play; gold-plated input/output jacks; super-hard metal alloy record/playback heads; 31-tune quick music sensor; auto song and side repeat; auto tape slack take-up; peak-reading LED meters; wireless remote control capability with optional RC 430/RMC 12; memory rewind. Wow and flutter 0.05%; frequency response (overall: -20 dB below 0 VU) ±3 dB 35-14,000 Hz normal, to 15 kHz CrO_2, and to 16 kHz metal; S/N ratio 70 dB with Dolby C, 60 dB with Dolby B, 52 db with Dolby off; output line level/impedance 560 mV/3.5 kilohms; input line sensitivity/impedance -27 dBV/50 kilohms; mic level/impedance -70 dBV/6.5 kilohms; 16⅜" × 3¹⁰⁄₁₁" × 11²⁹⁄₃₂"; 8 lbs $350

SD-420 Dolby B/C Cassette Deck
Stereo cassette deck with Dolby B and C noise-reduction systems. Features soft-touch transport controls; gold-plated input and output connectors; multiple program Compuskip forward and backward; repeat playback; fine bias control; LED indicators for all transport controls and for tape type, Dolby; timer standby; LED peak signal-level displays; metal/CrO_2/normal tape selector; record mute; tape counter. Wow and flutter 0.05% wrms; frequency response ±3 dB 40-12,500 Hz normal, to 15 kHz CrO_2, to 16 kHz metal tape; S/N ratio no NR/Dolby B/Dolby C 52/62/72 dB; input sensitivity/impedance -24 dBV/50k ohms line, -70 dBV/10k ohms mic; output level/impedance 600 mV/5k ohms line, 35 mV/240 ohms headphones; 16⅝"W × 11⅞"D × 3⅞"H $300

SD-320 Dolby B/C Cassette Deck
Stereo cassette deck with Dolby B and C noise-reduction systems. Features soft-touch transport controls; gold-plated input and output connectors; LED peak-signal level displays; normal/CrO_2/metal tape selector; record mute; timer standby; tape counter. Wow and flutter 0.07% wrms; frequency response ±3 dB 40-12,500 Hz normal, to 14 kHz CrO_2, to 15 kHz metal tape; S/N ratio no NR/Dolby B/Dolby C 52/62/72 dB; input sensitivity/impedance -24 dBV/50k ohms line, -70 dBV/10k ohms mic; output level/impedance 600 mV/5k ohms line, 35 mV/100 ohms headphones; 16⅝"W × 7½"D × 3⅞"H $225

SD-321 Stereo Cassette Deck
Metal-ready stereo cassette deck with Dolby B and C. Features soft-touch operation; peak-reading LED meters; 3-digit tape counter; 3-position tape selector; timer standby; gold plated input/output plugs. Wow and flutter 0.05%; frequency response (overall: -20 dB below 0 VU) ±3 dB 30-14 kHz normal, to 15 kHz



CrO_2, to 16 kHz metal; S/N ratio Dolby B/C on 70 dB/62 dB, Dolby off 52 dB; output line level/impedence 500mV/ 5 kilohms; line input (level at 0 VU) sensitivity/impedence is -20 dBV/ 50 kilohms; mic level/impedence -65 dBV/5 kilohms; 16⅜" × 3⅞" × 7½"; 7 lbs $185

SD-221. Same as SD-321 except without Dolby C; 6 lbs $130

Cassette Decks

SD-225 Stereo Cassette Deck
Stereo cassette deck with Dolby B noise-reduction system. Features soft-touch transport controls; timer standby; LED peak-signal level meters; normal/CrO_2/metal tape selector; record mute; tape counter. Wow and flutter 0.08% wrms; frequency response ±3 dB 40-12,500 Hz normal, to 14 kHz CrO_2, to 15 kHz metal tape; S/N ratio Dolby off/on 52/62 dB; input sensitivity/impedance -24 dBV/50k ohms line, -70 dBV/10k ohms mic; line output level/impedance 600 mV/5k ohms; 16⅝"W × 7½"D × 3⅞"H ... $179

MCS by JC PENNEY

MCS 3590 dbx Cassette Deck
Two-motor stereo cassette deck with dbx noise reduction in addition to Dolby B and C. Features feather-touch function controls; fluorescent meters; electronic tape counter; remaining time signal; program search; record mute. 16⁷/₈"W × 3⁷/₈"H × 10¾"D $300

MCS 3588 Auto-Reverse Cassette Deck
Auto-reverse stereo cassette deck with Dolby B noise-reduction system. Features continuous automatic-reverse control; quick reverse control; mechanical soft-touch transport controls; timer standby; LED record-level meters; record mute; metal tape capability. Wow and flutter 0.08%; S/N ratio Dolby off/on 51/60 dB; separation/adjacent-track crosstalk 57/57 dB; power consumption 11.2 W; 16.5"W × 10.6"D × 4.3"H; 9.5 lb $280

MCS 3566 Double Cassette Deck
Two-transport stereo cassette deck with high-speed dubbing capability. Features soft-touch mechanical operation; Dolby B noise reduction; auto program search; one-touch dubbing control; 2 frequency generator servo motors; playback and record logic; record mute. 17"W x 4⅞"H × 11¼"D $260

MCS 3565 Real-Time Cassette Deck
Three-motor stereo cassette deck with electronic feather-touch transports. Features Dolby B and C noise reduction; fluorescent meters; digital tape counter; program search; record mute; automatic MPX filter switch. 16⁹/₁₀"W × 4¹/₃"H × 10³/₅"D $250

MCS 3556 Solenoid Cassette Deck
Stereo cassette deck with feather-touch solenoid transports and both Dolby B and C noise reduction systems. Features fluorescent meters; digital tape counter; program search; metal-tape compatibility. 16.9"W × 4.3"H × 8.2"D..... $200

MCS 3544 Stereo Cassette Deck
Stereo cassette deck with Dolby B and C noise reduction. Features soft-touch operation; fluorescent meters; digital tape counter; auto rewind; auto stop; one-touch recording; metal-tape compatibility. 16⁷/₈"W × 4⁵/₁₆"H × 9³/₁₆"D $180

MCS 3543 Stereo Cassette Deck
Soft-touch transport stereo cassette deck with Dolby B noise-reduction system. Features automatic shut-off; VU record meters; metal-tape capability; LED record indicator. Wow and flutter 0.06% wrms; frequency response ±3 dB 50-13,000 Hz normal, to 14 kHz CrO_2, to 15 kHz metal tape; S/N ratio Dolby off/on 60/60 dB; input sensitivity 100 mV line, 0.45 mV mic; power consumption 10 W; 16¾"W × 7½"D × 4¾"H $150

MCS 3522 Mid-Size Cassette Deck
Stereo cassette deck with soft-touch transport mechanisms and electronic servo DC motor. Features LED

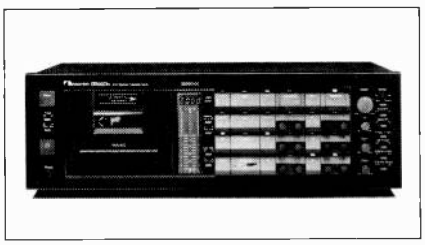
record-level indicator; Dolby B noise reduction; metal-tape compatibility; digital tape counter; auto shutoff. 15³/₄"W × 4½"H × 8¼"D $150

MCS 3531 Soft-Touch Cassette Deck
Stereo cassette deck with soft-touch transport control and Dolby B noise reduction. Features 5-LED peak level display meters; automatic program search; metal-tape compatibility; permalloy head. 15³/₈"W × 4⅝"H × 8⅝"D..... $130

NAKAMICHI

1000ZXL Computing Cassette Deck
Front-loading computer-controlled discrete stereo cassette deck with Dolby B noise-reduction system, double-capstan transport, 3 heads. Microcomputer automatically calibrates azimuth, bias, level, equalization of any quality tape; features 4 tape memories for recording conditions obtained by computer; 15 program RAMM with 30 command memories via high-speed bidirectional search; LED status indicators. Additional features include 70/120-μsec equalization selector; under/normal/over bias set selector; 400 Hz test-tone oscillator; quartz-controlled bias oscillator; multiplex and subsonic filter switches; dual fluorescent recording level bargraph displays with peak hold, VU/peak switch; 2-channel mic, line input, and output-level vertical slide controls; tape/source-monitoring; LED 4-digit tape counter with memory stop/play; pitch control; timer record/play with external audio timer; C-MOS logic function controls powered by motor-driven cam; direct-coupled recording and playback amplifiers, double NF equalizer circuitry; 3 microphone inputs for tri-mic recording, mic/line mixing; provision for external noise-reduction system. Wow and flutter 0.04% wrms; frequency response 10-25,000 Hz ±3 dB; EIA rack-mounting; 20¾"W × 12¹¹/₁₆"D × 10⅛"H..... $3800

Dragon Auto-Reverse Cassette Deck
Microprocessor-controlled auto-reverse 3-head stereo cassette deck with Dolby B and C noise reduction. auto azimuth correction system automatically and



continuously aligns the play head to the recorded track to ensure perfect play in both directions. Features assymetrical diffused-resonance transport (incorporating dual capstans driven by 2 different super-linear-torque direct-drive motors); auto retracting slot guides; tape-pad lifter; auto tape slack takeup; 2-speed cueing; 2-speed master fader; auto record pause; record level and bias calibration controls with 2-tone oscillator; dual-gap ferrite/sendust erase head; separate tape and equalization switches for ZX, SX, and EX tape; direct-coupled recording and playback amps with double NF circuitry; left, right, master input levels; output level control; rec mute; high-output headphone jack; defeatable subsonic filter; LED counter with memory stop and repeat; remote control with optional RM-20. Minimum specs in forward or reverse: frequency response 20-22,000 Hz ±3 dB with ZX tape; wow and flutter 0.019% weighted wrms; S/N ratio 70 dB Dolby B, 72 dB Dolby C at 400 Hz, 3% THD A-weighted with ZX tape, 0 dB; input sensitivity/impedance 50 mV/50 kohms line; output level/impedance 1 V/2.2k ohms line. 17³/₄"W × 5⁵/₁₆"H × 11¹³/₁₆"D; 21 lbs $1850

ZX-9 Stereo Cassette Deck
Super-tuned version of ZX-7 deck (below) with assymetrical capstans driven by a unique super-linear-torque direct-drive motor to totally eliminate cogging. Electronics improved by direct coupling the playback as well as the record amp and upgrading the remaining capacitors. Specs same as for ZX-7 except for wow and flutter of 0.022% $1550

ZX-7 Stereo Cassette Deck
Microprocessor-controlled discrete 3-head, double-capstan stereo cassette deck with Dolby B and C noise-reduction systems. Features microprocessor-controlled transport; master fader; diffused-resonance transport; asymmetrical dual capstan; LED peak-level meters with -40 to +10 dB range; 4-digit LED tape counter; high-quality amplification with special equalizer and double-NF monitor; record mute; defeatable MPX filter; facility for optional RM-20 remote control; timer record/play capability. Wow and flutter >0.08% weighted peak, >0.04% wrms; frequency response ±3 dB 20-20,000 Hz SX and EXII, to 21 kHz ZX tape; S/N ratio Dolby B/C on >66/>72 dB; THD <1% with SX and EXII tape, <0.8% with ZX tape; 17¾"W × 11¹³/₁₆"D × 5⁵/₁₆"H; 21 lb $1250

LX-5 Stereo Cassette Deck
Discrete 3-head stereo cassette deck with Dolby B and C noise-reduction systems. Features micro-processor-controlled transport; master fader; diffused-resonance transport; asymmetrical capstans; 50-dB LED peak-indicating meters; 4-digit electronic LED tape counter; bias tune control; defeatable MPX filter; record mute; facility for optional RM-20 remote controller; timer record/play capability. Wow and flutter <0.11% weighted peak, <0.06% wrms; frequency response ±3 dB 20-20,000 Hz with ZX, SX, EXII tapes; S/N ratio Dolby B/C on >64/>70 dB; THD <0.9% ZX, <0.1% SX and EXII tape; 17¾"W × 12 ¹/₁₆"D × 5⁵/₁₆"H; 18 lb 12 oz $850
LX-3. Similar to LX-5 except 2-head design; S/N ratio Dolby B/C on >62/>68 dB; THD <1.0% ZX, <1.2% SX and EXII tape..... $595

BX-2 Dolby C Cassette Deck
Microprocessor-controlled stereo 2-head cassette deck with Dolby B and C noise reduction. Features 10,000-hr hyperbolic-contour laminated sendust record/play head; dual-gap erase head; cam transport (with 3 motors); double NF circuitry with memory play; rec mute; master record-level control; output control. Available in black or silver. 30-step alignment and calibration procedure guarantees minimum specs: frequency response 20-20,000 Hz ±3 dB; wow and flutter 0.06% wrms; THD <1.0% with ZX tape; separation/crosstalk 36/60 dB. 16¹⁵/₁₆"W × 4⁵/₁₆"H × 9⁷/₈"D..... $450
BX-1. Similar to BX-2 but without Dolby C ... $299

RM-20 Wired Remote Control
Allows remote operation of record, play, pause, stop, fast forward, rewind; and reverse operation with Dragon. For LX, ZX, 580, 680 series, 700XE, Dragon, and 1000ZXL decks $50

NIKKO

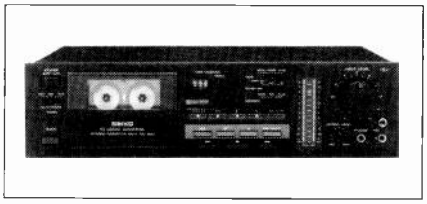
ND-1000C 3-Head Cassette Deck
Three-head, 2-motor stereo cassette deck with computerized tape-evaluation system for automatic bias, level, and sensitivity adjustment. Features source/tape monitoring; full-logic transport controls; facility for optional remote-control unit; normal/CrO_2/metal tape selector; dual 12-section LED peak-level dis-

Tape-recording terms are defined in the vocabulary on page 32. For an explanation of abbreviations, turn to the list on page 35.

plays; output-level control; Dolby B and C noise reduction; MPX filter; automatic memory stop/play function; timer record/play capability. Rack mountable with optional kit. Available in black or silver. 17.3"W × 9.9"D × 4.7"H $630

ND-800 3-Head Cassette Deck

Stereo 3-head cassette deck with 2-motor direct-drive transport operated by IC-logic controls. Features facility for optional remote-control unit; dual 12-section LED peak-level displays; output level control; Dolby B noise-reduction system; MPX filter; bias/EQ switches



for normal/CrO_2/metal tape; automatic rewind; automatic memory stop/play at preselected points on tape; timer record/play facility. Rack mountable with optional kit. Available in black or silver. 17.3"W × 9.9"D × 4.7"H $380

ND-700II dbx Cassette Deck

Stereo cassette deck with dbx and Dolby B noise-reduction systems. Features memory rewind; dual 9-section LED peak-level signal displays; power-assisted soft-touch tape-function buttons; one-button recording system; output level control; cue and review for fast location of recordings; MPX filter; 2-way dbx® NR system that also features expanded dynamic range; removable cassette-compartment door. Rack mountable with optional kit. Available in black or silver. 17.3"W × 9.9"D × 4.7"H..... $320

ND-620 Stereo Cassette Deck

Stereo cassette deck with dual-motor IC logic-control tape-transport mechanism. Compatible with normal, CrO_2, and metal tape. Features dual 5-section LED peak signal displays; Dolby B noise-reduction system; ferrite 2-gap erase head; timer record/play capabiltiy; super-hard permalloy head; remote controllable with optional kit; removable cassette-compartment door. Silver. 17.3"W × 10.6"D × 4.4"H..... $240

ND-520 Stereo Cassette Deck

Stereo cassette deck with Dolby B noise-reduction system. Features LED peak signal-level meters; cue and review; power-assisted transport controls. Silver. 17.3"W × 4.3"H × 10.0"D $200

ONKYO

Integra TA-2070 3-Head Cassette Deck

Metal-compatible 3-head stereo cassette deck with Dolby B and C noise reduction. Features tape/source monitoring; sendust heads; brushless direct-drive 3-motor tape transport; digital tape counter that indicates elapsed or remaining time; automatic Accubias; feather-touch transport controls; 2-color fluorescent signal meters; automatic space button; memory stop/play; facility for optional remote-control unit. Wow and flutter 0.021% wrms; frequency response 20-16,000 Hz ±3 dB normal, to 18 kHz CrO_2, to 19 kHz metal tape; S/N ratio no NR/Dolby B/Dolby C 60/70/80 dB with metal tape; input sensitivity/impedance 0.3 mV/400-50k ohms mic, 50 mV/50k ohms line; output-level/impedance 775 mV/>50k ohms line; 1 V/8-200 ohms headphones; power consumption 45 W; fast-wind time 90 secs with C60 cassette; 17 11/16"W × 15 7/16"D × 3 15/16"H; 20.9 lb $700

Integra TA-2066 Dolby B/C Cassette Deck

Microcomputer-controlled stereo cassette deck with Dolby B and C noise reduction and Accubias system to set correct bias for virtually any cassette tape. Features 3 motors; 3 permalloy heads; auto music control system; switchable EQ for normal, CrO_2, metal tape; electronic tape counter; memory stop and play; large feather-touch transport buttons; timer recording and play; remote-control capability; available in black or silver. Wow and flutter 0.035% wrms; frequency response 25-16,000 Hz ±3 dB normal, to 18 kHz CrO_2, to 20 kHz metal tape; S/N ratio (no NR) 60 dB with metal tape, with Dolby B, NR is 10 dB above 5 kHz and 5 dB at 1 kHz, with Dolby C, NR is 20 dB at 5 kHz; input sensitivity/impedance 50 mV/50k ohms line; output-level/impedance 1100 mV (0 dB)/>50k ohms line; power consumption 40 W; 17 1/8"W × 14 5/8"D × 4 3/8"H; 14.8 lbs $480

Integra TA-R77 Auto-Reverse Cassette Deck

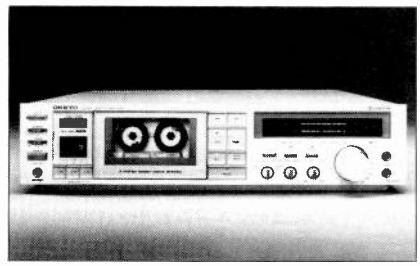
Microcomputer-controlled stereo cassette deck with quick reverse (changes tape direction in less than 1 sec). Features Dolby B and C; 3 transport modes (one side, both sides, or continuous); auto music control system to sample selections; sendust record/play head; auto space rec mute; large feather-touch transport buttons; electronic tape counter; 3 DC servo motors; compatible with normal, CrO_2, and metal tape; available in black or silver. Wow and flutter 0.05% wrms; frequency response 30-15,000 Hz ±3 dB normal, to 17 kHz CrO_2, to 18 kHz metal tape; S/N ratio (no NR) 60 dB with metal tape, with Dolby B, NR is 10 dB above 5 kHz and 5 dB at 1 kHz, with Dolby C, NR is 20 dB at 5 kHz; input sensitivity/impedance 50 mV/50k ohms line; output-level/impedance 500 mV (0 dB)/>50k ohms line; power consumption 30 W; 17 1/8"W × 14 3/8"D × 4 3/8"H; 14.8 lbs .. $400

TA-2055 3-Motor Cassette Deck

Metal-compatible stereo cassette deck with 3-motor direct-drive system, C90/C60/C46 tape-length selectors, digital real-time counter. Features display of remaining or consumed tape time; 5-second automatic space on record; hard permalloy record/play head; Accubias to fine tune recording bias for any type of tape; Dolby B and C noise-reduction systems; feather-touch transport controls; memory stop/play; 2-color LED peak level meters; timer record/play; facility for optional remote control. Wow and flutter 0.035% wrms; frequency response ±3 dB 20-15,000 Hz normal, to 18 kHz CrO_2, to 19 kHz metal tape; S/N ratio no NR/Dolby B/Dolby C 60/70/80 dB; input sensitivity/impedance 0.3 mV/5k ohms mic, 50 mV/50k ohms line; output-level/impedance 1100 mV/>50K ohms line; headphone output impedance 8-200 ohms; power consumption 28 W; fast-wind time 90 secs with C60 cassette; 16 1/2"W × 14 9/16"D x 3 15/16" H; 14.8 lb $360

TA-2044 3-Motor Cassette Deck

Three-motor stereo cassette deck with full logic-control silent mechanism. Features Dolby B and C; permalloy head; auto music control system; auto space rec mute; 10-part LED meters; timer stand-by; compatible with normal, CrO_2, metal tape. Wow and flutter 0.04% wrms; frequency response 30-15,000 Hz ±3



dB normal, to 16 kHz CrO_2, to 17 kHz metal tape; S/N ratio (no NR) 60 dB with metal tape, with Dolby B, NR is 10 dB above 5 kHz and 5 dB at 1 kHz, with Dolby C, NR is 20 dB at 5 kHz; minimum input level 50 mV line; input impedance 50k ohms line; output-level/impedance 500 mV (0 dB)/>50k ohms line; fast-wind time 90 secs with C60 17 1/8"W × 14 5/8"D × 4 3/8"H; $300

TA-2035 Dolby B/C Cassette Deck

Microcomputer-controlled 3-motor stereo cassette deck with Dolby B and C noise-reduction systems. Features automatic music search; automatic space on record; automatic tape selection; hard permalloy record/play head; Accubias fine bias tuning; timer switch; full automatic stop; 2-color LED peak-level displays; feather-touch transport controls; facility for op-

Cassette Decks

1

tional remote control. Wow and flutter 0.045% wrms; frequency response ±3 dB 30-14,000 Hz normal, to 16 kHz CrO_2, to 17 kHz metal tape; S/N ratio no NR/Dolby B/Dolby C 60/70/80 dB; input sensitivity/impedance 0.3 mV/5k ohms mic, 50 mV/50k ohms line; output-level/impedance 350 mV/>50k ohms line; headphone output impedance 8-200 ohms; power consumption 20 W; fast-wind time 90 secs with C60 cassette; 16½"W × 10⅝"D × 3¹⁵⁄₁₆"H; 9.9 lb $300

TA-2033 Dolby B/C Cassette Deck

Stereo cassette deck with Dolby B and C noise reduction. Features auto music control system; auto tape selector; full logic-control mechanism; hard permalloy head; 7-part LED meters; timer stand-by; DC servo motor; compatible with normal, CrO_2, metal tapes. Wow and flutter 0.05% wrms; frequency response 20-14,000 Hz ±3 dB normal, to 15 kHz CrO_2, to 16 kHz metal tape; S/N ratio (no NR) 60 dB with metal tape, with Dolby B, NR is 10 dB above 5 kHz and 5 dB at 1 kHz, with Dolby C, NR is 20 dB at 5 kHz; minimum input level 50 mV line; input impedance 50k ohms line; output-level/impedance 500 mV (0 dB)/>50k ohms line; power consumption 18 W; fast-wind time 90 secs with C60 tape. 16½"W × 10⅝"D × 4³⁄₈"H; 10.6 lbs..... $250

TA-2022. Similar to TA-2033 except lacks auto music control system and auto tape selector. Also available in black $200

TA-2015 Dolby B/C Cassette Deck

Computer-controlled 3-motor stereo cassette deck with Dolby B and C noise-reduction systems. Features automatic music search system; automatic space button in record; automatic tape detection system; hard permalloy record/play head; Accubias fine bias tuning; timer switch; full automatic stop; 2-color LED peak-level meters; feather-touch transport controls; facility for optional remote control. Wow and flutter 0.06%; frequency response ±3 dB 30-14,000 Hz normal, to 15 kHz CrO_2, to 16 kHz metal tape; S/N ratio no NR/Dolby B/Dolby C 58/68/78 dB; input sensitivity/impedance 0.4 mV/5k ohms mic, 50 mV/50k ohms line; output level/impedance 350 mV/>50k ohms line; headphone output impedance 8-200 ohms; power consumption 18 W; fast-wind time 90 secs with C60 casssette; 16½"W × 10⅝"D × 4¹³⁄₁₆"H; 10.1 lb..... $185

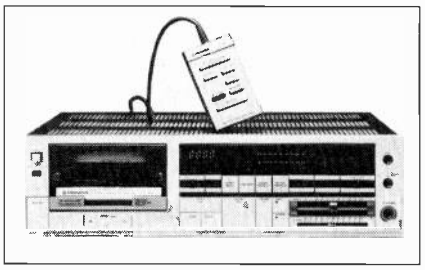
TA-W88 Dubbing Stereo Cassette Deck

High-speed dubbing stereo cassette deck with Dolby B noise-reduction system. Features one-touch recording; continuous/simultaneous playback modes; microphone mixer; dc servo-controlled motors; hard permalloy record/play heads; feather-touch transport controls; record mute; LED level meters; timer standby mode; full automatic stop; facility for remote control. Wow and flutter 0.06% wrms; frequency response ±3 dB 30-14,000 Hz normal, to 15 kHz CrO_2, to 16 kHz metal tape; S/N ratio 68 dB with Dolby on, metal tape; input sensitivity/impedance 0.3 mV/5k ohms mic, 50 mV/50k ohms line; output level/impedance 350 mV/>50k ohms line; headphone output impedance 8-200 ohms; power consumption 18 W; fast-wind time 90 secs with C60 cassette; 16½"W × 10⅝"D × 4¾"H; 14.3 lb . $380

PIONEER

CT-90R Auto-Reverse Cassette Deck

Computer-controlled stereo cassette deck with 3-motor direct-drive transport and quick auto-reverse record and play. Features index scan; music search/repeat; blank search; blank skip; auto bias, level, and equalization; record mute; LED level meters; Dolby B and C; digital electronic real-time tape counter (indicates minutes and seconds even in fast-wind modes). Frequency response 20-20,000 Hz with metal tape; S/N ratio 78 dB Dolby C, 68 dB Dolby B, 58 dB Dolby



off; wow and flutter 0.03% wrms; 16½"W × 13⅜"D × 4¾"H. 19 lbs $520

CT-70R. Similar to CT-90R except electronic counter; no auto bias, level, equalization. Frequency response 25-19,000 Hz with metal tape. 17.6 lbs..... $420

CT-50R Auto-Reverse Cassette Deck

Stereo cassette deck with 2-motor tape transport and auto-reverse record and play. Features auto space record mute; music search; blank skip; LED level meters; Dolby B and C. Frequence response 25-17,000 Hz with metal tape; wow and flutter 0.05% wrms. 16½"W × 10⅝"D × 4¾"H. 13.9 lbs..... $310

CT-1040W Double Cassette Deck

High-speed dubbing stereo cassette deck with one-button sychro start. Features relay play (AB); skip search (9 cuts forward and reverse; play transport only); music search (play transport only); auto tape selector; rec mute; LED level meters; Dolby B. Frequency response 25-17,000 Hz with metal tape; S/N ratio 77 dB Dolby on, 57 dB Dolby off; wow and flutter 0.045% wrms. 16½"W × 11"D × 4"H; 17.9 lbs $375

CT-40 Two-Motor Cassette Deck

Stereo 2-motor cassette deck with skip search (9 cuts forward and reverse). Features music search; rec mute; LED level meters; Dolby B and C; electronic tape counter. Frequency response 25-17,000 Hz with metal tape; S/N ratio 77 dB Dolby C, 67 dB Dolby B, 57 dB Dolby off; wow and flutter 0.04% wrms. 16½"W × 11"D × 4"H; 10.8 lbs.... $260

CT-30. Similar to CT-4 except no skip search, music search, rec mute, or electronic tape counter. 11.9 lbs $220

CT-20. Similar to CT-30 except lacks Dolby C. 11 lbs $175

CT-10. Similar to CT-20 except has soft-touch operation and lacks 2-motor tape transport. Frequency response 25-16,000 Hz with metal tape; wow and flutter 0.05% wrms; 16½"W × 9¼"D × 4⅝"H; 11.5 lbs $150

JT-216 Wired Remote Controller

Wired remote controller for CT-90R, CT-70R computer-controlled cassette decks..... $50

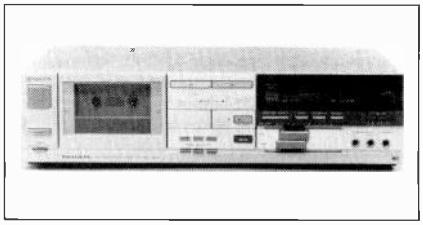
JT-217 Wired Remote Controller

Wired remote controller unit for CT-50R $50

REALISTIC

SCT-42 Stereo Cassette Deck

Logic-controlled cassette deck with auto reverse and Dolby B and C. Features 3 motors; feather-touch op-



eration; auto record mute; auto tape selection; multirepeat. Can be preprogrammed to play selections in any order..... $300

SCT-28 Stereo Dubbing Deck

High-speed dubbing dual stereo cassette deck with Dolby B noise-reduction system. Features automatic music search; soft-touch transport controls; deck 1 optimized for playback and has automatic equalization selection; deck 2 has full record/play facilities with pushbutton selectors for normal/CrO_2/metal tape; record mute; dual concentric level controls; 2-color, 5-segment LED peak-level meters; switchable MPX filter; high/normal-speed selector..... $270

SCT-29 Stereo Cassette Deck

Stereo cassette deck with Dolby B and C noise-reduction, automatic music search. Features 2-color, 8-LED peak-level meters; normal/CrO_2/metal tape selectors; switchable MPX filter; soft-touch transport controls; damped cassette door; output-level control. Wow and flutter <0.15% wrms; frequency response ±3 dB 30-14,000 Hz metal, to 12 kHz CrO_2/normal tape; S/N ratio 64 dB Dolby on; THD 1.3%; output level 0.7 V maximum; 15⅜"W × 9"D × 4⅞"H .. $220

SCT-40 Stereo Cassette Deck

Single-capstan 2-head stereo cassette deck with logic control. Features feather-touch operation; LED record-level meter; MPX filter; Dolby B and C; auto search music system. Compatible with normal, CrO_2, metal tape. 390mm W × 102mm H × 229mm D $180

SCT-41 Stereo Cassette Deck

Two-head cassette deck with soft-touch mechanism and Dolby B and C. Features auto search music system; LED record-level meter; output level control; auto line/mic switching; LED power indicator. Compatible with normal, CrO_2, metal tape. 390mm W × 110mm H × 210mm D $160

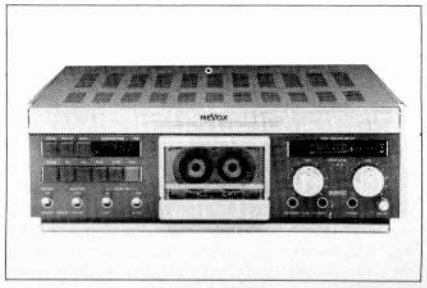
SCT-24 Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby noise-reduction system, switchable multiplex filter. Features LED peak meters; auto stop; tape selector buttons for ferric, CrO_2, metal tapes; tape counter. Wow and flutter 0.15% wrms; frequency response ±3 dB 30-12,000 Hz (ferric and CrO_2), to 14 kHz (metal); S/N ratio 64 dB with metal tape, Dolby on; THD 0.3%, CCIR weighted $120

REVOX

B710 MKII Stereo Cassette Deck

Microprocessor-controlled stereo cassette deck with Dolby B and C noise reduction. Features peak-level



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.

bargraph meters with up to +8-dB indication; 2 quartz-controlled DD capstan motors; 2 servo-controlled reel motors; unique hinged headblock for absolute stability in azimuth plane; diecast aluminum-alloy transport chassis; mic/line mixing; internal programmable 24-hour clock for stop/start record/play;headphone volume control; auto tape-type sensing; automatic start-of-oxide cueing; MPX filter. Wow and flutter 0.035% wrms; frequency response 30-20,000 Hz +2/-3 dB; S/N ratio > 72 dB IEC A-weighted at 3% distortion, Dolby C on $1995

SAE

C101 Stereo Cassette Deck

Three-head 2-motor Computer Direct-Line™ stereo cassette deck with Dolby B and C. Features bias and level adjust; 2 test tones for adjusting bias. Frequency response 24-18,000 ±2.5 dB with type I tape, 24-20,000 ±2.5 dB with type II, 24-20,000 ±2 dB with type IV; S/N ratio (Dolby off) 52 dB type I, 53 dB type II, 55 dB type IV; S/N ratio (Dolby B) 62 dB type I, 64 dB type II, 65 dB type IV; S/N ratio (Dolby C) 70 dB type I, 72 dB type II, 73 db type IV; wow and flutter <0.05% wrms; THD <0.9% all tape types. Rack mountable. 5.25"H × 10.5" D × 19"W. ... $650

C2 Stereo Cassette Deck

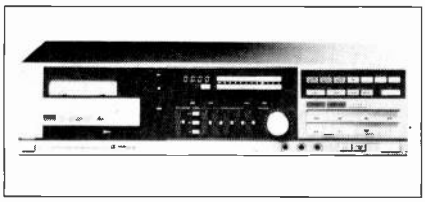
Stereo cassette deck with Dolby B and C noise-reduction systems. Features full-logic transport controls; Cam-Actuated Transport for smooth engagement of all functions; automatic program search; fluorescent level meters; memory, repeat functions; remote timer play/record; facility for optional full-function remote control $299

Remote One. Remote control unit for C2 and C101 .....$50

SANSUI

D-970B Stereo Cassette Deck

Microprocessor-controlled 3-head cassette deck with automatic CompuTrec bias, equalization, sensitivity adjustments, Dolby B and C noise-reduction systems. Features direct-drive capstan; Dyna-Scrape filter with hold-back servo tension mechanism; DD/DC (diamond-differential dc) equalizer, dc amplifier; ferrite heads with separate record and play gaps; normal/real-time digital counter; LED peak-level meters; automatic muting; timer-controlled functions; automatic tape lead-in. Wow and flutter 0.025% wrms; frequency response 30-22,000 Hz ±3 dB with metal tape; S/N ratio 81 dB with metal tape, Dolby C on . $680



D-990R. Similar to D-970B except has auto reverse and dbx noise reduction. Remote control optional $650

D-770R Stereo Cassette Deck

Auto-reverse 3-motor deck with dual capstan drive, Automatic Music Program Search for up to 15 selections. Features 4-digit normal/real-time electronic counter; Dolby B and C noise-reduction systems; 4-second auto rec mute; dual memory function; available in black (D-770RB) or silver (D-770RS) finish. Wow and flutter 0.048% wrms; frequency response 35-18,000 Hz ±3 dB with metal tape; S/N ratio 80 dB with metal tape, Dolby C on $600

D-590R. Similar to D-570 except has auto reverse $500

D-W9 Double-Recording Cassette Deck

Stereo cassette deck with two complete transports capable or recording simultaneously (or sequentially) on command. Features full-logic controls; 15-selection Random Music Program Search; 3-function memory; Dolby B and C; auto bias and equalization; 4-sec record mute; automatic leader bypass; timer record and playback capability; 6-segment peak level display; auto level control. Frequency response 20-19,000 Hz; wow and flutter <0.04% wrms; S/N ratio 78 dB with Dolby C. $16^{15}/_{16}$"W × $4^{7}/_{16}$"H × $12^{5}/_{16}$"D. 14 lbs..... $450

D-570 Stereo Cassette Deck

Direct-drive, full-logic 3-head stereo cassette deck with Dolby B and C noise-reduction systems. Features automatic music program search; tape lead-in facility to bypass leader; roller-coupled holdback tension that takes up tape slack; Compu-Edit capability; dual memory function; 4-digit fluorescent tape/real-time counter; 12-segment peak-indicating signal meters; timer record/play capability; semiautomatic bias control. Wow and flutter 0.03% wrms; frequency response 30-21,000 Hz ±3 dB with metal tape; S/N ratio no NR/Dolby B/Dolby C 60/70/80 dB; $16^{13}/_{16}$"W × $12^{3}/_{4}$"D × $4^{3}/_{8}$"H; 14.3 lb..... $540

D-370. Similar to D-570 except has 2 heads. Available in black (D-370B) or silver (D-370S) finish. Frequency response 30-18,000 Hz ±3 dB $420

D-77R Auto-Reverse Cassette Deck

Bidirectional record/play stereo cassette deck with Compu-Edit to make recording easy with Sansui turntables. Features automatic level control; automatic music program search; IC-controlled transport; Compu Selector system; Dolby B. Available in black (D-77RB) or silver (D-77RS). Wow and flutter 0.05% wrms; frequency resonse 30-17,000 Hz ±3 dB; S/N ratio 68 dB with Dolby on $320

D-77F. Single-direction version of D77R. Available in black (D-77FB) or silver (D-77FS) finish $230

D-55M Stereo Cassette Deck

Stereo cassette deck with Soft-Touch transport controls; automatic level control. Features Dolby B noise-reduction system; available in matte-black (D-55MB) or silver (D-55MS) finish. Wow and flutter 0.07% wrms; frequency response 30-15,000 Hz ±3 dB $190

D-99D Dubbing Cassette Deck

Dual-transport stereo cassette deck with Compu-Edit for synchronization with some Sansui turntables. Features separate record/play and play-only transports; automatic music program search; play one transport while recording on other; full IC-logic transport controls; automatic level control; Compu Selector for one-touch operation with some Sansui amplifiers/receivers; provision for external timer operation; available in black (D-99DB) or silver (D-99DS) finish..... $350

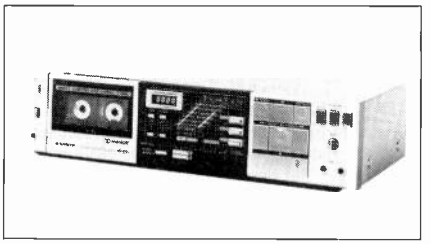
SANYO

RDW310 Double Cassette Deck

Double stereo cassette deck with high-speed (2.5×) tape dubbing. Features auto music select; metal capability; Dolby B; LED peak level meters; rec mute; auto stop; air-damped doors; mic/line mixing; DC servo motor; soft-touch controls. Frequency response 40-17,000 Hz (metal), 40-16,000 Hz (chrome), 40-13,000 Hz (normal); wow and flutter 0.055% wrms; S/N ratio (with metal tape) 57 dB (Dolby off), 65 dB (Dolby on); 16.5"W × 4.2"H × 6.5"D $200

RDF70 Dolby B/C Cassette Deck

Stereo cassette deck with Dolby B and C noise reduction. Features auto music select; dual-motor transport; auto stop; soft-touch logic controls; shows tape used, elapsed time, minutes remaining; 9-part LED meters; rec mute; adjustable bias; LED function indicators; high-sensitivity mic inputs. Frequency response 30-18,000 Hz (metal), 30-17,000 Hz (chrome), 30-13,000 Hz (normal); wow and flutter 0.04% wrms; S/N ratio (with metal tape) 57 dB (Dolby off), 77 dB (Dolby C); 16.5"W × 4.2"H × 8.5"D $190



RDR60 Auto-Reverse Cassette Deck

Stereo cassette deck with auto reverse and Dolby B and C noise reduction. Features open-loop dual-capstan tape transport; programmable operation; auto bias and equalization; auto music select; soft-touch controls; 7-part LED meters; adjustable bias; high-sensitivity mic inputs; headphone jack. Frequency response 30-18,000 Hz (metal), 30-16,000 Hz (chrome), 30-14,000 Hz (normal); wow and flutter 0.05% wrms; S/N ratio (with metal tape) 59 dB (Dolby off), 77 dB (Dolby C); 16.5"W × 4.5"H × 10.5"D..... $180

RDF50 Dolby B/C Cassette Deck

Stereo cassette deck with Dolby B and C noise reduction. Features auto music select; metal compatibility; full-logic soft-touch controls; 16-part LED meters; adjustable bias; auto stop; high-sensitivity mic inputs; air-damped cassette door; DC servomotor. Frequency response 30-18,000 Hz (metal), 30-16,000 Hz (chrome), 30-14,000 Hz (normal); wow and flutter 0.05% wrms; S/N ratio (with metal tape) 59 dB (Dolby off), 77 dB (Dolby C); 16.5"W × 4.5"H × 10.5"D..... $170

RDS40 Time-Display Cassette Deck

Stereo cassette deck displays tape used, elapsed time, and time remaining. Features Dolby B and C noise reduction; auto music select; power-assisted controls; 7-part LED meters; rec mute; adjustable bias; LED function indicators; high-sensitivity mic inputs; auto stop; air-damped cassette door. Frequency response 30-18,000 Hz (metal), 30-17,000 Hz (chrome), 30-13,000 Hz (normal); wow and flutter 0.05% wrms; S/N ratio (with metal tape) 57 dB (Dolby off), 77 dB (Dolby C); 16.5"W × 4.2"H × 8.6"D $150

RDS30 Dolby B/C Cassette Deck

Stereo cassette deck with Dolby B and C noise reduction. Features auto music select; metal compatibility; power-assisted controls; 7-part LED meters; adjustable bias; LED function indicators; auto stop; air-damped cassette door. Frequency response 40-16,000 Hz (metal), 40-15,000 Hz (chrome), 40-13,000 Hz (normal); wow and flutter 0.06% wrms; S/N ratio (with metal tape) 57 dB (Dolby off), 77 dB (Dolby C); 16.5"W × 4.2"H × 7.2"D $130

RDS23 Dolby B Cassette Deck

Stereo cassette deck with Dolby B noise reduction and auto music select. Features logic interlock power-assisted soft-touch controls; metal compatibility; one-touch record; permalloy head; LED function indicators; high-sensitivity mic inputs; auto stop; air-damped cassette door; DC servomotor. Frequency response 30-17,000 Hz (metal), 30-16,000 Hz (chrome); wow and flutter 0.05 % wrms; S/N ratio (with metal tape) 64 dB (Dolby on); 16.6"W × 4.4"H × 9.8"D $100

RDS22 Dolby B Cassette Deck

Stereo cassette deck with Dolby B and soft-touch transport controls. Features single-motor DC servo drive; metal-tape compatibility; 5-part LED meters; auto stop; mic and line inputs; headphone jack; air-damped cassette door. Frequency response 40-16,000 Hz (metal); wow and flutter 0.06% wrms; S/N ratio (with metal tape) 61 dB (Dolby on); 16.5"W × 4.9"H × 7.2"D $90

RDS11 Dolby B Cassette Deck

Stereo cassette deck with Dolby B noise reduction and single-motor DC servo drive. Features 5-part LED meters; auto stop; air-damped cassette door; headphone jack; mic and line inputs; metal compatibility. Frequency response 40-15,000 Hz (metal); wow and flutter 0.08% wrms; S/N ratio 60 dB (Dolby on); 16.5"W × 4.9"H × 7.2"D.....$80

RD7 Dolby B Cassette Deck

Stereo cassette deck with Dolby B noise reduction and metal-tape compatibility. Features 5-part LED

Cassette Decks

meters; headphone jack; 2 mic inputs. Frequency response 40-15,000 Hz; wow and flutter 0.08% wrms; S/N ratio 54 dB (Dolby off); 11.8"W × 5.2"H × 7.2"D $70

H.H. SCOTT

659DC Slimline Cassette Deck

Stereo auto-reverse cassette deck with soft-touch controls. Features Dolby B and C; compatible with normal, chrome, metal tape; 2-color peak-hold LED meters; rec mute; separate left and right record level controls; soft-eject; steel cabinet. Frequence response 25-17,000 Hz with metal tape; wow and flutter 0.05%; S/N ratio 74 dB with Dolby. 18"W × 4 3/8"H $279

639DC. Similar to 659DC except lacks auto reverse $224

619DB. Similar to 639DC except lacks Dolby C $189

SHARP

RT-300 Stereo Cassette Deck

Solenoid full-logic feather-touch transport stereo cassette deck with Dolby B and C noise-reduction systems. Features slim design; auto program search system; metal-tape capability; normal/CrO_2/metal tape selector; 2-color 8-LED peak signal-level displays; soft eject; full automatic stop; 17"W × 9 7/8"D × 4"H $200

RT-250 Stereo Cassette Deck

Solenoid full-logic feather-touch transport stereo cassette deck with APSS and Dolby B and C. Features metal-tape capability; 2-color LED peak signal-level meters; soft eject; normal/CrO_2/metal tape selector; electronically controlled dc motor. Wow and flutter 0.07% wrms; frequency response ±3 dB 40-14,000 Hz metal, to 13 kHz CrO_2, to 12.5 kHz normal tape; S/N ratio Dolby off/on 52/62 dB; input sensitivity/impedance 0.2 mV (−74 dB)/6.8k ohms mic, 50 mV (−26 dB)/50k ohms line; output level/impedance 550 mV/50k ohms line, 0.2 mW/8 ohms headphones; 15 3/8" W × 9" D × 4" H; 6.9 lb $150

RT-100 Stereo Cassette Deck

Low-profile stereo cassette deck with metal-tape capability and Dolby B noise-reduction system. Features 10-LED peak signal level displays; electronically controlled dc motor; normal/CrO_2/metal tape selector; soft eject; hard permalloy record/play head. Wow and flutter 0.1% wrms; frequency response ±3 dB 40-13,000 Hz metal, to 12 kHz CrO_2, to 11 kHz normal tape; S/N ratio Dolby off/on 52/62 dB; input sensitivity/impedance 0.2 mV (−74 dB)/6.8k ohms mic, 50 mV (−26 dB)/50k ohms line; output level/impedance 550 mV/50k ohms line, 0.2 mW/8 ohms headphones; 15 3/8" W × 8 5/8" D × 4 5/8" H; 5.5 lb $110

RT-150 Stereo Cassette Deck

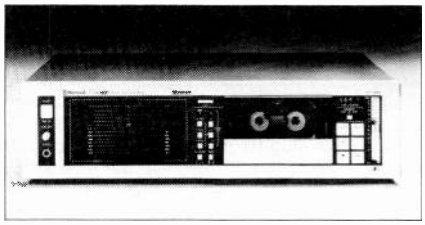
Soft-touch stereo cassette deck with Dolby B and C. Compatible with metal, CrO_2, and normal tape. Features rewind auto-play; dual 5-part LED peak signal-level meters; independent left/right record-level controls. Wow and flutter 0.07% wrms; S/N ratio 72 dB with Dolby C. 390 mm W × 245 mm D × 110 mm H $130

Tape-recording terms are defined in the vocabulary on page 32. For an explanation of abbreviations, turn to the list on page 35.

SHERWOOD

S-6000 CP 3-Head Cassette Deck

Stereo cassette deck with 3 heads, Dolby B and C noise reduction. Features sendust tape heads; normal/CrO_2/metal tape capability; fine bias adjust control; switchable MPX filter; microprocessor-controlled soft-touch transport. Wow and flutter 0.05% wrms; frequency response 30-21,000 Hz ±3 dB



with metal tape; S/N ratio > 77 dB with Dolby C; THD 3%; 17 3/8"W × 15 1/2"D × 4 3/8"H $400

S-450 CP Dolby B/C Cassette Deck

Microprocessor-controlled cassette deck with Dolby B and C. Features auto music selection; index scan; real-time counter; elapsed-time indicator; auto rewind, repeat, replay between selected points; sendust heads; fine bias adjust. Wow and flutter < 0.06% wrms; frequency response 30-19,000 Hz +1/−3 dB. 17 3/8"W × 15 1/2"D × 4 3/8"H $300

S-250 CP Dolby B/C Cassette Deck

Metal-capable stereo cassette deck with Dolby B and C noise reduction. Features Dynalloy tape heads; normal/CrO_2/metal tape selector; soft-touch transport controls; 12-segment LED level meters. Wow and flutter < 0.06% wrms; frequency response 30-19,000 Hz +1/−3 dB; S/N ratio > 76 dB with Dolby C; THD 3%; 17 3/4"W × 15 1/2"D × 4 3/8"H $230

S-150 Stereo Cassette Deck

Metal-compatible cassette deck with Dolby B noise reduction. Features 7-part LED meters; pushbutton selection of metal, CrO_2, normal bias and equalization; soft-touch controls; backlit cassette well; LED indicators for pause, play, record; Dynalloy record/play head; dc motor. Frequency response 30-16,000 Hz ±3 dB; S/N ratio 67 dB with CrO_2 tape (Dolby on). 17 3/8"W × 13 1/2"D × 4 3/8"H $230

SONY

TC-D5M Portable Cassette Deck

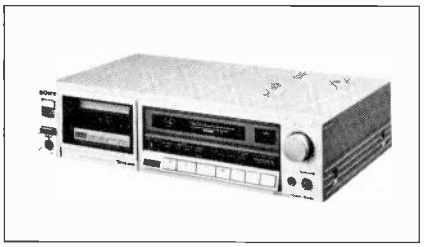
Pro-quality portable cassette deck with disk drive transport. Operates from 3 power sources: batteries, 12-V car battery (with optional DCC-127AW adapter) and ac outlets (with optional AC-61 adapter). Features large VU meters with +6 dB LED peak indication, battery check position, and 10-sec illumination; independent L/R record-level controls; switchable record-level limiter; switchable mic attenuater; built-in monitor speaker; sendust and ferrite record/playback heads; dc-to-dc converter power supply; coreless dc servomotor; Dolby B noise reduction; direct-coupled playback head amp; 4-position tape selector; 4-gap erase head. Wow and flutter 0.06% wrms ±0.17 (DIN 45507); frequency response (±3 dB, re -20 dB) 30-17,000 Hz metal and FeCr, 30-15,000 Type II (Sony UCX), 30-14,000 Type I (Sony SHF); S/N ratio (re 3% THD, peak-weighted): with Dolby NR off, 58 dB metal, 59 dB FeCr, 64 dB Type II (Sony UCX), 53 dB (SHF), with Dolby NR on, 65 dB metal, 66 dB FeCr, 64 dB UCX, 64 dB SHF; THD at 1 kHz (re 0 dB record level) 1.0% metal and Type II; crosstalk 60 dB at 1 kHz between tracks; separation 35 dB at 1 kHz between channels; power consumption 10 W. 9 1/4" × 1 7/8" × 6 5/8"; 3 lbs, 12 oz $780

TC-FX1010 3-Head Cassette Deck

Self-monitoring 3-head computerized stereo cassette deck with audio signal processor IC for feather-touch control of all functions, settings. Features self-monitoring head that sets record levels for minimum distortion; multifunction memory for storing tape settings, calibration of up to 4 different types of tape; Dolby B and C noise reduction; independent-suspension sendust and ferrite record, play/monitor head; closed-loop dual-capstan drive system with BSL capstan and dc reel motors; concentrated display that includes electronic peak program meters, linear real-time tape counter, record-level setting guides; auto tape selection system for all types of tape, including metal; auto play; memory play/stop; auto-space record mute; memory backup system; dc amp, direct-coupled play head amplifier; facility for optional remote control. Wow and flutter 0.04% wrms; frequency response 25-18,000 Hz ±3 dB; S/N ratio 60 dB A-weighted, Dolby off $650

TC-K555 2-Motor Cassette Deck

Three-head, 2-motor stereo cassette deck with independent suspension sendust and ferrite record and playback heads. Features closed-loop dual-capstan dc servo belt-drive transport system; BSL capstan, dc reel motors with solenoid logic feather-touch transport controls; fine-tuning bias control for Type I tape,



plus positions for Types II, III, and IV tapes; Dolby B and C noise-reduction; auto-space record mute; auto play; memory stop/play; concentrated display that includes electronic peak program meter, linear real-time tape counter, record setting guides; provision for optional remote control. Wow and flutter 0.04% wrms; frequency response 30-18,000 Hz ±3 dB with Type IV tape; S/N ratio 60 dB A-weighted, Dolby off $450

RM-50. Wired remote control $55

RM-80. Wireless infrared remote control $120

RM-44. Full system wireless remote control for use with selected Sony RC-capable products $150

RM-65. Recording synchronizer for use with selected Sony turntables $25

TC-FX77 Dolby B/C Cassette Deck

Stereo cassette deck with Dolby B and C noise-reduction systems, 2 motors. Features dc servo belt-drive system; noncrystalline Laser-Amorphous record/play head for greater dynamic range; feather-touch full-logic solenoid transport controls; concentrated display that includes electronic peak program meters, linear real-time tape counter, 9-selection Auto Music Sensor/auto repeat feature, 4-position tape selector (includes metal); auto play; memory play/stop; auto-space record mute; Wow and flutter 0.04% wrms; frequency response 30-17,000 Hz ±3 dB with metal tape; S/N ratio 59 dB A-weighted, Dolby off .. $400

TC-FX66. Similar to TC-FX77 except no AMS/repeat feature or record-level guides $320

TC-V7 Auto-Reverse Cassette Deck

Feather-touch, full-logic control auto-reverse cassette deck with linear counter for precise index of tape location and optional remote control. Features continuous playback; auto music sensor; concentrated display; blank skip; auto play; auto space/rec mute; 13-segment peak meters; synchronized operation possible with some Sony turntables; unattended recording or wake-up timer; roto-bilateral head and dual-capstan transport system; Laser-Amorphous head; Dolby B and C; gap erase head. Wow and flutter 0.065% wrms, ±0.2% (DIN 45507); frequency response (±3 dB, re -20 dB) 30-15,000 Hz metal, FeCr, and Type II (Sony UCX); 30-14,000 Type I (Sony SHF); S/N ratio (re 3% THD, peak-weighted), no Dolby/Dolby B/Dolby C: 58/65/78 dB metal, 59/66/72 dB FeCr, 57/64/70 dB Type II (UCX), 54/61/67/ dB Type I (SHF); THD 1.0% at 1kHz, re 0dB record level, metal and FeCr; crosstalk 60 dB at 1 kHz between tracks; separation at 1 kHz between channels 35 dB; power consumption 20 W; 14" × 3 1/4" × 11 1/8"; 11 lbs, 1 oz $350

TC-FX600 Full-Logic Cassette Deck

Full-logic, feather-touch cassette deck with auto music sensor and repeat function. Features linear counter; end-of-tape alarm; concentrated display; memory counter; auto play; 16-segment peak program meters; auto space/rec mute; choice of remote controls; synchronized operation; headphone output jack; Dolby B and C; 2-motor tape drive; dynamically balanced antiresonant flywheel; dc amplifier; direct-coupled playback head amp; 4-gap erase head; 4-position tape selector. Wow and flutter 0.04% wrms ±0.14% (DIN 45507); frequency response (±3dB, re -20 dB) 30-17,000 Hz metal, 30-17,000 FeCr, 30-15,000 Type II (Sony UCX), 30-14,000 Type I (Sony SHF); S/N ratio (re 3% THD, peak-weighted), Dolby NR off/Dolby B/Dolby C: 59/66/72 dB metal, 60/67/73 FeCr, 57/65/71 Type II (UCX), 54/61/67 Type I (SHF); THD 1.0% at 1 kHz, re 0 dB record level, metal and FeCr; crosstalk 60 dB at 1 kHz between tracks; separation 35 dB at 1 kHz between channels; power consumption 10 W. 17" × 4¼" × 10¾"; 12 lbs, 6 oz $320

TC-FX505R Auto-Reverse Cassette Deck

Auto-reverse feather-touch full-logic cassette deck with continous play mode. Features music scan; blank skip; auto music sensor; auto tape selector; auto play; optional remote control; fast 13-segment peak meters; auto space/record mute; unattended recording; Laser-Amorphous head construction; Dolby B and C; dc amplifier; direct-coupled playback head amp; 4-gap erase head. Wow and flutter 0.05% wrms ±0.14% (DIN 45507); frequency response: (±3dB, re -20 dB) 30-17,000 Hz metal, FeCr, Type II (Sony UCX), 30-15,000 Type I (Sony SHF); S/N ratio: (re 3% THD, peak-weighted), no Dolby/Dolby B/Dolby C: 58/65/71 dB metal, 59/66/72 FeCr, 56/63/69 Type II (UCX), 54/61/67 Type I (SHF); THD 1.0% at 1 kHz, re 0 dB record level, Type IV and Type II; crosstalk 60 dB at 1 kHz between tracks; separation 35 dB at 1 kHz between channels; power consumption 14 W; 17" × 4¼" × 10¾"; 9 lbs, 15 oz $260

TC-FX45 Dolby B/C Cassette Deck

Feather-touch full-logic cassette deck with optional remote conrol. Features music scan for 10-sec sample of each cut; blank skip; auto music sensor; auto tape selector; auto play; unattended recording or timed wake-up option; headphone output jack; mic input jack; Dolby B and C; 4-gap erase head. Wow and flutter 0.05% wrms ±0.14% (DIN 45507); frequency response: (±3 dB, re -20 dB) 30-16,000 Hz metal and FeCr, 30-15,000 Type II (Sony UCX), 30-13,000 Type I (Sony SHF); S/N ratio (re 3% THD, peak-weighted), Dolby off/Dolby B/Dolby C: 58/65/71 dB metal, 59/66/62 FeCr, 56/63/69 Type II (UCX), Type I 54/61/67 (SHF); THD 1.0% at 1 kHz, re 0 dB record level, Type IV and Type II; crosstalk 60 dB at 1 kHz between tracks; separation 35 dB at 1 kHz between channels; power consumption 14 W; 17" × 4¼" × 10¾";9 lbs, 11 oz..... $230

TC-FX44 Dolby B/C Cassette Deck

Stereo cassette deck with Dolby B and C noise-reduction systems, SD record/play head. Features dc servo belt-drive system; full-logic feather-touch transport controls; auto tape selection system for all tape formulations, including metal; Automatic Music Sensor with auto-space record mute; auto play; LED peak meters; facility for optional remote controller. Wow and flutter 0.05% wrms; frequency response 30-16,000 Hz ±3 dB with metal tape; S/N ratio 59 dB A-weighted, Dolby off $210

TC-FX35 Dolby B/C Cassette Deck

Feather-touch full-logic cassette deck with cue and review. Features auto play; headphone output jack; 4-gap erase head. Wow and flutter 0.05% wrms ±0.14 (DIN 45507); frequency response (±3 dB, re -20 dB) 30-16,000 Hz metal and FeCr, 30-14,000 Hz Type II (Sony UCX), 30-13,000 Hz Type I (Sony SHF); S/N ratio (re 3% THD, peak-weighted) Dolby off/Dolby B/Dolby C: 58/65/71 dB metal, 59/66/72 FeCr, 56/63/69 Type II (UCX), 54/61/67 Type I (SHF); THD 1.0% at 1 kHz, re 0 dB record level, Type IV and Type II; crosstalk 60 dB at 1 kHz between tracks; separation 35 dB at 1 kHz between channels; power consumption 14 W; 17" × 4¼" × 10¾"; 9 lbs, 8 oz $210

TC-V3 Dolby B/C Cassette Deck

Dolby B and C cassette deck with feather-touch, full-logic controls and auto music sensor. Features auto tape selector; auto play; fast LED peak meters; auto space/rec mute; optional unattended recording or timed wake-up; 14" width for combatibility with Sony G-V3 system; SD record/playback head; 4-gap erase head. Wow and flutter 0.065% wrms ±0.02 (DIN 45507); frequency response (±3 dB, re -20 dB) 30-15,000 Hz metal and FeCr, 30-15,000 Hz Type II (Sony UCX), 30 Hz-14,000 Hz Type I (Sony SHF); S/N ratio (re 3% THD, peak-weighted), Dolby off/Dolby B/Dolby C: 58/65/71 dB metal, 59/66/72 FeCr, 56/63/69 Type II (UCX), 54/61/67 Type I (SHF), THD 1.0% at 1 kHz, re 0 dB record level, Type IV and Type II; crosstalk 60 dB at 1 kHz between tracks; separation 35 dB at 1 kHz between channels; power consumption 11 W; 14" × 4¼" × 9¾"; 8 lbs, 13 oz $210

TCZ-FX25 Full-Logic Cassette Deck

Feather-touch, full-logic cassette deck with auto tape selector. Features auto play; cue and review; auto space/rec mute; fast 8-segment peak meters; optional unattended recording or timed wake-up; Dolby B; SD record playback head; direct-coupled playback head amp; 4-gap erase head; wow and flutter 0.05% wrms ±0.14 (DIN 45507); frequency response (±3 dB, re -20 dB) 30-15,000 Hz metal and FeCr, 30-14,000 Hz Type II (Sony UCX), 30-13,000 Type I Hz (Sony SHF); S/N ratio (re 3% THD, peak-weighted), Dolby off/Dolby B: 58/65 dB metal, 59/66 FeCr, 56/63 Type II (UCX), 54/61 (SHF); THD 1.0% at 1 kHz, re 0 dB record level, Type IV and Type II; crosstalk 60 dB at 1 kHz between tracks; separation 35 dB at 1 kHz between channels; power consumption 14 W; 17" × 4¼" × 10¾"; 9 lbs, 4 oz $170

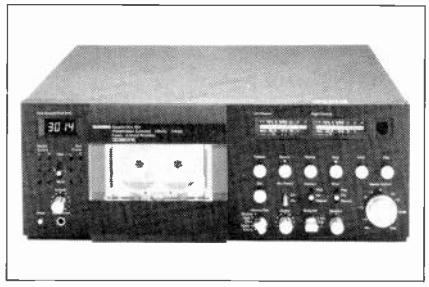
TANDBERG

TCD 3004 Cassette Deck

Microprocessor-controlled metal-compatible vertical front-loading stereo cassette deck with dual Dolby B noise-reduction system, 4 motors, 3 tape heads. Features PROM-brain logic microprocessor function controls with LED indicators; recording preset; Dyneq® record equalization, Actilinear® headroom-extension system; 4-position bias/record, 70/120 μsec playback equalization controls with bias fine adjust; calibration selector for off, azimuth, bias fine adjust, left/right record levels with calibration meter; separate left/right record, mic level controls with master control; source/tape monitor switch; headphones volume control; resettable LED digital counter display with memory; dual peak-indicating meters; error-detection digital display; winding speed control; azimuth control. Frequency response 20-20,000 Hz ±3 dB; S/N ratio 70 dB..... $2395

TCD 3014 Cassette Deck

Microprocessor-controlled stereo cassette deck with four servo-controlled tape-transport motors. Has scan to play, scan to stop, auto rewind, auto replay, timer record/play functions. Features 3 heads; Dolby B and C; azimuth alignment; bias adjustment; record current adjustment utilizing built-in test system; linear motor to position heads and pinch-rollers to tape; instant "flying start" record/play; Dyneq® record equalization; Actilinear II® headroom-extension system; peak-reading meters; cue and review at half speed; real time/real revolution counter; LED indication of all transport functions. Optional side panels in rosewood. Wireless infrared remote control with built-in receiver and rack mounts are available $1395



TCD 440A Cassette Deck

Metal-compatible stereo cassette deck with dual Dolby B noise-reduction system, separate record, play, Tandberg erase heads (80 dB erasure at 1 kHz and 60 dB erasure at 100 Hz), 3 motors in dual-capstan transport system. Features Dyneq® record equalization circuitry designed to automatically adjust record preemphasis of deck to maximize potential treble response while simultaneously minimizing treble distortion; Actilinear® recording system; peak-indicating meters with second scale reflecting metal-particle signal levels; 10-kHz test oscillator; bias adjust controls for ferric, CrO_2, and metal tapes with set of left/right LEDs; separate left, right slider input/output-level controls with LEDs; LED Dolby, tape I and II/metal, source/tape, record preset on/off, power indicators; optional PCM infrared wireless remote control available. Frequency response 20-20,000 Hz ±3 dB; S/N 70 dB A weighted; anodized matte black finish; 18⅝"W × 8⅞"D × 4"H $995

TCD 420A Stereo Cassette Deck

Front-loading metal-compatible stereo cassette deck with Dolby B noise-reduction system, 3 motors in dual-capstan transport system, diamond-cut Senalloy record/play and Tandberg erase (80-dB erasure at 1 kHz, 60-dB at 100 Hz) heads. Features Dyneq® dynamic equalization amplifier circuitry; Actilinear® recording system; tape and bias selectors for tape I (ferric), II (chrome), and metal with left-, right-channel bias-adjust selectors for each tape; separate left, right input/output-level controls; equalized peak-indicating VU meters; 3-digit tape counter with reset. Wow and flutter 0.13% wrms; frequency response 30-18,000 Hz ±3 dB; THD 3.0% metal, 2.0% ferric and chrome; S/N with metal tape 68 dB (IEC A weighted); input sensitivity/impedance 8 mV/47k ohms radio, 40 mV/220k ohms line; microphone input sensitivity 0.15-20 mV (mic input matched to dynamic microphone); 18⅝"W × 8⅞"D × 4"H..... $649

TCD 3034 Stereo Cassette Deck

Soft-touch, logic-controlled stereo cassette transport. Features cue, record mute; peak-indicating equalized meters; Dyneq® and Actilinear® headroom-extension system; instant-access loading. Dust cover for cassette compartment optional. Accommodates metal tape. Frequency response 10-20,000 Hz ±3 dB $499

TASCAM by TEAC

122 2-Speed Stereo Cassette Deck

Stereo cassette deck with 2 speeds, 3 heads, Dolby B noise reduction, and Dolby HX headroom extension. Features $1^7/_8$ and $3^3/_4$ ips speeds; bias and EQ controls; extra line inputs on front panel; interface jacks for optional dbx noise-reduction unit; optional microprocessor remote control; auto rewind; fader start; rack mountable; DC servo capstan motor; DC reel motor; compatible with normal, CrO_2, metal tape; VU meters with peak-reading LEDs; LSI logic circuitry; tape counter memory; headphone volume control. Wow and flutter at $1^7/_8$ ips ±0.085% (IEC/ANSI/DIN weighted), 0.06% (NAB weighted); at $3^3/_4$ ips ±0.055% (IEC/ANSI/DIN weighted), 0.04% (NAB weighted); frequency response (with CrO_2 tape) at $3^3/_4$ ips 35-14,000 Hz ±3 dB at 0 VU, 35-20,000 Hz at -20 dB; at $1^7/_8$ ips 35-8,500 Hz ±3 dB at 0 VU, 35-14,000 Hz at -20 VU; THD 1% at $3^3/_4$ with CrO_2 tape at 0 VU=160 nWb/m, 1 kHz, 1.2% at

Cassette Decks

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$1^{7}/_{8}$; S/N ratio at $3^{3}/_{4}$ (with CrO_2 tape, 1 kHz ref., 3% THD) 63 dB A-weighted, at $1^{7}/_{8}$ 58 dB A-weighted; separation > 35 dB at 1 kHz. Line input: source impedance 10k ohms or less, unbalanced; nominal input level -14 dBV (190 mV). Line output: minimum load impedance 25k ohms or more, unbalanced; nominal output level -10 dBV (0.3 V). 19"W × 5.8"H × 13.6"D; 19.8 lbs $725

M-124 Syncaset Stereo Cassette Deck

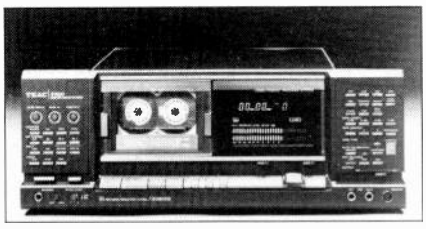
Front-loading Simul-Sync stereo cassette deck with Dolby B noise-reduction system, FG dc servo-controlled motor, and record/play and erase heads. Features Simul-Sync that permits monitoring on one track while simultaneously recording on another through the same head; crossfield switch for Simul-Sync for slight blending of left and right channels; independent bias and equalization selectors for normal/CrO_2 tapes; separate left and right record level controls; mic/DIN and line input selector; 3-digit tape counter with memory rewind; 2 VU meters; fast-wind time 90 seconds with C60 cassette. Wow and flutter 0.07% wrms; frequency response 30-16,000 Hz ±3 dB with CrO_2 tape; S/N ratio 55 dB, improved 5 dB at 1 kHz and 10 dB at 5 kHz with Dolby. Mic input: source impedance 10k ohms or less, unbalanced; nominal input level -60 dBV (1 mV). Line input: source impedance 10k ohms or less, unbalanced; nominal input level -10 dBV (0.3 V). Line output: minimum load impedance 25k ohms or higher, unbalanced; nominal output level -10 dBV (0.3 V). $16^{1}/_{4}$"W × $11^{1}/_{2}$"D × $6^{1}/_{4}$"H $450

TEAC

Z Series Professional Cassette Decks

Z-7000 Stereo Cassette Deck

Three-head 3-motor cassette deck with automatic bias, level, and equalization. Tape memory function can be programmed with calibration data for three tape types. Features Dolby B and C and dbx noise reduction; dbx disc decoding; linear tape counter for time display; search to zero; search to cue; programming of up to 19 selections; 30-segment fluorescent peak level meters; search to record; Intro Search;



sendust record head; ferrite playback head; pitch control; motorized head loading system; power eject; automatic fade-in/fade-out; memory stop/playback/repeat; headphone amp with adjustable volume; MOL balance controls. Wow and flutter 0.018% wrms; S/N ratio with dbx on 100 dB with metal tape; frequency response 20-24,000 Hz ±2 dB with metal tape; 432mm W × 160mm H × 432mm D; 16kg $1,800

Z-6000 Stereo Cassette Deck

Similar to Z-7000 above except wow and flutter 0.019% wrms; frequency response 20-22,000 Hz ±2 dB. Heads are directly coupled to the playback amplifier's FET input stage $1,400

Z-5000 Stereo Cassette Deck

Similar to Z-6000 except wow and flutter 0.025% wrms, permalloy record and playback heads, 15-segment flourescent peak level meters; frequency response 20-20,000 Hz ±2 dB with metal tape $1,000

RX Series Stereo Cassette Decks

3RX Stereo Cassette Deck

Stereo cassette deck with dbx noise-reduction system and 3-head, 2-motor transport. Features double dbx NR; tape/source monitoring; Dolby B noise-reduction system; 3-step independent bias and equalization selectors; timer function; memory play/stop; independent input level controls; output level control; adjustable bias/record calibration; optional rack-mount kit, remote controller, test-tone oscillator. Wow and flutter 0.04% NAB weighted; frequency response ±3 dB 20-20,000 Hz metal, to 19 kHz CrO_2 and CO, to 16 kHz normal tape; S/N ratio no NR/dbx 60/91 dB; fast-wind time 80 seconds with C60 cassette; 15.7"W × 15.7"D × 5.8"H; 20.9 lb $690

V-95RX Stereo Cassette Deck

Bidirectional record/play stereo cassette deck with 3-head, 2-motor transport and dbx noise-reduction system. Features quick-reverse transport; Computomatic Program System; block repeat; 4-digit LED tape counter; LED bargraph level meters; electronic-control output level (up/down, 2-step, slow/fast); L/R balanced output level control; remote-control capability (CPS, start/stop memory capability); timer function. Optional accessories include remote controller and timer $625

V-1RX Stereo Cassette Deck

Electroload motorized head loading stereo cassette deck with 3-motor, 3-head transport and dbx noise-reduction system. Features dynamic-range-expansion system; direct-drive capstan motor; block repeat; vertical peak level meters; timer record/play; output level control; fine bias adjust control; double Dolby B noise-reduction system; normal/CrO_2(Co)/metal tape selectors; 4-digit electronic tape counter; soft-touch transport controls. Wow and flutter 0.025% wrms; frequency response ±3 dB 20-18,000 Hz normal, to 19 kHz CrO_2/Co, to 20 kHz metal tape; S/N ratio no NR/Dolby/dbx 63/73/92 dB; input sensitivity/impedance 60 mV/50k ohms line; microphone input 0.25 mV/−72 dB; output level/impedance 0.3 V/50k ohms line; headphone output impedance 8 ohms; power consumption 25 W; fast-wind time 90 seconds with C60 cassette; $17^{13}/_{16}$"W × $10^{1}/_{4}$"D × $4^{7}/_{16}$"H; 13 lb 4 oz $590

V-95RX Stereo Cassette Deck

Bidirectional stereo cassette deck with Positouch transport control, Computomatic Program System, dbx and Dolby noise-reduction systems, and dbx dynamic-range expansion. Features real-time reverse; block repeat; 3-motor transport; touch fader control system; bipolar power supply; dc circuitry; timer record/play; LED bargraph peak level meters; 4-digit LED tape counter; output level control; recording balance control; all-clear button; normal/CrO_2(Co)/metal tape selectors. Wow and flutter 0.045% wrms; frequency response ±3 dB 30-16,000 Hz normal, to 18 kHz CrO_2/Co, to 19 kHz metal tape; S/N ratio no NR/Dolby/dbx 59/69/91 dB; input sensitivity/impedance 60 mV/50k ohms line; microphone input 0.25 mV/−72 dB; output level/impedance 0.3 V/50k ohms line; headphone output impedance 8 ohms; power consumption 25 W; fast-wind time 80 seconds with C60 cassette; $17^{13}/_{16}$"W × $11^{13}/_{16}$"D × $4^{7}/_{16}$"H; $13^{7}/_{8}$ lb $695

V-90R. Same as V-95RX except no Computomatic Program System; weight $13^{1}/_{4}$ lb $490

V Series Cassette Decks

V-80 Stereo Cassette Deck

Professional Series stereo cassette deck with Positouch controlled 3-head, 2-motor transport and TRT-mode tape counter. Features color-coded fluorescent peak level meters; double Dolby B noise-reduction system; multifunction tape counter with real-time display; memory stop; record mute; timer record/play capability; source/tape monitor switch; separate left and right record level controls and single output level control; normal/CrO_2/metal bias selectors. Wow and flutter 0.035% wrms; frequency response ±3 dB 20-17,000 Hz normal, to 19 kHz CrO_2 and metal tape; S/N ratio Dolby off/on 59/69 dB; input sensitivity/impedance 60 mV/50k ohms line; mic input 0.25 mV/−70 dB at 200 ohms or more; output level/impedance 0.3 V/50k ohms or more; mic output impedance 8 ohms; power consumption 30 W; fast-wind time 90 seconds with C60 cassette; 17"W × $10^{3}/_{8}$"D × $4^{1}/_{8}$"H; 13 lb 3 oz $420

V-70C Stereo Cassette Deck

Standard Audio Series stereo cassette deck with Dolby B and C noise-reduction systems, multifunction real-time display tape counter, and fluorescent peak program meters. Features IC logic transport controls; 2-head, 2-motor transport; record mute; memory stop; normal/CrO_2/metal tape selectors; timer record/play; facility for optional remote controller. Wow and flutter 0.035% wrms; frequency response ±3 dB 20-17,000 Hz normal, to 18 kHz CrO_2, to 19 kHz metal tape; S/N no NR/Dolby B/Dolby C 59/69/74 dB; input sensitivity/impedance 60 mV/50k ohms line; mic input sensitivity 0.25 mV/−72 dB at 200 ohms or greater; output level/impedance 0.3 V/50k ohms; headphone output impedance 8 ohms; power consumption 30 W; fast-wind time 90 seconds with C60 cassette; 17"W × $10^{3}/_{8}$"D × $4^{1}/_{4}$"H; 13 lb 3 oz $390

V-66C Stereo Cassette Deck

Cobalt-amorphous-head cassette deck with Dolby B and C noise reduction. Features 12-segement fluorescent bar display for record/play levels; solenoids for transport functions; DC servomotor for capstan control; second DC motor for tape reels. Frequency response 30-19,000 Hz with metal or chrome tape; to 17,000 with normal tape; wow and flutter 0.035%; S/N ratio 59 dB weighted without noise reduction, 69 dB above 5 kHz with Dolby B and 74 dB with Dolby C $280

V-50 Stereo Cassette Deck

Stereo cassette deck with Dolby B noise-reduction system, built-in condenser microphone, and metal-tape capability. Features 3-step bias/equalization selector; LED bargraph signal-level meters; output level control; input level controls; line/mic/built-in mic selector; record mute; timer standby record/play. Wow and flutter 0.06% NAB weighted; frequency response ±3 dB 30-17,000 Hz metal and CrO_2, to 15 kHz normal tape; S/N ratio Dolby off/on 57/67 dB; distortion 1.0% at 400 Hz; fast-wind time 110 seconds with C60 cassette; 17"W × 10"D ÷ 4.3"H; 12 lb $270

V-40. Similar to V-50, including microswitch soft-touch transport controls but less built-in microphone and output level control $240

V-44C Stereo Cassette Deck

Soft-touch cassette deck with Dolby B and C noise reduction and BRILLIANT switch for boosting treble frequencies. Features DC servomotor; 12-segment fluorescent bar meter; record muting switch. S/N ratio 72 dB with Dolby C; wow and flutter 0.05%; frequency response 30-16,000 Hz with metal or chrome tape, to 15,000 Hz with normal tape $240

V-33 Stereo Cassette Deck

Front-loading cassette deck with Dolby B noise reduction and BRILLIANT switch for increasing high-frequency response. Features 12-segment LED bar level indicator; record muting switch; metal tape compatiblity. Frequency response 30-16,000 Hz with metal or chrome tape, to 15,000 Hz with normal tape; S/N 57 dB without noise reduction, 67 dB above 5,000 Hz with Dolby B; wow and flutter 0.05% weighted $210

V-30 Stereo Cassette Deck

Stereo cassette deck with Dolby B noise-reduction system. Features BRILLIANT switch for improving frequency response; LED bargraph signal level meters; 3-step bias/equalization selectors; timer record/play. Wow and flutter 0.06% wrms; frequency response ±3 dB 30-17,000 Hz metal and CrO_2, to 15 kHz normal tape; S/N ratio Dolby off/on 57/67 dB; distortion 1.0% at 400 Hz; 17"W × 10"D × 4.3"H; 12 lb $210

Simul-Sync System Cassette Deck

M-124 Syncaset Stereo Cassette Deck

Front-loading Simul-Sync stereo cassette deck with

Dolby B noise-reduction system, FG dc servo-controlled motor, and record/play and erase heads. Features Simul-Sync that permits monitoring on one track while simultaneously recording on another through the same head; crossfield switch for Simul-Sync for slight blending of left and right channels; independent bias and equalization selectors for normal/CrO_2 tapes; separate left and right record level controls; mic/DIN and line input selector; 3-digit tape counter with memory rewind; 2 VU meters; fast-wind time 90 seconds with C60 cassette. Wow and flutter 0.07% wrms; frequency response ±3 dB 30-16,000 Hz with CrO_2 tape; S/N ratio Dolby off/on 55/65 dB; input sensitivity/impedance 60 mV/50k ohms line, 0.25 mV/600 ohms mic; 16¼"W × 11½"D × 6¼"H $450

TECHNICS

SV-P100 Digital Cassette Deck

Stereo digital cassette deck uses pulse-code modulation to record on, play back from, standard VHS videocassette. Features LSI IC-chip digital signal processing; versatile editing capabilities; liquid-crystal display tape counter, level display meters (includes peak hold); input, output terminals for direct dub from second SV-P100; recessed power switch to prevent accidental power off; headphone, microphone jacks on front panel; fade-in/out control; motor-driven cassette holder; dew lamp; soft-touch transport controls; automatic recording possible with audio timer. Frequency response 2-20,000 Hz ±0.5 dB; harmonic distortion <0.01% at 1 Hz_2, 0dB; dynamic range >86 dB; input sensitivity/impedance 30 mV/10k ohms line, 0.7 mV/600 ohms microphone, 1 V p-p/75 ohms digital; output level/impedance 400 mV/600 ohms line, 1 V p-p/75 ohms (video format); record/play time 2 hours maximum; power consumption 85 W; 16¹⁵⁄₁₆"W × 13⅜"H × 10¹⁵⁄₁₆"D; 46.3 lb. $3000

Professional Series

RS-M85MkII Stereo Cassette Deck

Metal-compatible stereo cassette deck with Dolby B noise-reduction system; vertical hold; flat component style; quartz-locked-planar-opposed dc brushless, coreless, slotless direct-drive capstan motor with servo-controlled circuit; separate coreless reel motor; full IC-logic control; laminated sendust head; low-noise equalizer and high-linearity amplifier; MPX filter. Features fluorescent electronic bargraph peak displays; dim/bright and VU/peak switches; 4-position tape selector with fine bias-adjust control; electronic full automatic stop; record mute; mic/line mixing; output level control; 3-digit tape counter with memory rewind; timer record with external timer; electronic muting circuit. Wow and flutter 0.035% wrms; frequency response ±3 dB 30-14,000 Hz normal, to 16 kHz CrO_2 and FeCr tape; S/N ratio Dolby off/on 59/69 dB; microphone input sensitivity/impedance 0.25 mV/400-10k ohms; fast-wind time 90 seconds with C60 cassette; 19"W × 15⅞"D × 3⅞"H.... $750

dbx Cassette Decks

RS-M275X Stereo Cassette Deck

Direct-drive stereo cassette deck with Dolby B and C, dbx noise-reduction systems. Features 3-motor direct-drive transport; Intro-Search; AX (amorphous) head; multi-function FL digital counter; wide-scale, 3-color FL meter (-40 to +18 dB) with peak-hold; dbx disc decoder; automatic normal/CrO_2/metal tape selector; microprocessor feather-touch transport controls; bias fine adjust control. Wow and flutter 0.03% wrms; frequency response ±3 dB 30-16,000 Hz normal, to 17 kHz CrO_2, to 18 kHz metal tape; S/N ratio no NR/Dolby B/Dolby C/dbx 58/68/76/92 dB; dynamic range 110 dB at 1 kHz with CrO_2 tape; 16⅞"W × 12⅞"D × 3⅞"H..... $600

RS-M253X Stereo Cassette Deck

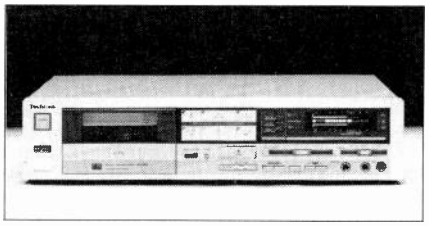
Three-head slim design stereo cassette deck with dbx and Dolby B and C noise reduction. Also has dbx disc decoding. Features fine bias adjustment; 2 motors; microprocessor logic control; AX (amorphous) head; 3-color 18-segment FL meter with peak hold; electronic counter for tape, time, music select (maximum 20 skips), record-mute time, refrain (maximum 16 times auto repeat); auto monitor change play (manually changeable); tape monitor; rec/source monitor; auto tape select; auto input select; output volume control; remote control with optional RP-9645; timer stand-by. Wow and flutter 0.045% wrms $450

RS-245X Stereo Cassette Deck

Two-motor stereo cassette deck with dbx and Dolby B and C noise reduction. Also has dbx disc decoding. Features microprocessor logic control; AX (amorphous) head; 3-color 18-segment FL meter with peak hold; electronic counter for tape, time, music select (maximum 20 skips), record-mute time, refrain (maximum 16 times auto repeat); auto tape select; auto input select; output volume control; remote control with optional RP-9645; timer stand-by. Wow and flutter 0.045% wrms $330

RS-235X Stereo Cassette Deck

Slim-line two-motor stereo cassette deck with dbx and Dolby B and C noise reduction. Also has dbx disc decoding. Features microprocessor logic control; AX (amorphous) head; 3-color 18-segment FL meter with



peak hold; auto tape select; auto input select; metal-compatible MX head; record mute; cue and review; timer stand-by. Frequency response with metal tape 20-19,000 Hz; wow and flutter 0.045% wrms$270

RS-M234X Stereo Cassette Deck

Slim-line stereo cassette deck with dbx and Dolby B and C noise reduction. Also decoding for dbx discs. Features soft-touch transport; single-touch recording; rewind auto play; 3-color 18-segment FL meter with peak hold; metal-compatible MX head; timer record/play; auto tape select; auto input select; record mute. Wow and flutter 0.05% wrms $220

RS-M227X Stereo Cassette Deck

Slim-line stereo cassette deck with dbx and Dolby B and C noise reduction. Features soft-touch transport; single-touch recording; rewind auto play; illuminated meters; metal-compatible MX head; timer record/play. Frequency response with metal tape 20-17,000 Hz; wow and flutter 0.05% wrms $180

Stereo Cassette Decks

RS-M258R Stereo Cassette Deck

Auto-reverse stereo cassette deck with Dolby B noise-reduction system. Features quick-reverse tape mechanism; mode and direction selectors; fixed SX heads; dual flywheel; soft-touch transport controls; music select; record mute; single-touch recording; timer record/play; automatic normal/CrO_2/metal tape selection; dot-pattern FL meters; output-level control; automatic input selector. Wow and flutter 0.07% wrms; frequency response ±3 dB 30-15,000 Hz normal, to 16 kHz CrO_2 and metal tape; S/N ratio Dolby off/on 57/67 dB; input sensitivity/impedance 0.25 mV/400-10k ohms mic, 60 mV/>36k ohms line; output level/impedance 700 mV/2.6k ohms line, 125 mV/8-125 ohms headphones; fast-wind time 90 seconds with C60 cassette; power consumption 20W; 16⅞"W × 13⅜"D × 4¹⁵⁄₁₆"H; 12 lb 13 oz. $400

RS-M222 Stereo Cassette Deck

High-speed-dubbing double stereo cassette deck with Dolby B noise-reduction system. Features synchro start; microphone mixing; series playback; automatic normal/CrO_2/metal tape selection; music selector; dub/mix switch; peak-hold FL meters; playback level control; single-touch recording; record mute; soft-touch transport controls; rewind automatic play; metal-compatible MX heads; dual pause control; automatic input selector. Wow and flutter 0.048% wrms; frequency response 20-17,000 Hz ±3 dB with normal tape, to 18 kHz CrO_2, to 19 kHz metal; S/N 57 dB Dolby off, 67 dB Dolby on; input sensitivity/impedance 1.0 mV/400-10k ohms mic, 60 mV/>47k ohms line; output level/impedance 400 mV/2.5k ohms line, 800 mV (at 8 ohms)/8-600 ohms; power consumption 15 W; fast-wind time 90 seconds for C60 cassette. 16⅞"W × 10¹⁵⁄₁₆"D × 4¹¹⁄₁₆"H. 12 lbs 7 oz..... $300

RS-M226 Stereo Cassette Deck

Stereo cassette deck with Dolby B and C noise-reduction systems, soft-touch transport controls. Features single-touch recording; rewind automatic play; cue and review; timer record/play; large illuminated meters; metal-compatible MX head; oil-damped cassette door. Wow and flutter 0.048% wrms; frequency response 20-17,000 Hz ±3 dB normal, to 18 kHz CrO_2 and metal tape; S/N ratio 57 dB no NR,67 dB Dolby B, 75 dB Dolby C; input sensitivity/impedance 0.25 mV/400-10k ohms mic, 60 mV/>47k ohms line; output level/impedance 400 mV/<2.3k ohms line, 80 (at 8 ohms)/8-600 ohms headphones; fast-wind time 90 seconds with C60 cassette; power consumption 12 W; 16⅞"W × 9³⁄₁₆"D × 4⅝"×; 8 lb 13 oz..... $160

RS-M205 Stereo Cassette Deck

Stereo cassette deck with metal-tape compatability, soft-touch transport controls, and dual analog VU meters. Features Dolby noise-reduction system; left, right input level-controls; oil-dampened soft load, eject; removable cassette-well door; MX record/play, double-gap ferrite erase heads. Wow and flutter 0.05% wrms; frequency response ±3 dB 20-17,000 Hz metal, to 16 kHz CrO_2, to 15 kHz normal tape; S/N ratio Dolby off/on 56/66 dB; fast-wind time 90 seconds with C60 cassette; power consumption 10 W; 16⅞"W × 8⅛"D × 4¹³⁄₁₆"H $130

TEKNIKA

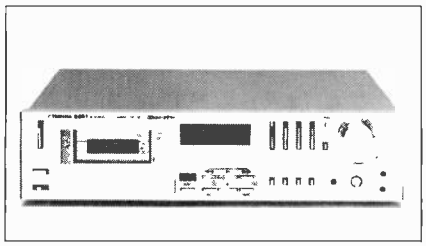
8861 Stereo Cassette Deck

Front-loading, damped-eject stereo cassette deck with hard permalloy record/play head and dual-gap ferrite erase head. Features solenoid-operated 2-motor, direct-drive transport with FG servo dc capstan motor; soft-touch IC-logic transport controls; cassette program quick sensor to locate beginnings of programs; separate input and output level controls; Dolby B noise-reduction system; 24-segment peak-hold fluorescent signal-level meters; 4-position tape selector (includes metal); automatic stop at end of play. Wow and flutter 0.03% wrms; frequency response 30-17,000 Hz ±3 dB with metal tape; S/N ratio 63 dB,

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.

Cassette Decks



Dolby on; THD <1.5% at 0 VU; 17 1/16"W × 12 13/16"D × 4 1/4"H $299

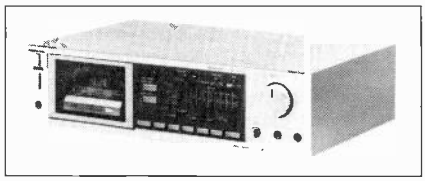
8461 Stereo Cassette Deck

Front-loading, damped-eject stereo cassette deck with hard Dynalloy record/play head and dual-gap ferrite erase head. Features dc capstan motor; soft-touch IC-logic-controlled transport; Dolby B noise-reduction system; LED recording-level displays; normal/CrO_2/metal tape selector; automatic stop. Wow and flutter 0.06% wrms; frequency response 40-16,500 Hz ±3 dB; S/N ratio 61 dB, Dolby on; THD <1.5%; 14 3/16"W × 9 1/16"D × 5 7/8"H $199

TOSHIBA

PC-G50R Auto-Reverse Cassette Deck

Stereo 2-motor cassette deck with auto reverse and Dolby B and C noise reduction. Features rotary head; quick reverse; one side, two side, or continuous play; auto bias/EQ selector; peak-indicating level meters;



timer record/play; compatible with metal tape. Wow and flutter 0.04% wrms; frequency range 20-17,000 Hz; S/N ratio 75 dB with Dolby C. 16 9/10"W × 4 5/8"H × 10 5/8"D $230

PC-G30 Dolby B/C Cassette Deck

Solenoid-operated 2-motor stereo cassette deck with Dolby B and C noise reduction. Features peak-indicating LED level meters; amorphous head; timer record/play; compatible with normal, CrO_2, metal tape. Wow and flutter 0.45% wrms; frequency range 20-18,000 Hz; S/N ratio 75 dB with Dolby C $180

PC-G10 Stereo Cassette Deck

Metal-compatible cassette deck with Dolby B. Features soft-touch operation; peak-reading LED level meters; timer record/play. Wow and flutter 0.055% wrms; frequency range 20-18,000 Hz; S/N ratio 63 dB with Dolby B $140

UHER by WALTER ODEMER

CR-240 Portable Cassette Deck

Compact front-loading portable cassette deck with Dolby noise-reduction system, low-wear motor with electronic control, 2 contrarotating flywheels, and built-in loudspeaker for mono monitoring. Features automatic start after fast-forward or rewind; automatic end-of-tape shut-off; switchable automatic level control; remote control accessory; clock timer operation; separate or tandem (mechanical coupling) record level controls; twin peak-reading level meters for record and playback with meter illumination and 3 LED function indicators; battery check with quick-action switch; built-in condenser microphone; linear stereo power amplifier; stereo headphone jack socket; joystick control for selection of 3 tape transport functions. Wow and flutter 0.2% (DIN); frequency range 30-16,000 Hz; S/N 58 dB Dolby off with FeCr, 66 dB Dolby on with CrO_2 and FeCr, 65 dB Dolby on with normal tape; crosstalk −70 dB at 1 kHz, reverse track, −45 dB stereo; mic input 0.2 mV at 500 ohms source impedance; power ac line, dry cells, rechargeable, or car battery; 9 1/4" × 2 1/3" × 7 1/4" .. $1389

CR-240AV. Audio-visual version of CR-240.. $1427

NEED MORE INFORMATION?

Write directly to the manufacturer or distributor. A list of names and addresses starts on page 36.

VECTOR RESEARCH

VCX-800 Stereo Cassette Deck

Front-loading stereo cassette deck with 3 heads, 2 motors, dual capstans. Features Dolby B/C tape, Dolby FM noise-reduction, HX headroom-extension systems; microprocessor-controlled Compu-counter that automatically selects tape length, displays remaining time in minutes and seconds, searches for any location on a tape; sweep oscillator that allows adjustment for flattest response; 2 memory circuits; automatic rewind/play; record mute; feather-touch transport controls. Wow and flutter 0.03%; frequency response ±3 dB 25-19,000 Hz normal, to 20 kHz CrO_2, to 21 kHz metal tape; S/N ratio no NR/Dolby B/Dolby C 56/66/76 dB; 17 3/8"W × 14 1/2"D × 5 5/16"H $1,000

VCX-510 Stereo Cassette Deck

Stereo cassette deck with Dolby B/C noise-reduction systems, IC-logic 2-motor transport, Music Search®. Features Duralloy head; 4-position tape selector; automatic rewind/play; repeat play memory function; LED peak level meters; record mute; output-level control; MPX filter; provision for optional VRC-22 remote-control unit. Wow and flutter 0.04% wrms; frequency range 25-19,000 Hz metal, to 18 kHz CrO_2, to 16 kHz normal; S/N ratio no NR/Dolby B/Dolby C 56/66/76 dB A weighted, referred to 3% THD; input sensitivity/impedance 60 mV/50 ohms line, 0.25 mV/−72 dB (600 ohms or more) mic; output level/impedance 650 mV/1k ohm line, 120 mV/8 ohms headphones; fast-wind time 100 seconds with C60 cassette; power consumption 35W; 17 3/4"W × 14 1/2"D × 5 5/8"H; 15.7 lb $500

VCX-400 Stereo Cassette Deck

Stereo cassette deck with Dolby B/C noise-reduction systems, full-logic solenoid-controlled transport, memory rewind. Features Duralloy head; 4-position tape selector; fine bias adjust control; LED peak-level meters; record mute; MPX filter; provision for optional VCR-22 remote control. Wow and flutter 0.05% wrms; frequency range 25-18,000 Hz metal, to 17 kHz CrO_2, to 15 kHz normal tape; S/N ratio no NR/Dolby B/Dolby C 56/66/76 dB A weighted referred to 3% THD; input sensitivity/impedance 60 mV/50k ohms line, 0.25 mV/−72 dB (600 ohms or more) mic; output level/impedance 650 mV/1K ohm line, 120 mV/8 ohms mic; fast-wind time 100 seconds with C60 cassette; power consumption 30 W; 17 3/8"W × 14 1/2"D × 5 5/8"H; 14.6 lb..... $350

VCX-200 Stereo Cassette Deck

Power-assist one-motor-transport cassette deck with Dolby B and C noise reduction. Features music search; 2 sendust heads; variable bias; 4-position tape selector; LED meters; rec mute. Frequency response 30-16,000 Hz ±3 dB (metal), to 15 kHz (CrO_2), to 14 kHz (normal); S/N ratio 56 dB no Dolby, 66 dB Dolby B (over 4 kHz), 76 dB Dolby C (over 2 kHz); all other specs same as for VCX-400. 17 3/8"W × 14 1/2"D × 4 3/4"H $250

YAMAHA

K-2000 3-Head Cassette Deck

Stereo 3-head 2-motor cassette deck with dbx and Dolby B noise reduction. Features triple-laminated sendust heads; Linear Electromagnetic Transduction Circuitry to reduce TIM; 16-part LED meters (from −40 to +18 dB); direct drive; auto bias; monitor erase; time counter; auto return to point recording began; pitch control (±15%); full-logic, light-touch controls; full repeat; memory rewind; continuous playback of programmed section. Wow and flutter 0.02%. Available in black only $795

K-1000B. Similar to K-2000 except has manual bias control, double-laminated sendust heads. Black front panel $595

K-1000S. Same as K-1000B except with silver front panel $595

K-700 Auto-Reverse Cassette Deck

Auto-reverse stereo cassette deck with microcomputer-controlled functions and Dolby B and C noise reduction. Can be programmed to omit unwanted cuts while recording and can play up to 15 cuts in any order. Features auto fade in/out during 2.5-sec reverse; blank skip; 2 motors; remaining time indicator; auto return to point recording began; intro scan; memory stop; auto advance; auto tape-type selector; record/play timer; 12-part LED metes; optional remote control $495

960B Stereo Cassette Deck

High-end deck contains Dolby and dbx noise-reduction systems (providing up to 30 dB of noise suppression with dbx system). Features sendust record/play, double-gap ferrite erase heads; 2-motor transport with IC logic control; fluorescent bargraph meters; continuously adjustable bias control; timer recording switch; subsonic and MPX filters; low-noise equalizer preamp; focus switch to extend high-end frequency response; black front panel. Wow and flutter <0.028% wrms, <0.1% DIN; frequency response ±3 dB 30-17,000 Hz normal, to 19 kHz CrO_2, to 22 kHz metal tape; S/N ratio no NR/dbx on >60/>100 dB with metal tape; overall distortion <1.0% normal and metal tape, <1.5% CrO_2 tape; input sensitivity/impedance 0.3 mV/5k ohms mic, 50 mV/100k ohms line; output level/impedance 340 mV/1.6k ohms line, 1 mW/8 ohms (5 mW/150 ohms); power consumption 35 W; fast-wind time 70 seconds with C60 cassette; 17 1/4"W × 12"D × 5 5/16"H; 17 lb 10 oz $495

K-960S. Same as K-960B but with silver front panel $495

K-500 Stereo Cassette Deck

Full-logic transport controls stereo cassette deck with 2 motors and Dolby B and C noise reduction. Features sendust record/play and double-gap ferrite erase heads; 2-color bargraph meters; automatic tape selector; timer record/play function; memory stop with repeat function; dc servo capstan and dc reel motors; facility for optional remote controller. Wow and flutter <0.05% wrms, <0.08% DIN; frequency response ±3 dB 40-16,000 Hz normal, to 18 kHz CrO_2, to 20 kHz metal tape; S/N ratio no NR/Dolby B/Dolby C 60/68/76 dB EIAJ with CrO_2 tape; overall distortion <1% EIAJ at 315 Hz; input sensitivity/impedance 0.4 mV/3.9k ohms mic, 60 mV/60k ohms line; output level/impedance 350 mV/24k ohms line; 0.6 mV/8 ohms headphones; power consumption 20 W; 17 1/8"W × 11"D × 4 3/8"H; 9 lb 14 oz $350

K-300. Similar to K-500 except no memory stop with repeat or remote-control capability; has hard Permalloy record/play head. Frequency response to 16 kHz normal, to 16 kHz CrO_2, to 17 kHz with metal tape $275

K-200 Stereo Cassette Deck

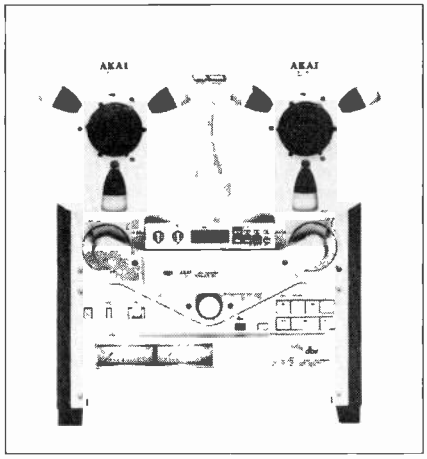
Two-motor stereo cassette deck with Dolby B noise reduction. Features soft-touch transport controls; true meter-type signal-level meters with VU characteristics; timer record function; dc servo capstan, flat-torque dc reel motors; hard permalloy record/play, double-gap ferrite erase heads. Wow and flutter 0.05% wrms, 0.08% DIN; frequency response 40-15,000 Hz ±3 dB all tape formulations, including metal; S/N ratio Dolby off/on >50/>60 dB with CrO_2 tape; overall distortion 1.0% at 315 Hz; separation >35 dB at 1 kHz; crosstalk >60 dB at 125 Hz; input sensitivity/impedance 0.3 mV/5k ohms mic, 60 mV/80k ohms line; output level/impedance 350 mV/2.2k ohms line; power consumption 14 W; fast-wind time 80 seconds with C60 cassette; 17 1/8"W × 11"D × 4 13/32"H; 9 lb $220

2 Open-Reel Tape Decks

AKAI

GX-747 dbx Open-Reel Deck

Open-reel 4-track, 2-channel auto-reverse stereo/mono deck with dbx noise reduction. Features 10½" reel capacity; EE tape capability; VU meters; full-logic feather-touch transport controls; tape/source monitoring; automatic tension arm-lock system; electronic



digital real-time counter with memory function; cue and review; remote-control capability. Wow and flutter <0.03% wrms; frequency response 25-33,000 Hz ±3 dB at 7½ ips; S/N ratio >65 dB at 7½ ips; distortion 0.4% at 7½ ips; 19.4" H × 17.3" W × 10.1" D; 51.2 lb $1,400

GX-625 Open-Reel Tape Deck

Open-reel 3¾ and 7½-ips, ¼-track 2-channel stereo deck with ac servo direct-drive capstan, 2 eddy-current reel motors. Features 2 GX record/play, one erase head; reel capacity 10½"; automatic repeat, play, stop; illuminated logic solenoid tape function controls with LED standby indicator; LED digital timer/tape counter; 2-deck tape monitoring; mic/line mixing; output level control; variable pitch control; mono/stereo recording; timer record/play with external timer; computerized electronic braking. Wow and flutter 0.03% rms at 7½ ips; frequency response 30-26,000 Hz; ±3 dB at 7½ ips; S/N ratio 62 dB weighted, with low-noise tape, peak recording level at 3% THD; 17.6"H × 17.3"W × 9.5"D $850

GX-77D Open-Reel Tape Deck

Open-reel 4-track, 2-channel, automatic-reverse record/play stereo/mono 7" deck with EE tape capability. Features 2-color LED peak-hold meters; tape/source; power loading system; digital electronic real-time counter; fine bias-adjust control; cue and review; timer record/play capability; remote-control capability. Tape speeds 7½, 3¾ ips; wow and flutter <0.03% wrms at 7½ ips; S/N ratio >63 dB at 7½ ips, DIN 45500 standard; frequency response 25-33,000 Hz ±3 dB at 7½ ips; distortion <0.5% at 7½ ips; 17.2"W × 9.6"H × 8.9"D; 37.5 lb. $795

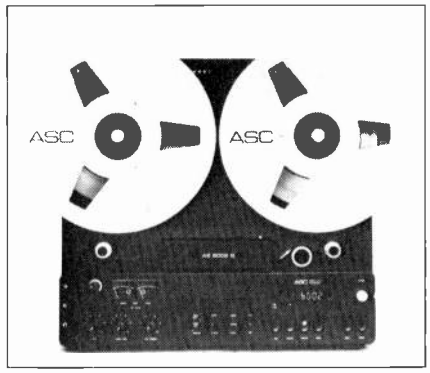
GX-4000D Compact Tape Deck

Contains GX record and playback and separate erase heads, accommodates up to 7" reels. Features tape/source monitoring; mic/line mixing; sound-on-sound, sound-with-sound; track selector; automatic stop; output level control; VU meters. Tape speeds 7½ and 3¾ ips; wow and flutter <0.08% rms at 7½ ips; frequency response 30-24,000 Hz ±3 dB at 7½ ips; S/N ratio >60 dB weighted at wide range tape setting with peak level at 3% THD; distortion <1% at 1 kHz, 0 VU; 17.3"W × 12.4"H × 9.1"D; 29 lb $400

ASC by HAMMOND

ASC 6000 Open-Reel Tape Deck

Multi-head 10½-inch with three speeds: 15, 7½, and 3¾, or 7½, 3¾, and 1⅞ ips. Available in ½-track or ¼ track configuration. Two asynchronous outer-rotor reel motors are designed for fast and accurate winding and a collectorless DC electronically controlled



capstan motor provides precise tape speed. Features cueing capability, built-in mixing, and full-logic tape transport $1795

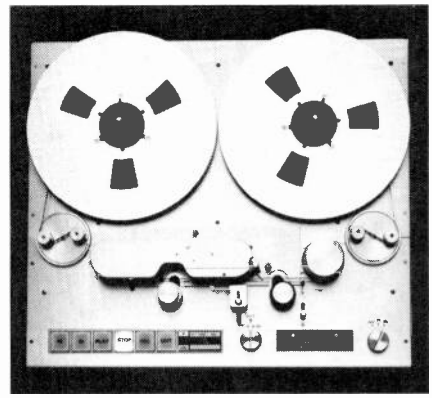
MARK LEVINSON

ML-5 Master Recorder

Open-reel recorder contains the Studer A80RC transport with audio electronics by Mark Levinson Audio; available in either 30 AES/15 NAB and CCIR ips, or 15 NAB and CCIR/7.5 NAB and CCIR ips. Features low gap splatter; wide-track record and playback heads; full-track erase head; complete editing features. Operating level 200 nWb/meter = −6 dBm (387 mV); record/playback frequency response (30 and 15 ips) 31.5 Hz to 125 Hz ±1.5 dB, 125 Hz to 20 kHz +0.2 dB, −0.5dB; total third harmonic distortion <1.81% at 400 Hz; S/N ratio at -6 dBm: >−54 dB unweighted, −62 dB ASA A-weighted. 11¼" × 25⅛" × 21⅜"; 117 lbs..... $14,400

For an explanation of abbreviations, turn to the list on page 35.

Tape-recording terms are defined in the vocabulary on page 32.



PIONEER

RT-909 Stereo Tape Deck

Open-reel 3¾ and 7½-ips, ¼-track, 3-motor, 4-head stereo tape deck; FG dc servo dual-capstan motor, two 6-pole inner rotor reel motors; accepts up to 10½" reels. Features 2-step bias/equalization selector with variable bias; fluoroscan level indicators with peak/average functions; 4-digit electronic counter; reel and speed selector; pitch control; repeat switch; timer start with external timer; automatic reverse; tape/monitor switch; separate mic/line, left/right input-level controls; output-level control. Wow and flutter 0.04% at 7½ ips, 0.08% at 3¾ ips; frequency response 20-28,000 Hz ±3 dB (7½ ips), 20-18,000 Hz ±3 dB (3¾ ips); S/N ratio 60 dB (7½ ips), 55 dB (3¾ ips); 13⅜"H × 18⅞"W × 12½"D..... $895

RT-707 Stereo Tape Deck

Automatic-reverse open-reel stereo tape deck. Features 3¾- and 7½-ips speeds; speed accuracy ±0.5%; 3 motors; 4 heads; ¼-track, 2-channel design; handles 7" reels; FG servo ac direct drive motor for capstan drive, 2 6-pole inner-rotor induction motors for reel drive; solenoid-operated, direct-switchable function buttons, preset function button for timer record/play; automatic/manual reverse play; automatic repeat play; independent L/R recording mode selectors; 2 bias/2 equalization tape selection; full complement of inputs/outputs. Wow and flutter 0.055 wrms; (7½ ips), 0.08% wrms (3¾ ips); S/N ratio 58 dB; distortion 1% maximum at 7½ ips; fast rewind 100 seconds with 7" reel; frequency response 30-24,000 Hz ±3 dB at 7½, to 16 kHz at 3¾ ips; crosstalk −50 dB; separation 50 dB; pitch control ±6% (playback only); 9 1/16"H × 18 29/32"W × 14 1/32"D..... $695

REVOX

B77 MKII Stereo Tape Recorder

Stereo 2-speed (choice of 3¾ and 7½ ips, 7½ and

Open-Reel Tape Decks

2

15 ips, 15/16 and 1 7/8, or 1 7/8 and 3 3/4 ips) tape recorder with 3 motors; 10½" reel capacity. Features front-panel vari-speed control (±2 semitones); integrated-drive-logic computer-type push-point function keys; built-in tape cutter; 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 crossfade unit. Wow and flutter (DIN 45507/IEEE 193-1971) 0.06% at 15 ips, 0.08% at 7½ ips; frequency response +2/-3 dB 30-22,000 Hz at 15 ips, to 20 kHz at 3¾ ips, to 16 kHz at 3¾ ips; S/N ratio on ¼-track 63 dB at 15 and 7½ ips, 60 dB at 3¾ ips; on ½-track 67 dB at 15 and 7½, 64 dB at 3¾ ips; mic input level/impedance 0.15 mV/2.2k ohms (lo position, 50-to-6000-ohm mics), 2.8 mV/110k ohms (hi, 20k-ohm mics); 16.3"H × 17.8"W × 8.14"D $1,799

B77 Self Sync. Same as B77; available in 3¾ and 7½ ips or 7½ and 15 ips speeds with playback possibility from record head $1,749

B77 Autostart. Same as B77 except with VOX control $2,049

B77 Slide Sync. Same as B77 except with additional head for slide projector control $1,899

PR99 Stereo Tape Deck

Stereo 15- and 7½- or 7½- and 3¾-ips half-track recorder with direct-drive, servo-controlled capstan, electrically-controlled reel motors, 10½" reel capacity. Features balanced (XLR) line-in/out and switched cal/uncal level settings; high- or low-impedance microphone input (balanced, XLR option); 2-way Self-Sync with complete tape editing facilities including tape dump; logic-controlled transport; true VU meters with LED peak indicators; tape/source monitoring; safe/ready record switches; 4-digit tape counter; manual/remote-control/fader-start operation. Wow and flutter (DIN) 0.06% at 15 ips, 0.08% at 7½ ips, 0.1% at 3¾ ips; frequency respone +2/−3 dB 30-22,000 Hz at 15 ips, to 20 kHz at 7½ ips, to 16 kHz at 3¾ ips; S/N ratio 66 dB at 15 and 7½ ips, 63 dB at 3¾ ips; case or 19" rack mount; 19"W × 15.7"H × 7.9"D $2,095

Console $330

Carrying case $225

SONY

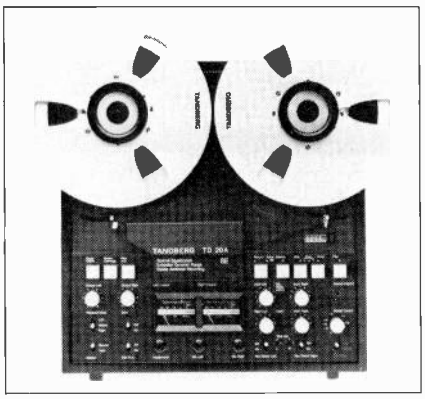
TC-399 Open-Reel Deck

Quarter-track stereo record/play deck with ferrite-and-ferrite heads in 3-head design, head/play amplifier. Features ac induction motor drive system; 7½, 3¾, and 1 7/8 ips tape speeds; servo back-tension device; scrape flutter filter; all-mode automatic stop; 7" reel capacity. 17¼"H × 16⅜"W × 7½"D; 27 lb 13 oz $520

TANDBERG

TD20A SE Open-Reel Deck

Open-reel tape deck with new record equalization curves allowing signal-to-noise ratio of up to 80 dB without noise-reduction system (EQ switchable to NAB standard). Features Actilinear II® record system; Dyneq® headroom-extension system; active transconductance circuit for lower intermodulation distortion;



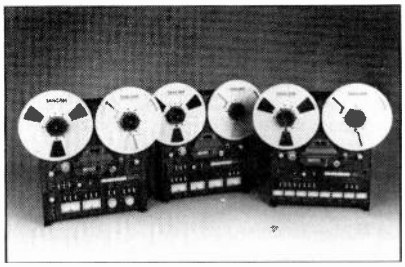
Sel Sync 4-motor solenoidless operation; phase linearity network; pushbutton operation with LED indicators; FREE position for easy tape editing and threading; stand-by position with LED when one or both record buttons are engaged; electronically governed speed; optional wireless infrared remote control or conventional cord remote control; 4 line inputs; master control for fading in/out; 2-step front panel; wide-scale peak-reading meters; bias adjustment on front panel. Available in three versions: 1/4 track, 15 and 7 1/2 ips; 1/2 track, 15 and 7 1/2 ips; and 1/4 track, 7 1/2 and 3 3/4 ips. $1595

TD20 A. Similar to TD20A SE except lacks Dyneq® headroom-extension system and special equalization. Features Actilinear I® record system; 2-step front-panel switch for mic attenuation of 25 dB. 7 1/2 and 3 3/4 ips, 1/4 track $999

TASCAM by TEAC

Series 30 Recorder/Reproducers

Feature high-torque slotless dc reel motors; FG dc servo capstan motor; pitch control; permalloy record/sync and repro heads; logic-operated transport controls; computer-controlled sensing logic; photo-optical end-of-tape detector; 10½" reel capacity; full sync functions; full frequency response in sync reproduce mode; FET switching in function and output select



sections; zero return function; optional full dual-process dbx noise-reduction system; circuit driven 4-digit FL index counter; flip-up head cover; Sync head shield; cue lever; dump edit logic; facility for optional remote transport control; optional remote punch-in/out foot pedal. Can be used vertically or horizontally or mounted in standard 19" EIA rack with optional hardware.

Model 38. Eight-track ½" recorder/reproducer operates at 15 ips and features precision die-cast head mounting block and plug-in head assembly for field replacement with minimal or no realignment. Head angle can be adjusted while tape is moving. Manually retractable shield minimizes noise $2,750

Model 34. Four-track ¼" recorder/reproducer operates at 15 and 7½ ips and features illuminated VU meters and 4 phono-jack unbalanced high-impedance line inputs and outputs (nominal level −10 dBV or 0.3 V). Wow and flutter 0.06% peak at 15, 0.09% peak at 7½ ips; frequency response (Sync ± reproduce 3 dB at 0 VU) 40-22,000 Hz at 15 ips, to 16 kHz at 7½ ips; THD (at 1 kHz) 0.08% at 0 VU (250 nWb/m), 3% at 13 dB above 0 VU (1116 nWb/m); S/N ratio 68 dB NAB A weighted at 15 ips, 66 dB at 7½ ips; crosstalk >50 dB down at 1 kHz, 0 VU); 17.5"H × 16"W × 8.43"D; 44 lb..... $1,700

Model 32. Half-track ¼" recorder/reproducer operates at 15 and 7½ ips and features dual concentric input and output-level controls; stereo headphone jack with independent level control; 2 illuminated VU meters; 2 unbalanced high-impedance phono-type line input jacks; 2 unbalanced high-impedance phono-type mic input jacks. Nominal line/mic input level −10 dBV (0.03 V)/−60 dBV (1 mV); wow and flutter at 15 and 7½ ips 0.06%/0.09% weighted peak; frequency response (sync and repro. 3 dB at 0 VU) 40-22,000 Hz at 15 ips, to 15 kHz at 7½ ips; THD (at 1 kHz) 0.08% at 0 VU (250 nWb/m), 3% at 13 dB above 0 VU (1116 nWb/m); S/N ratio 68 dB NAB A weighted at 15 ips, 66 dB at 7½ ips; crosstalk >50 dB down at 1 kHz, 0 VU; 17.5"H × 16"W × 8.43"D; 44 lb..... $1,300

22-4 Recorder/Reproducer

Four-channel system with 7" reel capacity and 15 and 7½ ips record/play capability. Features mixer interface; function and output select; punch-in recording; removable head housing; logic-controlled transport functions; headphone monitor selectors; expanded scale VU meters; independent level controls; memory stop function; ±6% pitch; manual cueing dbx. Type I interface optional. Tape format ¼"; tape speeds 15 and 7½ ips ±0.5%; frequency response 40-22,000 Hz at 15 ips, to 16 kHz at 7½ ips, both ±3 dB at 0 VU; THD 1.0% at 0 VU, 1 kHz, 185 nWb/m; S/N ratio 671 dB at 15 ips, 60 dB at 7½ ips A weighted (NAB) (increases to 88 dB in both cases with dbx); record/play amplifier headroom 23 dB above 0 VU; 16⅜"W × 16⅛"H × 10¼"D; 40 lb $1,425

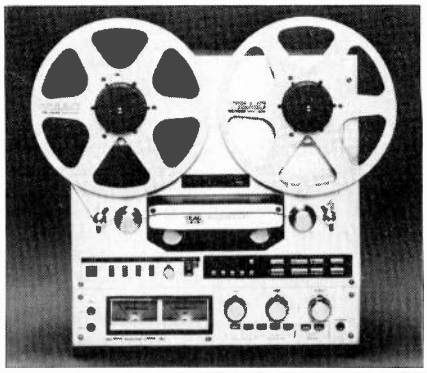
22-2 Half-Track Recorder/Reproducer

Three-motor/three-head ¼" tape recorder/reproducer that accepts 7½" reels and operates at 15 or 7½ ips. Features expanded-scale −2 to +5 dB VU meters; independent monitor and record ready controls for each channel; mic/line mixing; detachable head housing; precision molded reel tables, spring-loaded reel holders. Fully independent electronics permit source or tape monitoring, record for reproduce mode to be selected independently for either track. Wow and flutter 0.07% peak DIN/IEC/ANSI weighted at 15 ips, −0.04% rms JIS/NAB weighted at 15 ips (0.09% and 0.05%, respectively, at 7½ ips); frequency response 40-22,000 Hz ±3 dB at 0 VU, 1 kHz, 185 nWb/m; S/N ratio 66 dB NAB A weighted at 15 ips, 64 dB at 7½ ips; headroom >26 dB above 0 VU at 1 kHz for record, 38 dB for play amplifiers; 16⅛"W × 12 7/8"H ×9⅛"D; 30.8 lb $775

TEAC

X-1000R Bidirectional Open-Reel Deck

Computer-controlled dual-capstan stereo open-reel deck with bidirectional record/play, dbx decilinear noise-reduction/dynamic range-expansion system, and EE-tape compatibility. Features 5-digit LED multifunction digital tape counter/timer; dual-capstan



closed-loop transport with tension servo control; Magnefloat capstan bearings; STZ (search to zero) and STC (search to cue); automatic spacing in record; block repeat; Dupli-Sync for dubbing to cassette; automatic reverse/repeat; real-time pause; electrically assisted reel braking; 6% pitch control; motion sensing; timer record/play; 3 dc motors; 6 heads (3 each forward and reverse); facility for optional remote controller. Speeds 7½ and 3¾ ips; reel size up to 10½"; wow and flutter at 7½ and 3¾ ips 0.03%/0.04%; frequency response ±3 dB 40-30,000 Hz at 7½, to 24 kHz at 3¾ ips; S/N ratio dbx off/on 65/100 dB; harmonic distortion 0.8% at 1 kHz, normal operating level; separation 50 dB at 1 kHz; input sensitivity/impedance 60 mV/50k ohms line, 0.25 mV (−72 dB)/200 ohms or more mic; output level/impedance 0.45 V/10k ohms or more line; headphone output impedance 8 ohms; power consumption 80 W; fast-wind time 100 seconds with 1800-ft tape; 17¹³⁄₁₆"H × 17"W × 10⁹⁄₁₆"D; 48 lb 6 oz $1400

X-1000 Open-Reel Stereo Tape Deck

Computer-controlled 4-track 2-channel dual-capstan transport open-reel tape deck with dbx noise reduction, multi-function digital tape counter/timer, EE tape compatibility. Features permalloy heads; search to zero; search to cue; block repeat; rec mute; auto spacer; mic attenuation switching; independently switchable L/R recording for monaural or sound-on-sound recording; independent L/R source/tape monitoring; full-logic transport; mic/line mixing; ±6% pitch control; 3 DC motors; optional remote control. Reel size 10¹/₂" and 7"; wow and flutter 0.03% rms at 7¹/₂" ips; 0.04% rms at 3³/₄"; frequency response 30-34,000 Hz ±3 dB; 40-30,000 -10VU at 7¹/₂ ips; S/N ratio 65 dB dbx out, 100 dB dbx in (3% THD level, weighted); separation 50 dB at 1;000 Hz. 17"W × 17.8"H × 10.3"D; 48.5 lbs..... $1,200

TECHNICS

RS-1520 Open-Reel Deck

Compact professional tape deck; ½-track, 2-channel record/play and ¼-track, 2-channel record/play and ¼-track, 2-channel play; 4 head system; 15-, 7½-3¾-ips speeds; quartz control phase-locked dc brushless servo direct-drive capstan motor; reel tables; 2-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, right bias/equalization controls; left and right VU meters; built-in stroboscope. Wow and flutter 0.018% wrms at 15 ips, 0.3% wrms at 7 ½ ips; fast-wind time 150 seconds with 2500-ft tape; frequency response 30-30,000 Hz ±3 dB at 15 ips, to 25 kHz at 7½ ips; S/N ratio 60 dB; 0.8% distortion; 50 dB separation; mic input sensitivity 0.25 mV (-72 dB); microphone impedance 200-10,000 ohms; 17½"H × 18"W × 10⅛"D..... $2,100.

RS-1500US Open-Reel Deck

Three-speed (15, 7½, and 3¾ ips) ½-track 2-channel record, playback, erase, and ¼-track 2-channel playback stereo tape recorder with quartz-controlled PLL dc brushless servo direct-drive capstan motor with double pinch rollers, 2 tape-tension-controlled dc brushless direct-drive reel motors, 4 heads for recording, ½- and ¼-track playback, erasure; mixing; reel capacity 10½". Features IC-logic plus transistor tape transport controls with LED indicators, mode-to-mode switching with automatic pause between modes; 3-position bias and equalization switches; dual 2-scale VU meters with ±3-dB normal, +6-dB high range meter scale selector; separate mic and line level input controls with mixing; 0/20-dB mic attenuator; output-level control; left, right tape/source monitor switches; left/right rec mode switches; 4-digit tape counter showing elapsed time in minutes, seconds; timer start with external audio timer; edit dial; fast-wind time 150 seconds (2,500-ft, 1.5-mil tape). Wow and flutter 0.018% wrms at 15 ips, 0.03% at 7½ ips; frequency response ±3 dB 30-30,000 Hz at 15 ips, 20-25,000 Hz at 7½ ips, 20-15,000 Hz at 3¾ ips; S/N ratio 60 dB NAB weighted at 7½ ips, 58 dB at 3¾ ips; THD at 400 Hz, 0 VU 0.08%; separation 50 dB; input sensitivity/impedance 0.25 mV/4.7k ohms (mic, unbalanced), 60 mV/150k ohms (line, phono jack); rosewood veneer side panels; 19³⁄₈"W × 17½"H × 10⅛"D $1,600

RS-1506US. Similar to RS-1500US except 4-track 2-channel play/record, 2-track 2-channel play $1,600

RS-1700. Similar to RS-1506US except automatic reversing 4-track 2-channel record/play, no 2-track 2-channel play $2,100

For an explanation of abbreviations, turn to the list on page 35.

Tape-recording terms are defined in the vocabulary on page 32.

UHER by WALTER ODEMER

SG-631 Logic Open-Reel Deck

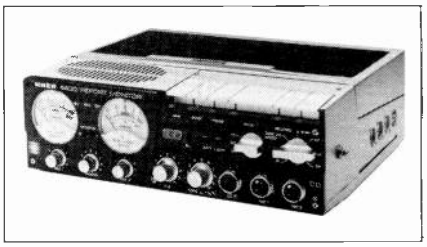
Three-speed (7½, 3¾, 1⅞ ips) 2- or 4-track stereo record/play deck; Omega looping system eliminates pinch-roller, drive couplings, springs, and function wheels; 4-motor drive system includes 2 dc hub motors, an electronically regulated capstan drive, and servomotor to form the Omega loop. Wow and flutter 0.05%; frequency response 20-25,000 Hz at 7½ ips, to 16 kHz at 3¾ ips, to 12 kHz at 1⅞ ips; S/N ratio 65 dB, 2-track at 7½ ips. Features built-in strobe disc; speed control; peak-reading meter; Dia-Pilot for recording signal impulses and automatic slide-projector control; switchable peak-level limiter; separate stereo headphone power with volume, bass, and treble controls; A/B monitoring; remote-control facility; 10½-in reel, maximum..... $1,936

SG561 Royal Open-Reel Deck

Four-speed (7½, 3¾, 1⅞, ¹⁵⁄₁₆ ips) 2- or 4-track mono/stereo record/play deck with interchangeable 2- or 4-track tape head mount with Recovac longlife heads and built-in stereo amplifier with mixing facility; 7" reel capacity. Features Synchro-Play sound-with-sound, Multi-Play sound-on-sound, reverb effect, and echo; Dia-Pilot for record/play of cueing signals for automatic slide projectors, will also synchronize sound and picture in 8- and 16-mm film-making; separate mic/radio and phone input controls; mic in/out switch; dual peak-indicating meters tape/source monitor switch separate and continous tandem tone control; 4-digit tape counter with zero reset; tape tension comparator; electronic end-of-tape shutoff. Wow and flutter (DIN 45507) 0.05% at 7½ ips, 0.1% at 3¾ ips, 0.2% at 1⅞ ips; frequency response 20-20,000 Hz at 7½ ips, to 15 kHz at 3¾ ips, to 9 kHz at 1⅞ ips; S/N ratio (DIN 45500) on 2-track 67 dB at 7½ ips, 66 dB at 3¾ ips, 65 dB at 1⅞ ips, on 4-track 65 dB at 7½ ips, 64 dB at 3¾ ips, 61 dB at 1⅞ ips; crosstalk −60 dB mono, −45 dB stereo; 18"W × 13.9"H × 7.5"D..... $1,711

Report Monitor Series Tape Recorders

All three versions of the Report Monitor include 3 heads, LED function indicators, integrated power supply, fully electronic amplifier switching, battery or AC



operation, tape-tension regulators, die-cast aluminum casings. All are suitable for stationary or portable use. Speeds: ¹⁵⁄₁₆, 1⅞, 3¾, 7½ ips.

4400 Report Monitor. Four-track stereo ... $1,512

4200 Report Monitor. Two-track stereo. ... $1,512

4000 Report Monitor AV. Half-track monaural $1,313

3 Blank Audio and Video Tape

BASF

Metal IV Cassettes
Metal-particle tape for Type IV/metal settings.
- 60 min $8.59
- 90 min $11.49
- 120 min $13.99

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

Pro I Super Cassettes
Ferric-oxide formulation for Type I/normal bias position.
- 60 min $4.49
- 90 min $5.99

Pro II Chrome Cassettes
Pure chromium-dioxide formulation for Type II/chrome/high-bias position.
- 60 min $4.69
- 90 min $6.29

Ferrochrom III Cassettes
Double-layer formulation of chromium dioxide and ferric oxide; Type III, ferrichrome bias, or Type I bias and 70 μsec equalization. Recommended for car stereos.
- 60 min $4.49
- 90 min $5.99

Performance I Cassettes
Normal/Type I/ferric position.
- 60 min $2.99
- 90 min $4.19
- 120 min $5.19

Ferro LH Open-Reel Tape
Low-noise/high-output formulation exceeds professional recording studio requirements. Complete with sleeve and dust-proof box.
- 1800 ft, 7″ reel $9.99
- 2400 ft, 7″ reel $11.99

Ferro Super LH Open-Reel Tape
Wide-dynamic-range tape designed for the most demanding studio mastering use as well as high-quality audiophile recordings.
- 1800 ft, 7″ reel $11.99
- 3600 ft, 10½″ metal reel $31.99

Chrome EE Open-Reel Tape
Extra-efficiency chrome tape for recorders with EE bias and EQ position.
- 1800 ft, 7″ reel $19.99
- 3600 ft, 10½″ metal reel $49.99

Videocassette Tape

Beta Format
BASF chrome formulation.
- L-250. h-1-1h hrs $12.95
- L-500. 1-2-3 hrs $17.95
- L-500 carded. 1-2-3 hrs $17.95
- L-500 HG (High grade). 1-2-3 hrs $20.95
- L-750. 3-4½ hrs $26.95
- L-750 carded. 3-4½ hrs $26.95
- L-750 HG (High grade). 3-4h hrs ..... $29.95.

VHS Format
BASF chrome formulation.
- TC-20. For specially equipped VCRs. 20-60 mins $15.99
- T-60. 1-2-3 hrs $17.95
- T-120. 2-4-6 hrs $26.95
- T-120 HG (High grade). 2-4-6 hrs $29.95
- T-160. $2^{2}/_{3}$-$5^{1}/_{3}$-8 hrs $29.95

CERTRON

Ferex I Cassettes
Premium tape.
- F-60 FE. 60 min $3.00
- F-90 FE. 90 min $3.99

Ferex II Cassettes
High-bias cassettes
- FEII 60 min $3.00
- FEII 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

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.
- C60. 60 min $8.60
- C90. 90 min $12.00

DX-7 Series Cassettes
Improved chrome-position double-coated cobalt-doped tape for music programs; 70 μsec equalization; high saturation output level in high frequencies and wide dynamic range; precision shell half.
- C60. 60 min $5.00
- C90. 90 min $7.00

DX-5 Series Cassettes
Double-coated FeCr-type music tape; broad bias curve and +8-dB increase in maximum output level/bias setting of 70 μsec; compatible with variety of cassette decks and program sources; ferrichrome position.
- FC-60. 60 min $5.00
- FC-90. 90 min $7.00

DX-4 Series Cassettes
"Ultimate" normal-bias tape with double-oxide coating. Improved high-frequency response. Same shell half, friction sheets, and dynamically balanced hubs as DX7. 120 μsec equalization.
- C90. 90 min. $5.99
- C60. 60 min. $4.35

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

DX-11010B Studio Master Tape
Open-reel audio tape with polyester-base film material. Width 6.25mm; base film thickness 21mm; coating thickness 14mm; back coating 2.5mm; total thickness 37.5mm; length 1100 meters. Frequency response +1 dB at 10 kHz, +1.5 dB at 12.5 kHz; MOL 400 kHz +12 dB, at 12.5 kHz +7 dB; S/N ratio 63 dB; print-through 51 dB; dynamic range 91 dB; coercivity 340 oersteds $35.00

DX-551. Same as DX-11-1B except no back coating, total thickness 35mm, and length is 550 meters. $15

FUJI

FR Series Metal Cassettes
Metal coating with tensilized polyester base; designed for metal bias, 70 μsec equalization; packaged in hinged plastic box.
- FR (C-46). 46 min $7.15
- FR (C-60). 60 min $7.95
- FR (C-90). 90 min $10.75

FR-II Series Cassettes
Chromium-dioxide cassettes with tensilized polyester base; designed for Type II/CrO_2 bias, 70 μsec equalization; packaged in hinged plastic box.
- FR-II (C-46). 46 min $4.90
- FR-II (C-60). 60 min $5.45
- FR-II (C-90). 90 min $7.50

FR-I Series Cassettes
Ferric formulation with tensilized polyester base; designed for ferric/normal/Type I bias, 120 μsec equalization; packaged in hinged plastic box.
- FR-I (C-46). 46 min $4.90
- FR-I (C-60). 60 min $5.45
- FR-I (C-90). 90 min $7.50

ER Series Cassettes
Ferric formualtion with tensilized polyester base; designed for ferric/normal/Type I bias, 120 μsec equalization; packaged in hinged plastic box.
- ER (C-46). 46 min $3.60
- ER (C-60). 60 min $4.10
- ER (C-90). 90 min $5.75

DR Series Cassettes
- DR (C-46). 46 min $2.95
- DR (C-60). 60 min $3.40
- DR (C-90). 90 min $4.75
- DR (C-120). 120 min $6.60

Videocassette Tape

Super HG VHS Format
Super-fine Beridox. Exclusive Duroback coating; 4 dB higher color and video S/N ratio.
- T-120. 2-6 hr $37.00
- T-100. 1⅔-5 hr $33.35
- T-80. 1⅓-4 hr $29.65
- T-60. 1-3 hr $27.00

T-40. ⅔-2 hr $24.85
T-30. ½-1½ hr $24.10
T-20. ⅓-1 hr $23.35

VHS Format
Fine-grain Beridox.
T-160. 2⅔-8hr $39.95
T-120. 2-6 hr $29.65
T-90. 1½-4½ hr $26.70
T-60. 1-3 hr $21.65
T-30. ½-1½ hr $19.45

Super HG Beta Format
Super-fine Beridox formulation with dense, uniform distribution of particles for improved video S/N ratio, color S/N ratio, audio quality. Duroback coating.
L-500. 1-2 hr $25.95
L-370. ¾-1¾ hr $21.70
L-250. ½-1 hr $18.55
L-125. ¼-½ hr $16.80

Beta Format
Fine-grain Beridox; high-impact ABS housing.
L-750. 1½-4½ hr $26.95
L-500. 1-2 hr $21.60
L-370. ¾-1¾ hr $18.10
L-250. ½-1 hr $15.45
L-125. ¼-½ hr $14.00

HITACHI

High-End High-Bias Cassettes
High bias and chrome equalization.
SXC60. 60 min $5.10
SXC90. 90 min $6.95

High-End Cassettes
Normal bias and equalization.
SRC60. 60 min $5.10
SRC90. 90 min $6.95

Mid-Range High-Bias Cassettes
High bias and chrome equalization.
EXC60. 60 min $4.35
EXC90. 90 min $5.95

Mid-Range Cassettes
Normal bias and equalization.
ERC60. 60 min $4.35
ERC90. 90 min $5.95

Low-Noise Cassettes
Normal bias and equalization.
LNC60. 60 min $2.25
LCC90. 90 min $3.45

IRISH

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.
7000 C-60. 60 min $2.10
7000 C-90. 90 min $2.70

270 Series Professional Tape
277-151. 1800-ft, 7" reel $15.25

200 Series Professional Tape
Standard, 1½-mil, polyester base, ¼".
231-151. 1200-ft, 7" reel $8.95

JVC

ME-Pro II Cassette Tape
Metal-particle tape with high magnetic density and high particle acicularity for high MOL.
C-90 ..... $16.95

Dynarec Series Audio Cassettes
Especially designed for recording Compact Discs and other PCM digital source material.

DA7 High-Bias Cassette Tape
Tape combines two layers of high-energy cobalt-treated particles.
C-90 ..... $7.45
C-60 ..... $5.25

DA3 Normal-Bias Cassette Tape
Normal-bias tape designed for recording music with two layers of magnetic coating; one with high coercivity and one with high magnetic flux density. Requires 120μsec equalization
C-90 ..... $6.95
C-60 ..... $4.75

DA1 Normal-Bias Tape
Normal-bias tape with low noise and high output made with gamma ferric magnetic particles having a high residual magnetic flux density.
C-90 ..... $5.25
C-60 ..... $3.85

F1 Cassette Tape
Popular series.
C-90 ..... $3.95
C-60 ..... $2.95

Videocassette Tape

Dynarec New HG VHS Videotape
Dynarec videotapes have super-fine magnetic particles for recording at slower speeds, better resolution, improved color and sound.
T-120HG $30.00
T-100HG $28.00
T-80HG $25.00
T-60HG $23.00
T-40HG $21.00
T-30HG $19.00
T-20HG $18.00

Dynarec Super HG VHS Videotape
Especially designed for multi-generation duplication.
T-120SHG $34
T-100SHG $32
T-80SHG $29
T-60SHG $27
T-40SHG $25
T-30SHG $23
T-20SHG $21

VHS Dynarec Standard
T-30. ½-1 hr $15.00
T-60. 1-2 hr $17.00
T-90. 1½-3 hr $22.00
T-120. 2-4-6 hr $26.00
T-160. 2⅔-5⅓-8 hr $34.95

KENWOOD

MD Series Cassettes
Designed for metal bias/70 μsec equalization.
MD-60. 60 min $9.25
MD-90. 90 min $11.55

CD Series Cassettes
Cobalt-adsorbed gamma ferric oxide formulation designed for high bias/70 μsec equalization.
CD-60. 60 min $4.25
CD-90. 90 min $5.75

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.
ND-60. 60 min $3.45
ND-90. 90 min $5.00

N Series Cassettes
High-output 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

Blank Audio and Video Tape

bias/equalization controls.
N-60. 60 min $2.70
N-90. 90 min $3.45

KONICA

Metal Cassette Tapes
60 min $5.49
90 min $7.49

GM-II High-Bias Cassette Tapes
60 min $3.09
90 min $3.99

GM-I Cassette Tapes
60 min $2.49
90 min $3.59

ML Cassette Tapes
60 min $1.89
90 min $2.59
120 min $3.29

Videocassette Tape

VHS Format Videotape
T60 ..... $11.00
T120 ..... $14.50

Beta Format Videotape
L500 ..... $11.20
L750 ..... $14.20

LORAN

Normal-Bias Cassettes
Designed for normal bias, 120 μsec equalization settings.
C-46. 46 min $4.45
C-60. 60 min $5.55
C-90. 90 min $7.65

High Bias, Type II Cassettes
Ferri-cobalt tape designed for use with CrO_2 settings.
C-60. 60 min $5.75
C-90. 90 min $7.75

Metal Cassettes
Metal-particle formulation cassettes designed for type IV bias, 70 μsec equalization.
C-60. 60 min $12.70
C-90. 90 min $15.75

LUXMAN

XM-IV Metal-Particle Tape
Premium audio cassette tape designed for metal (Type IV) bias and 70-μsec equalization.
C90. 90 min. $14.95

MAGNAVOX

Videocassette Tape

Chromavue Plus VHS Videotape
Pure chrome VHS videotape designed for high-quality picture and sound reproduction.
AH9204. T-160 ..... $32.99
V800010. T-120 ..... $19.99

MAXELL

MX Metal Cassettes
Metal bias/equalization.
MX-46. 46 min $8.99
MX-60. 60 min $9.99
MX-90. 90 min $11.99

XL II-S Epitaxial Cassettes
High-level bias; 70-μsec equalization.
XL II-S 60. 60 min $5.29
XL II-S 90. 90 min $7.29

XL I-S Epitaxial Cassettes
Normal bias; 120-μsec equalization.
XL I-S 60. 60 min $5.29
XL I-S 90. 90 min $7.29

UD-XL-I Epitaxial Cassettes
Normal bias; 120-μsec equalization.
C-60. 60 min $4.59
C-90. 90 min $6.39

UD-XL II Epitaxial Cassettes
Chrome type; high-level bias; 70-μsec equalization.
C-60. 60 min $4.59
C-90. 90 min $6.39

Ultra-Dynamic Cassettes
Normal bias.
UD-46. 46 min $3.19
UD-60. 60 min $3.49
UD-90. 90 min $5.19
UD-120. 120 min $6.99

Low-Noise Cassettes
Normal bias.
LN-46. 46 min $2.19
LN-60. 60 min $2.39
LN-90. 90 min $3.59
LN-120. 120 min $4.69

Microcassettes
MC-46MX (1 per card) $8.09
MC-60MX (1 per card) $8.99
MC-46UD2PK (2 per card) $8.39
MC-60UD2PK (2 per card) $9.29

Open-Reel Tapes

XLII Open-Reel Tapes
Designed for use with EE-capable decks.
XLII 35-90. 1800 ft $19.99
XLII 35-180. 3600 ft $54.59

XLI Back-Coated Open-Reel Tapes
XLI 50-60B. 1200 ft, 7" reel $11.29
XLI 50-120B. 2500 ft, 10½" reel $30.59
XLI 35-90B. 1800 ft, 7" reel $12.69
XLI 35-180B. 3600 ft, 10½" reel $34.99

Videocassette Tapes

VHS Epitaxial Videocassettes
Cobalt-ferric oxide formulation; mirror-finished tape surface and binder system keep head wear to a minimum.
T-60. ..... $17.06
T-120. ..... $19.74
T-160. ..... $32.75

VHS High-Grade Epitaxial Videocassettes
HGX T-30. ..... $17.06
HGX T-60. ..... $19.77
HGX T-90.90 min $23.35
HGX T-120.120 min $23.44

Beta Videocassettes
L-250. ..... $12.83
L-500. ..... $16.67
L-750. ..... $20.85

HGX Beta Videocassettes
High-grade Beta-format videocassettes.
HGX L-250. ..... $15.71
HGX L-500. ..... $20.21
HGX L-750. ..... $24.11

MEMOREX

METAL IV Cassettes
State-of-the-art metal formulation for metal bias (Type IV) and 70-μsec equalization settings; low and midrange S/N ratio at +6 dB above conventional premium tapes; unique dustproof Memorex album locks open or closed, accepts cassettes in either direction.
METAL IV C-60. 60 min $4.59
METAL IV C-90. 90 min $6.29

HIGH BIAS II Cassettes
Exclusive superfine uniform ferrite crystal oxide formulation for high-bias (CrO_2, Type II) setting and 70-μsec equalization; delivers flat frequency response at preferred recording level (0 dB) and 4 to 5 dB lower noise; unique dustproof Memorex album locks open or closed, accepts cassettes in either direction.
HIGH BIAS II C-60. 60 min $3.19
HIGH BIAS II C-90. 90 min $4.79

MRX I Cassettes
Finest Memorex Type I cassette tape, with unique ferric-oxide formulation for normal bias; 120-μsec equalization settings; improved dynamic range across full sound spectrum; unique dustproof Memorex album locks open or closed, accepts cassettes in either direction.
MRX I C-30. 30 min $2.79
MRX I C-45. 45 min $2.99
MRX I C-60. 60 min $3.19
MRX I C-90. 90 min $4.79
MRX I C-120. 120 min $6.39

dB Series Cassettes
Cassette tape for general recording of voice or music. Full lifetime warranty.
C-60. 60 min $2.59
C-90. 90 min $3.79

Videocassette Tape

VHS HG Videocassette
Extra performance in all critical recording parameters. For use as master recording or in home video cameras. Includes dustproof plastic storage case.
T-120. 2-4-6 hrs $29.99

VHS Pro Series Videocassettes
High chroma output for brilliant life-like color. High S/N for picture clarity and stability. Features dustproof plastic storage case.
T-60. 1-2-3 hrs $16.99
T-90. 1½-3-4½ hrs $18.99
T-120. 2-4-6 hrs $24.99

Beta HG Videocassettes
Extra performance in all critical recording parameters. For use as master recording or in home video cameras. Includes dustproof plastic storage case.
L-500 ..... $21.95
L-750 ..... $25.95

Betamax Premium Videocassettes
High chroma, high rf output for brilliant life-like color, excellent picture quality and stability.
L-250 ..... $12.45
L-500 ..... $16.95
L-750 ..... $20.95

NAKAMICHI

ZX Reference Cassette Tape
Metalloy (metal-particle) formulation for use with metal-compatible decks only; features ultra-high coercivity and retentivity for improved distortion and MOL; 70-μsec equalization.
ZX-C60. 60 min $6.50
ZX-C90. 90 min $9.00

SXII Reference Cassette Tape
Double-coated ionized cobalt and ferric-oxide formulation. CrO_2 bias and equalization (70μsec).
C-60. 60 min $5.85
C-90. 90 min $8.00

SX Reference Cassette Tape
Single-coated; ionized cobalt and ferric oxide formulation; high coercivity permits use of CrO_2 bias and equalization (70-μsec) for 4-5 dB better S/N ratio.
SX-C60. 60 min $4.50
SX-C90. 90 min $6.30

EX II Reference Cassette Tape
Single-coated; ferricobalt formulation; same bias and equalization (120μsec) as EX tape; extra-low noise,

high output.
EXII-C60. 60 min $3.70
EXII-C90. 90 min $5.40

PDMAGNETICS

1100 Metal Audio Cassettes
Designed to produce flat response over entire 30-20,000-Hz range for critical recording applications.
C-60. 60 min $8.99
C-90. 90 min $11.99

500 Crolyn® Audio Cassettes
Chromium-dioxide cassettes in precision housings with laminated double-layer foil construction for superior winding quality, controlled friction, and no jamming; designed for CrO_2 bias.
C-60. 60 min $4.99
C-90. 90 min $6.49

Tri-Oxide FERRO Audio Cassettes
Premium-quality ferric-oxide audio cassettes designed for normal bias.
C-60. 60 min $3.49
C-90. 90 min $4.99

Videocassettes

Beta-Format Videocassettes
L-250 ..... $13.45
L-500 ..... $17.45
L-750 ..... $21.95

VHS-Format Videocassettes
T-60 ..... $17.95
T-90 ..... $21.95
T-120 ..... $25.95
T-160 ..... $34.95

QUASAR

MT462M Microcassettes
46-minute metal-bias microcassettes in twin pack $9.50

MT90A Microcassettes
Angrom tape microcassettes $9.50

MT602 Microcassettes
60-minute normal-bias microcassettes in twin pack $4.95

Videocassette Tape

VHS Format
VC-T60. 1-2-3 hrs $9.95
VC-T120. 2-4-6 hrs $12.95
VC-T160. $2^2/_3$-$5^1/_3$-8 hrs $24.95

REALISTIC

Supertape Metal Cassettes
44-960. 60 min $5.99
44-961. 90 min $6.99

Supertape Hi-Bias Cassettes
44-940. 60 min $3.99
44-941. 90 min $4.99

Supertape Gold Cassettes
44-920. 45 min $2.69
44-921. 60 min $2.99
44-922. 90 min $3.99
44-923. 120 min $4.99

RECOTON

Rainbow 5-Packs
Audio cassettes supplied in 5 packs in see-through molded plastic boxes. Cassette shells come in 5 different colors for easy identification.
RC5×60. 60 min each $3.99
RC5×90. 90 min each $5.79

Studio Cassettes
High-bias high-energy cassette tapes with Teflon-treated reels. 70μsec equalization. Frequency response 50-23,000 Hz.
SHB60. 60 min. $3.49
SHB60RJ. 60 min. $3.99

Studio Standard Series
High-bias cassettes in rigid Norelco case. Features Teflon-treated tape reels for trouble-free operation.
SH-60. 60 min $2.79
SH-60RJ. 60 min, blister packed $2.79

Deluxe Ultra Flow Cassettes
RU60. 60 min $1.19
RU90. 90 min $1.49
RU60-2RJ. Pkg of 2 60 min $2.49
RU90-2RJ. Pkg of 2 90 min $3.29
RU4×60. Four 60 min in Magic-Stak module $5.39
RU4-90. Four 90 min in Magic-Stak module $6.79

Ultra Flow High-Energy Cassettes
Available individually boxed or on blister cards.
HE60. 60 min $1.75
HE90. 90 min $2.25

RKO

Ultrachrome Cassettes
Chromium dioxide formulation; chrome (high) bias; 70 μsec equalization; housed in five-screw polystyrene shell with chrome notch.
C-60. 60 min $4.49
C-90. 90 min $5.99

Broadcast I Cassettes
Ferric formulation; normal bias; 120μsec equalization; housed in five-screw polystyrene shell.
C-60. 60 min $3.99
C-90. 90 min $45.49

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-500. 1-3 hrs $16.95
T-120. 2-4 hrs $24.95

SCOTCH

XSM IV Cassettes
Fine metal magnetic particle formulation; delivers maximum output up to 10 dB better than typical oxide tapes and up to 7 dB greater than chrome tapes; low distortion, added high frequency response, and improved S/N ratio.
60 min $7.99
90 min $10.29

XS I Cassettes
Features premium grade, low-noise ferric oxide; for use with recorders in the normal or 120 μsec equalization position; album packaging; improved shell for critical mechanical permanence and 3-head equipment.
60 min $4.49
90 min $5.79

XS II Cassettes
Features premium grade, dual-layer, cobalt-modified ferric oxide; for use with recorders in the chrome or 70 μsec equalization position; album packaging; improved shell for critical mechanical permanence and 3-head equipment.
60 min $4.79
90 min $5.99

Blank Audio and Video Tape

CX Cassettes
Normal-bias ferric oxide cassette featuring extended sensitivity in both high and low frequency ranges. 5-screw impact polymer shell houses an inner assembly that features specially made low-friction roller guides; album package.
- 46 min $2.99
- 60 min $3.29
- 90 min $4.79
- 120 min $6.59

BX Cassettes
Ferric-oxide formulation for all-purpose cassette use; polyester base. 5-screw impact polymer shell featuring low-friction roller guides. Album packaging.
- 46 min $1.89
- 60 min $2.19
- 90 min $3.29
- 120 min $4.79

206-207 Open-Reel Tapes
Polyester-base tape with "Posi-Trak" back coating. Leader, trailer. Designed for critical stereo mastering.
- 206. 7" reel, 60 min at 7½ ips, 1.5 mil ... $9.39
- 207. 7" reel, 90 min at 7½ ips, 1.0 mil . $10.79

Dynarange Open-Reel Tapes
Provides high-fidelity recording even at 3¾ ips; multipurpose tape providing full dynamic range throughout audible spectrum; S/N is 4 to 6 dB better than standard tapes.
- 211. Polyester backing, white yellow trailer, 5" reel, 30 min at 7½ ips, 1.5 mil $4.09
- 7" reel, 60 min $6.29
- 212. 5" reel, 45 min at 7½ ips, 1.0 mil $4.89
- 90 min, 7" reel $8.39

Videocassette Tape

VHS-Format Videocassettes
- T-30. ½-1-1½hrs $18.45
- T-60. 1-2-3 hrs $21.75
- T-120. 2-4-6 hrs $27.95
- T-160. 2⅔-5⅓-8 hrs $37.75
- HGX-Plus T-120. 2-4-6 hrs $33.55

Beta-Format Videocassettes
- L-250. ½-1-1½ hrs $14.95
- L-500. 1-2-3 hrs $18.95
- L-750. 1½-3-4½ hrs $23.95
- L-830. 3⅓-5 hrs $29.95
- HGX-Plus L-500. 1-2-3 hrs $22.75
- HGX-Plus L-750. 1½-3-4½ hrs 28.75

SONY

Metal Series Cassettes
70 μsec metal equalization.
- Metallic 46. 46 min $7.00
- Metallic 60. 60 min $8.45
- Metallic 90. 90 min $11.50

FeCr Series Cassettes
Normal or FeCr bias; 70 μsec FeCr equalization.
- FeCr-46. 46 min $3.90
- FeCr-60. 60 min $4.40
- FeCr-90. 90 min $6.10

UCX-S Series Cassettes
Ferric-oxide magnetic tape; high bias, Type II. 70μsec equalizaton.
- UCX-S 60. 60 min $5.00
- UCX-S 90. 90 min $7.00

UCX Series Cassettes
Type II position tape (high bias, 70 μsec equalization).
- UCX-60. 60 min $4.15
- UCX-90. 90 min $5.75

AHF Series Cassettes
Type I position tape (normal bias, 120 μsec equalization).
- AHF-60. 60 min $3.80
- AHF-90. 90 min $5.20

BHF Series Cassettes
Normal-bias Type I tape; normal (120 μsec) equalization.
- HFX-46. 46 min $2.75
- HFX-60. 60 min $3.10
- HFX-90. 90 min $4.25
- HFX-120. 120 min $5.45

LNX Series Cassettes
Normal bias; normal (120-μsec) equalization.
- LNX-46. 46 min $2.05
- LNX-60. 60 min $2.25
- LNX-90. 90 min $3.15
- LNX-120. 120 min $4.05

Microcassettes

Popular Series
Ferric oxide; 3 to a package.
- 3MC-60. min $11.40

Blister pack.
- MC-60. 60/120 min $3.80
- MC-90. 90/180 min $8

High Fidelity Series
- MC45 HF. 46/92 min $4.10
- MC60 HF. 60/120 min $4.50

Metallic Series
- MC46 Metallic. 46/92 min $5.55
- MC60 Metallic. 60/120 min $6.10

Elcasets

Type I: SLH tape
- LC-60. 60 min $8
- LC-90. 90 min $10.60

Type II: FeCr tape
- LC-60. 60 min $10.60
- LC-90. 90 min $12.80

Open-Reel Tapes

FeCr Series
- FeCr 7-550BL. 90 min $14
- FeCr 11-1100BL. 180 min $39

ULH Series
- ULH 72-370BL. 60 min $9
- ULH 7-550BL. 90 min $11.50
- ULH 11-1100BL. 180 min $31

Videocassette Tape

Standard Beta Video Tape
- L-125. 125 min $10.95
- L-250. 250 min $12.45
- L-500. 500 min $16.95
- L-750. 750 min $20.95
- L-830. 830 min $22.95

High Grade Beta Video Tape
- L-125HG. 125 min $11.90
- L-250HG. 250 min $13.55
- L-500HG. 500 min $17.45
- L-750HG. 750 min $22.80
- L-830HG. 830 min $26.29

VHS Video Tape
Blister-carded video tape for VHS-format VCRs.
- T-120. 360 min $24.95

REVOX

631 Magnetic Tape
New tape with improved maximum output level at low frequencies. For 3% distortion, flux on tape reaches 1200 nWb/m, representing an S/N ratio of 78 dB. Bias adjustment compatible with 621 tape $40

TDK

Professional Reference Series

MA-R (Metal Alloy-Reference) Cassettes
Metal bias; 70-±sec equalization; housed in reference standard diecast metal shell; excellent high-frequency MOL and high coercivity for improved sensitivity and extra recording headroom.
- MA-R 60. 60 min $8.99
- MA-R 90. 90 min $11.99

SA-X (Super Avilyn-Extended) Cassettes
Double-coated Super-Avilyn-particle tape; high bias; 70-±sec equalization; high output and wide dynamic range; housed in precision shell and laboratory standard mechanism.
- SA-X 60. 60 min $4.99
- SA-X 90. 90 min $6.99

AD-X (Acoustic Dynamic-Extended) Cassettes
Avilyn-particle technology in a normal-bias cassette. High output, wide dynamic range, excellent sensitivity. Laboratory standard mechanism. 120-±sec equalization.
- AD-X60. 60 min $3.89
- AD-X90. 90 min $5.49

Reference Standard Series

MA (Metal Alloy) Cassettes
Metal bias; 70-±sec equalization; housed in precision molded plastic shell housing and laboratory standard mechanism.
- MA-60. 60 min $6.69
- MA-90. 90 min $8.99

SA (Super Avilyn) Cassettes
Cobalt-ferric formulation; high bias; 70-±sec equalization; extended frequency response and low noise; laboratory standard mechanism.
- SA-60. 60 min $4.39
- SA-90. 90 min $6.19

AD (Acoustic Dynamic) Cassettes
Linear ferric-oxide particle formulation for normal bias; 120-±sec equalization; superior high-end response and output level; laboratory standard mechanism; for home and car decks.
- AD-60. 60 min $3.29
- AD-90. 90 min $4.79

General-Purpose Cassettes

D (Dynamic) Cassettes
Normal bias; 120-±sec equalization; precision mechanism.
- D-30. 30 min $2.09
- D-46. 46 min $2.29
- D-60. 60 min $2.49
- D-90. 90 min $3.39
- D-120. 120 min $3.99
- D-180. 180 min $5.59

Endless Cassettes

EC (Endless) Cassettes
Endless-loop design permits continuous repeating of recorded material; back coated; available with or without foil strip for machines with automatic shutoff sensor.
- 20S(F). 20 sec $4.19
- 30S(F). 30 sec $4.29
- 1M(F). 1 min $4.39
- 3M(F). 3 min $4.49
- 6M(F). 6 min $4.99
- 12M(F). 12 min $5.99

Open-Reel Tapes

GX Open-Reel Tape
Extremely high output level, extended range, low noise, 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.
- GX35-90B. 1800 ft, 7" plastic reel $12.95
- GX35-180BM. 3600 ft, 10½" metal reel $34.95

GX50-60B. 1200 ft, 7" plastic reel $10.95
GX50-120BM. 2500 ft, 10½" metal reel $29.95

SA Open-Reel Tape
Extra-efficiency Super Avilyn open-reel tape for use with new EE tape decks. High coercivity, low noise for full performance at half speed.
SA35-90. 1800-ft, 7" plastic reel..... $15.95
SA35-180M. 3600-ft, 10½" metal reel . $41.95

LX Open-Reel Tape
High output level, extended range, low noise, low distortion tape for professional and all critical recording applications. Available in 35- and 50-micron thicknesses. Back treated (except for LX 35-90 and LX35-180M).
LX35-90. 1800 ft, 7" plastic reel.....$9.95
LX35-90B. 1800 ft, 7" plastic reel $10.95
LX35-180M. 3600 ft, 10½" metal reel . $27.95
LX35-180BM. 3600 ft, 10½" metal reel $30.95
LX50-60B. 1200 ft, 7" plastic reel $9.95
LX50-120BM. 2500 ft, 10½" metal reel $27.95

Microcassettes

M60 Microcassettes
Same tape formulations as corresponding standard-size cassettes.
MA-M60. Metal bias, EQ, high MOL and coercivity for recording music. 60 min $8.99
AD-M60B2. Normal bias, EQ, high output and low noise for music and speech. Twin pack. 60 min $9.99
D-M60B3. Normal bias, EQ, flat response and low noise for speech. Three pack. 60 min each . $11.99

Videocassette Tapes

Super Avilyn EHG VHS And Beta
Extra High-Grade formulation for higher output than standard videocassettes, 3-dB better video and 5-dB better chroma S/N levels, improved audio frequency response (2 dB) and sensitivity (1.5 dB), and improved performance at all speeds, especially in superlong play mode.
VAT-120EHG. 2-4-6 hr $28.50
VAT-60EHG. 1-2-3- hr $22.00
BAL-750EHG..... $27.00
BAL-500EHG..... $21.50

Super Avilyn VHS Videocassettes
Special formula designed to give crisp picture and brilliant color.
VAT-160. 2⅔-5⅓-8 hr $33.50
VAT-120. 2-4-6 hr $24.00
VAT-90. 1½-3-4½ hr..... $21.00
VAT-60. 1-2-3 hr..... $18.00
VAT-30. ½-1-1½ hr..... $16.00

Super Avilyn Compact Videocassettes
Extra high-grade Super Avilyn ½" VHS Compact videocassette designed for compact portable VCRs. Compatible with all home VHS recorders when used with a special adapter. Features same improvements as standard-size equivalent.
TC-20EHG. 20 min $15.00

Super Avilyn Beta Videocassettes
Special formula designed to give crisp picture and brilliant color.
BAL-750. 3-4½ hr $23.00
BAL-500. 1-2-3 hr $18.00
BAL-250. ½-1-1½ hr..... $13.00

TEAC

CDC Audio Cassettes
Normal and high-bias (Types I and II) audio cassettes in clear shell.
CDC-60 normal-bias $5.75
CDC-60 high-bias.....$5.95

YAMAHA

Metal-Alloy Audio Cassettes
Designed for metal bias, 70-μsec equalization.
MR-60. 60 min $8.39
MR-90. 90 min $11.29

Super Ferric-Oxide Extended Cassettes
Super ferric-oxide extended audio cassettes designed for high bias, 70-μsec equalization.
CRX-60. 60 min.....$6.29
CRX-90. 90 min.....$8.69

Super Ferric-Oxide Audio Cassettes
Super ferric-oxide audio cassettes designed for high bias, 70-μsec equalization.
CR-60. 60 min $5.49
CR-90. 90 min $7.79

Ferric-Oxide Extended Audio Cassettes
Ferric-oxide extended cassettes designed for normal bias, 120μsec equalization.
NRX-60. 60 min $5.10
NRX-90. 90 min $6.75

Ferric Oxide Audio Cassettes
Standard ferric-oxide audio cassettes designed for normal bias, 120-μsec equalization.
NR-60. 60 min $4.29
NR-90. 90 min $6.19

ZENITH

Beta-Format Videocassette Tapes
L830. 5 hr Beta III, 3½ hr Beta II $16.95
L750. 4½ hr Beta III, 3 hr Beta II $14.95
L500. 3 hr Beta III, 2 hr Beta II $12.95

ZiMAG

High-Energy Audio Cassettes
Ultra-high-density ferric-oxide formulation for extended dynamic range, higher output level and lower distortion.
Twelve-pack chipboard boxes with cassettes in Philips boxes.
12 C90s $24.99
12 C60s $19.99
Multi-pack poly bag in Philips boxes.
2 C90s.....$3.39
3 C60s.....$5.29
2 C90s.....$4.29
Blister pack.
BC45 .....$1.89
BC60 .....$1.99
BC90 .....$2.39
BC120 .....$2.89
Cellophane pack.
C45.....$1.59
C60.....$1.69
C90.....$2.29
C120 .....$2.59
Microcassettes on blister card.
C60.....$3.49
Mini cassettes on blister card.
C30.....$2.99

Extra Low Noise Audio Cassettes
Designed for consistent sound and minimal distortion for music and voice recording.
Multi-pack poly bag.
2 C60s.....$1.39
3 C60s.....$2.19
2 C90s.....$2.19
3 C90s.....$3.29
Blister pack.
BC45 .....$1.29
BC60 .....$1.39
BC120 .....$2.29
Cellophane pack.
C45.....$1.19
C60.....$1.29
C90.....$1.59

Videocassette Tape

VHS Format
Cellophane pack or poly bag with sleeve.
T120 ..... $19.99

Beta Format
Cellophane pack or poly bag with sleeve.
L500 ..... $19.99

4 VCRs and Video Cameras

AKAI

VS6 VHS Videocassette Recorder

Microcomputer-controlled VCR with 4 heads and 5-motor direct-drive system. Features Picture Control circuit (sharpness and detail enhancer); 18-function wireless remote control; special effects (still frame, variably slow frame-by-frame, speed search, high speed forward and backward, visual scan); cable-ready for 105 channels; 14-day, 8-event timer; 8-hour record and playback; fine-edit function; audio dubbing; real-time tape counter; front-panel camera connecter; digital clock. S/N ratio > 45 dB; horizontal resolution > 240 (SP), 221 (LP and SLP).. $1,095

VS-3 VHS Videocassette Recorder

Microcomputer-controlled VCR with 5-motor direct-drive system. Features Picture Control circuit (sharpness and detail enhancer); electronic pushbutton controls; 14-day/single event timer; 3-speed record/playback; remote control; auto tape rewind; LED dew indicator; dual rotary heads; azimuth helical scanning system. Horizontal resolution > 240 lines (SP mode); S/N ratio (video) > 45 dB $630

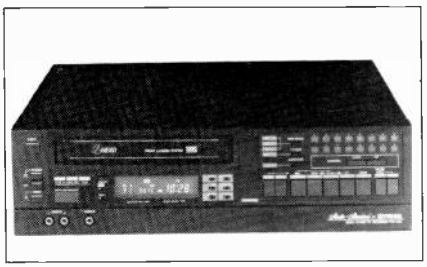
VC-X2 Color Video Camera

Color video camera with Saticon tube; auto focusing; exclusive intervalometer; 300-line resolution; polarity reverse-4 state; 30-Lux low-light capability; auto iris; auto white balance; 2-speed telephoto lens; 10-pin connector; universal control; auto fade; audio and video signal outputs $1,195

FISHER

FVH730 VHS Videocassette Recorder

VHS-format VCR with rotary 4-head helical scan system. SP, LP, EP modes for up to 8 hrs record/play time. Features 14-day/9-event programmable timer;



16 preset channels; front-load mechanism with tape indicator; stereo record and play; Dolby NR; two-phase tape-end warning; 105 channels; cable-adaptable VHF/UHF electronic tuner. Camera power supply built in $999

FVH530 VHS Videocassette Recorder

VHS-format VCR with rotary 2-head helical scan system. SP, LP, EP modes for up to 8 hrs record/play time. Features 14-day/9-event timer with everyday function; 5-mode play; 13-function wireless remote; 105 channels; cable adaptable VHF/UHF electronic tuner; 14 preset channels; 4-digit clock..... $899

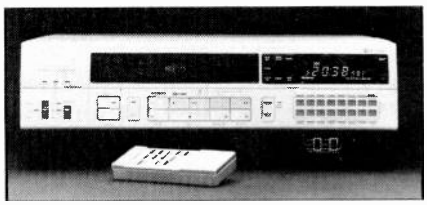
FVH515 VHS Videocassette Recorder

VHS-format VCR with rotary 2-head helical scan system. SP, LP, EP modes for up to 8 hrs record/play time. Features 1-day/1-event programming; 8-function, 6-button remote; cue and review at about 10× normal speed; 12 preset channels; VHF/UHF electronic tuner $599

JENSEN

AVS-4400 VHS Stereo Video Recorder

Four-head videocassette recorder with stereo recording and playback; able to record stereo audio of TV simulcasts. Features Dolby noise reduction; alternate-track audio dubbing; direct-drive transport; 2 and 6



hr record; 2,4,6 hr playback; 105-channel cable-ready tuner; 14 day/8 event programming; special viewing effects; video search and edit functions; 15-function wireless remote control $1,595

JVC

HR-7650 VHS Videocassette Recorder

VHS-format table-model videocassette recorder with SP/EP recording and SP/LP/EP playback capabilities. Features 4-head system; motorized front-loading mechanism; full-function infrared remote control; 2 audio channels with Dolby noise reduction; 16-channel presettable tuner with 105-channel cable-ready capacity; simplified insert editing and auto back-space editing; comprehensive digital fluorescent display; 14-day/8-event programmable timer; variable slow-motion, still-frame, and frame-advance special-effects playback; 2-way shuttle search in SP and EP modes; sleep timer; direct front-panel camera connector. 18⅛"W × 14⅜"D × 6⅛"H; 26.5 lb. $1,595

HR-7300 VHS Videocassette Recorder

VHS-format videocassette recorder with SP/EP record and SP/LP/EP playback capabilities. Features 4-head system; 2-way shuttle search in SP and EP modes; feather-touch microprocessor-based full-logic pushbutton transport controls; 14-day/8-event microprocessor-controlled programmable timer; 10-mode full-function remote control; precision-machined direct-drive head drum and 3 other independent motors; 14-channel pretunable electronic tuner; auto rewind at end of play; counter search. 17⅜"W × 13"D × 5⁹⁄₁₆"H; 21.6 lb. $1,050

HR-2650 VHS Portable Videocassette Recorder

VHS-format portable videocassette recorder with SP/EP record and SP/LP/EP playback capabilities. Features power supply flexibility (Ni-Cd battery pack, tuner/adapter, ac power adapter); 4 heads; full-function infrared remote control; 2 audio channels and Dolby noise reduction; simplified insert editing and auto back-space editing; 2-way shuttle search in SP and EP; flexible audio dubbing; slow motion atspeed and frame advance; fast motion at 3× normal in EP; liquid-crystal display tape counter with memory function; auto quick review with camera's viewfinder. 10⁹⁄₁₆"F × 10⅜"W × 4¹⁄₁₆"H; 10 lb without battery $1,150

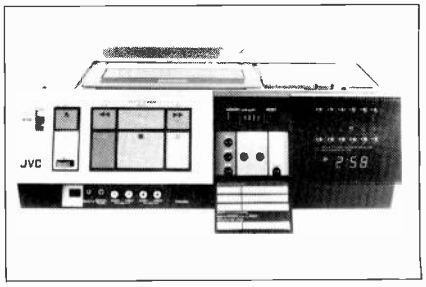
TU-26. Tuner/adapter for HR-2650 VCR. Features unattended recording with built-in 14-day/8-event programmable timer; 14-channel presetable tuner with 105-channel cable-ready capacity; 90-minute fast recharging of HR-2650's battery pack; remote controllable for power and channel change with HR-2650's remote controller. 12"D × 10⅜"W × 4¹⁄₁₆"H; 12.1 lb $375

HR-3CU VHS Compact Videocassette Recorder

Lightweight VCR with quartz-locked direct-drive drum motor, direct-drive capstan motor and power-supply flexibility (NiCad rechargeable battery pack, household ac, and car battery). Uses VHS Compact videotape for 20 minutes of recording time. Features power-saving switch; auto editing start control with back-space editing; remote-control capability; tape-recording indicator; LCD display for tape count and real-time tape-remaining indication; shuttle search in forward and reverse; audio dubbing; feather-touch controls; full-logic transport pushbuttons; auto quick review; auto rewind. 7⅕" × 3"H × 8"D; 4.4 lbs without battery $850

HR-7100U VHS Videocassette Recorder

Table-top VCR with color-coded function buttons and feather-touch microprocessor-based electronic logic control. Features 10-day/1-event programming; color-coded instructions on timer; shuttle search; 4-heads for 8-hr recording in EP mode; auto rewind; 12-channel electronic tuner with channel lock; front-



panel camera connection; air-damped cassette holder; 9-function remote; auto release; brushless quartz-locked direct-drive drum motor; independent capstan, reel, and tape-loading motors. Power consumption 35 W; horizontal resolution > 240 lines; S/N ratio > 45 dB; frequency response 70-10,000 Hz. 17⅜" × 5⁹⁄₁₆"H × 13"D; 21.2 lbs $699

Color Video Cameras

GX-N70. Color video camera with ⅔" Newvicon tube and low-light design enabling recording with a mini-

mum illumination of 10 lux (1 footcandle). Features infrared auto focus; auto iris; 2-channel audio; auto white balance; microprocessor-controlled title and date generator with 8 separate 60-character display memories; full-function remote control of VCR; 8× 2-speed power zoom lens with macro setting; fade in/out; image reverse switch; 1" electronic viewfinder. Maximum size 18 15/16"W × 11 15/16"W 9 13/16"D; approx. 6 lbs $1,295

GX-S9. Color video camera with Saticon™ tube. Features clear color picture with reduced lag and burn; ABO (auto beam optimizing) circuit that reduces "comet-tail" effect; minimum light intensity of 50 LUX; f/1.6 6× 2-speed power zoom lens; auto iris with EE lock and manual override; 2 audio channels for stereo or mixed mono recording; multifunction fade mechanism (allows both audio and video signals to be faded out); fade to white or black; remote control over VCR; built-in color-conversion filter; R/B dual-axis white-balance control circuit; 3 preset indoor color temperatures; telescoping unidirec-tional microphone; handgrip that can be positioned at 3 different angles; 1.5" CRT electronic viewfinder with indicators for exposure, VCR mode (standby or record), tape running, battery power alarm, white-balance adjustment, and position of built-in conversion filter; resolution > 300 lines at center; 14 1/16"D × 7¾"H × 7½"W; 6 lb $1,100

GX-N5. Color video camera with ⅔" Newvicon tube and low-light design enabling recording with a minimum illumination of 10 lux (1 footcandle). Features microprocessor-controlled title and date generator with 8 separate 60-character display memories; stereo mini-jack; full-function remote control of VCR; f/1.5 lens; 1.5" electronic viewfinder; 6× 2-speed power zoom with macro capability; auto fade in/out; auto iris; auto white balance. Horizontal resolution 270 lines; S/N ratio > 45 dB. 12 5/16"W × 9¼"H × 2 15/16"D; 3.1 lbs $995

GZ-S3U. Compact color video camera with ½" Saticon™ pickup tube and exclusive front-bias light system. Features 2 audio channels; Automatic Beam Control to reduce image lag; 6:1 power zoom; f/1.2 lens; macro focus; auto shutter (52mm); auto iris with iris lock and manual control; single carrier, frequency separation color system; auto white balance; remote control operates zoom, start/stop, and power; electronic viewfinder with 8-mode indication. Horizontal resolution 270 lines at center; sensitivity 30 lux; power consumption 5.5 W; power requirement 12 V dc; S/N ratio > 45 dB. 3¾"W × 3 1/16"H × 9¼"D; 2.7 lbs $895

VHS-C Compact Video Accessories

TM-P3U. Compact color video monitor $355
NB-P3U. Regular 40-min battery pack $30
NB-P4U. High-capacity 60-min battery pack $46
BB-P3U. Battery charger $93
AC-P3U. Ac power pack $50
AP-P3U. Car battery adapter $50
RM-P3U. Remote control unit $11.50
C-P2U. VHS cassette adapter for record/playback on standard VHS $43

Video Camera Accessories

MZ-250. Zoom microphone for video cameras .. $90
GA-23. Camera adapter for connecting HR-7300 VCR to GX-68 camera $112
CA-P25U. Camera adapter for connecting HR-7300 VCR to GX-S9 camera $80
CV-AC212A. Ac adapter kit for connecting HR-7300 VCR to GX-88/44 camera $79

KENWOOD

KV-905 Stereo VHS Videocassette Recorder

Motorized front-loading videocassette recorder with two-channel audio, 4 heads, and full-function infrared wireless remote control. LAP time counting for elapsed recording time, One-Touch Recording facility (up to 4 hrs) by 30-minute intervals (further time adjustment possible). Features Dolby noise reduction; 8-event/14-day timer; 105-channel auto-scanning TV tuner; centralized digital display; picture-sharpness control; tape-running indicator; Vue Search (7 times tape speed); digital tape counter; full-logic feather-touch controls; frame advance $949

KV-903 VHS Videocassette Recorder

Motorized front-loading videocassette recorder with infrared wireless remote control and 4 heads. LAP time counting for elapsed recording time, One-Touch Recording facility (up to 4 hrs) by 30-minute intervals (further time adjustment possible). Features 1-event/14-day timer; picture-sharpness control; tape-running indicator; Vue Search (7 times tape speed); digital tape counter; full-logic feather-touch controls; frame advance $749

MAGNAVOX

VR8440BK Front-Load Videocassette Recorder

Front-loading VHS videocassette recorder with Dolby stereo. Features 4 heads; special effects; 16-function IR; random-access tuner; 14-day/8-event programmer; one-touch recording; 128 channels; index search; tilt controls; electronic function controls; electronic quartz digital clock; audio and video dubbing; soft-touch controls; auto TV/VCR switching; edting controller connection; transition editing. 16¾"W × 4½"H × 14"D $1,400

VR8480BK Portable Videocassette Recorder

Lightweight portable VHS-format videocassette recorder with 4 heads. Features stereo capability; Dolby noise reduction; special effects; 14-position electronic tuner; 14-day/4-event timer; 16-function infrared remote; tape-reminder indicator; one-touch record; 105-channel capability; 4-digit LCD counter with memory; auto rewind; audio and video dubbing. Deck with battery pack 8.6 lbs; control center 8.1 lbs $1,400

VR8402BK Front-Load Videocassette Recorder

Front-loading 8-hr videocassette recorder with 12-position electronic tuner. Features 14-day/1-event timer; 2 heads; search; special effects; one-touch record; electronic function display; electronic counter; 4-function wired remote; auto TV/VCR switch; auto rewind; electronic quartz digital clock; soft-touch controls; transition editing; frame advance. 19 lbs, 2 oz $1,400

VR8430BK Front-Load Videocassette Recorder

Front-loading 8-hr VHS videocassette recorder with 4 heads. Features 10-function IR; 14-day/2-event programmer; one-touch recording; 105 channels; electronic function display; 14-position electronic tuner; 10-function infrared remote; electronic quartz digital clock; soft-touch controls; auto TV/VCR switching; transition editing; auto rewind; search; still; slow motion; frame advance. 20 lbs $1,000

VR8400BK VHS Videocassette Recorder

Eight-hr VHS videocassette recorder with 12-position electronic tuner. Features 14-day/1-event timer; 2 heads; search; special effects; one-touch record; electronic function display; electronic counter; 4-function wired remote; auto TV/VCR switch; auto rewind; transition editing; soft-touch controls; daily event feature. 17 lbs, 8 oz ..... $500-$600

Color Video Camera

VR8280BK. Chromavue deluxe video sound camera with Newvicon tube. Features infrared auto focus; stereo sound capability; on-screen character/stopwatch display; electronic viewfinder; f/1.4 lens; macro function; variable-speed 8× power zoom; 8-page memory with backup; built-in omnidirectional mic; remote control; auto iris. Minimum 10 lux sensitivity (1 footcandle); S/N ratio > 45 dB. 18" × 8¾" × 8¼". 3.5 lbs. $1,400

MITSUBISHI

HS-320UR VHS Videocassette Recorder

VHS-format 4-head videocassette recorder with SP/LP/EP modes and 8-hr record/play capability. Features 18-function wireless remote control; scan forward/reverse; slow motion; frame-by-frame advance; 14-day/8-event programmable timer; 105-channel cable-ready frequency-synthesized tuner; 5-V dc direct-drive transport motor; Dolby noise-reduction system; digital electronic real-time tape counter; timer backup; fine edit; auto rewind; speed search 9× normal in EP, 7× normal in SP. Horizontal resolution > 240 lines in SP mode; S/N ratio video/audio > 45/ > 46 dB; 16¾"W × 14 1/8"D × 5 15/16"H $1,300

HS-330UR VHS Videocassette Recorder

Front-loading 4-head VCR with Dolby B, stereo capability, dubbing provision. Features record and play in SP, LP, and EP; 5 motors; direct drive; forward and reverse scan; variable-speed slow motion; freeze frame; monitor control; 29-function wireless remote that converts nonremote-contolled TV to remote control; quartz random-access tuner; 139 channels; cable ready. 16.7"W × 14.9"D × 5.1"H; 20 lbs $1,000

HS-303UR VHS Videocassette Recorder

Compact-chassis VHS-format videocassette recorder with SP/LP/EP capability. Features 8-hr record/play capability; 8-function wireless remote control; microcomputer-controlled 5 V dc direct-drive motor transport; 1-day/1-event programmable timer; edit feature; timer backup; auto rewind. Horizontal resolution > 240 lines in SP mode; S/N ratio video/audio > 45/ > 40 dB; 16¾"W × 13 15/16"D × 4 15/16"H $800

HS-305UR VHS Videocassette Recorder

Front-loading 4-head VHS VCR with record and play in SP, LP, and EP modes. Features 5 motors; direct drive; forward and reverse scan; freeze frame; audio dubbing provision; 11-function wireless remote; soft-touch electronic tuner; 105 channels; cable ready. 16.7"W × 14.4"D x 5.1"H; 19 lbs $795

HS-304UR VHS Videocassette Recorder

Front-loading 2-head VHS VCR with play and record in SP, LP, and EP modes. Features 5 motors; direct dirve; scan in forward and reverse; freeze frame; audio dubbing provision; 8-function wireless remote; soft-touch electronic tuner. 16.7"W × 14.4"D × 5.1"H $525

PANASONIC

Omnivision Table Models

PV-1770 VHS Videocassette Recorder

VHS-format 6-hr programmable super long play (SLP) VHS color videocassette recorder with with full-function wireless infrared remote control and 14-position (105-channel, including cable) electronic tuner. Features Omnisearch in all modes (SP, LP, and SLP); 8-program/14-day programmable timer; soft-touch transport controls with total electronic tuning; automatic rewind at end of play; compatibility with other 2/4- and 2/4/6-hr VHS VCRs; 4 video heads; direct-drive video head cylinder and capstan motor; channel lock to prevent accidental channel change during record; 1-hr battery backup for digital clock; memory counter; auto dubbing; tracking control; dew detector that shuts off deck automatically under damp conditions; special motion features in SP and SLP modes with remote controller (features full rewind, stop, fast forward, play, record, pause, frame advance, ×2 playback speed, Omnisearch, various slow-motion and channel-change functions). Supplied with accessories to connect to all types of TV receivers and antennas and one NV-T60 blank videocassette $1,595

PV-1750. Similar to PV-1770 except has only 2 hot-pressed ferrite heads $1,495

PV-1720. VHS Videocassette Recorder

VHS-format VCR with Dolby B stereo, video insert capability and electronic indexing. Features 128-channel electronic tuning with HRC/ICC settings; infrared remote control; "stereo-out" balance indicator; 2 double-azimuth heads; built-in 10-pin camera connector; sharpness control and tape remaining indicator. $1,300

PV-1470 VHS Videocassette Recorder

Omnivision 6-hr super-long-play VHS VCR with 105-channel (including CATV band) tuning capability and 9-position remote control. Features Omnisearch in LP and SLP modes; 8-program/14-day programmable timer; soft-touch transport controls; electronic tuning; auto rewind at end of play; switchable to LP 4-hr and standard 2-hr record; 2 hot-pressed ferrite heads; di-

VCRs and Video Cameras

rect-drive video head cylinder and capstan motor; channel lock to prevent accidental channel change during record; auto backup of tape in pause while recording to eliminate picture skip; 1-hr battery backup of digital clock; memory counter; audio dubbing; tracking control; dew detector. Remote controller optional. Supplied with complete accessories to connect to all TV receivers and antennas and one NV-T60 blank videocassette $1,295

PV-1370 VHS Videocassette Recorder

Super-long-play VCR with Omnisearch in LP and SLP modes, still-frame in SLP mode, and 9-position remote control. Features soft-touch transport controls; electronic tuning; auto rewind at end of play; switchable to LP 4-hr and SP 2-hr recording; 2 hot-pressed ferrite heads; 24-hr/1-program programmable timer; direct-drive video head cylinder and capstan motors; channel lock to prevent accidental channel change during record; memory counter; audio dubbing; tracking control; dew detector. Supplied with complete accessories to connect to any TV receiver and antenna and one blank NV-T60 blank videocassette. $1,145

PV-1520 VHS Videocassette Recorder

VHS-format front loading 8-hour VCR with 10-function wireless remote control. Features 2 double-azimuth heads for completely still image, eliminatiing snow and noise interference; 105 cable-ready channels; direct-drive cylinder motor; 12-position electronic tuning; multifunction display; cassette load indicator; standard play, long play or super long play; auto adjustment to proper playback speed; auto rewind; moisture indicator; built-in switchable RF modulator for channels 3 and 4; VT/TV antenna selector; 4-digit tape counter; lightweight aluminum chassis; standard jacks for video and audio in and output. $850

PV-1320 VHS Videocassette Recorder

Front-loading, 105-channel cable-ready VHS with soft-touch front panel controls and 4-function wired remote control. Features total electronic switching; multifunction display panel; visual search 9× normal speed; frame-by-frame advance capability; built-in electronic digital clock/timer for auto recording of 1 program in 2-week period; azimuth recording for minimal crosstalk interference; standard play, long play or super long play; auto proper playback speed; auto rewind; moisture indicator; AFT tuning; built-in switchable RF modulator for channels 3 and 4; VTR/TV antenna selector; 4-digit electronic tape counter; standard phono jacks for video and audio in and output $650

PV-1220 VHS Videocassette Recorder

Multifunction display 8-hour VHS VCR with 4-function wired remote control. Features 12-position electronic tuner; 1-touch record function; single-channel programmer for recording up to 2 weeks ahead; 83 UHF and VHF channels; standard play, long play or super long play recording speeds; auto correct playback speed; direct-drive head cylinder and capstan servo system; 4-digit memory counter; auto rewind and fine tuning; lightweight aluminum chassis; audio and video in and out jacks $499-550

Portable/Home Series

PV-5500 VHS Videocassette Recorder

VHS-format 8-hr programmable portable/home videocassette recorder with wireless infrared remote control. Features 16-function wireless remote control; Omniflex playback features for freeze-action and frame-by-frame advance; 14-day/4-program cable-ready programmable timer with 105-channel programmability; Omnisearch for fast-speed search in forward and reverse; SP/LP/SLP modes; r-f output on TV Channel 3 or 4; aluminum diecast chassis; direct-drive motors; tracking controls; video dubbing; electronic LCD memory counter; soft-touch controls; camera remote on/off; tuner input, video in/out, audio in/out through microphone adapter; 3-way operation (ac, car battery, rechargeable battery); adjustable combination shoulder strap/carrying handle; battery-charge indicator; electronic VCR/TV switch; one-touch recording $1,350

PV-5200. Similar to PV-5500 except 12-function wireless remote control; 24-hr programmability; no one-touch recording $1,195

PV-5110. Similar to PV-5200 but minus tuner/timer $995

PV-5400 VHS Videocassette Recorder

Tuner/timer VCR can automatically record for 2 weeks with one touch record function. Features 4-function wired remote control; LCD tape counter showing approximate battery time remaining, dew presence, and memory on/off; choice of standard, long or super long recording speeds; search (cue and review) mode in super long play; direct drive head cylinder; direct drive capstan motor; four-head system; 10 pin video connector accepts standard VHS video cameras; lightweight aluminum chassis; powered by either LCS-2012P battery, (included) or optional PU-A100 multi-voltage AC adapter or optional car power cord; 4"x 9½"x 10" $950

PV-6500 VHS Videocassette Recorder

Portable, 16-function wireless remote control VHS with Dolby B noise reduction and overdubbing capabilities. Features Tech-4 system comprised of 2 double azimuth heads designed to produce virtually complete still picture and eliminate snow and noise interference in forward and reverse search modes; 4 event/2-week timer; one-touch time-shift programming; video-insert editing; 105-channel tuning capability; CATV-adaptable for programming 1 scrambled and 3 nonscrambled channels with optional cable adapter PV-CT2; auto rewind, pause release, slow-motion release and record review; choice of standard, long or super long play recording speeds; multi-speed search function; 4-digit tape counter with 24 hour memory; rechargable tuner battery; optional AC power supply or optional car-cord for 12-volt operation. All accessories in PV-5000 series interchangable with PV-6000 series. $1,300

PV-6110 VHS Videocassette Recorder

VCR with Dolby noise reduction and stereo sound. Features 12-function remote control; soft-touch controls; choice of standard, long and super long play recording speeds; search, field slow motion, still and field advance functions in standard , and super long play mode; supplied with plug in PV-A110 power supply and rechargable batteries; compatible with PV-R500 remote edit controller $1,000

Color Video Cameras

PK-973. New C-mount allows interchangable lenses; equipped with 12:1 power zoom lens. Other special features include a 2/3" low light, high sensitivity newvicon pick-up tube and a character generator that titles video tape during or after recording, displaying text on the adjustable electronic viewfinder. Time generator is on viewfinder for recording with time superimposed over picture. Automatic white balance and a micro processor that adjusts the auto iris assures proper exposure. Built in remote control transport functions and insert editing functions when using Panasonic's PV-5000 or PU-6000 series portable VTRs; and shock mounted stereo microphone are included . Weight is under 7 pounds, camera measures 7" x 6" x 3". Optional control fade in/fade out and color adjustment. $1,300

PK-972. Features special C-mount 12:1 newvicon pickup tube designed for low-light conditions; built-in character generator for inserting titles that appear on video tape; time generator that displays (on tape) elapsed time up to 59 minutes 100/100 seconds; VCR remote control with play/pause, search forward/reverse, slow and frame-by-frame advance; positive/negative switch for transferring negatives or slides to tape; pistol-grip-mounted variable-speed zoom and pause switch; pause compatibility switch for camera use with non-Panasonic brand VCRs using standard 10-pin connector; front-mounted auto white balance and color preference controls; 12:1 manual zoom lens with macro capability; auto/manual iris control; fade-in/fade-out control; electronic viewfinder/monitor; indoor/outdoor color temperature switch; built-in remote control for Panasonic PV-5000 Series portable VCRs; telescoping boom microphone. Power source 12 V dc; power consumption 5.8 W operating/1.0 W standby on 12 V dc, 19 W on 120 V ac; minimum light intensity 60 LUX at f/2.0; video output 1.0 V p-p, 75 ohms balanced; audio output −20 dB, 1000 ohms; S/N ratio >45 dB; horizontal/vertical resolution >250/>350 lines; 14"D × 8.7"H × 8.3"W, including shoulder/hand grip; 5.9 lb with shoulder strap/hand grip, plus 2.6 lb with optional ac adaptor $1,350

PK-956. Automatic-focus color video camera with ⅔" newvicon pickup tube for low-light conditions. Features character generator for on-tape titles; time generator for on-tape elapsed time display of sporting events; positive/negative switch for transferring negatives and slides to tape; pistol-grip-mount variable-speed zoom and pause switch; pause compatibility switch for use with non-Panasonic VCRs with standard 10-pin connector; front-mounted auto white balance and color preference controls; 6:1 f/1.4 variable-speed zoom lens with macro; electronic viewfinder/monitor; auto/manual iris; fade-in/fade-out control; indoor/outdoor color temperature switch; built-in remote control for PV-5000 Series portable VCRs; telescoping boom microphone. Power source 12 V dc; power consumption 6.4 W operating/1.4 W standby on 12 V dc, 19 W on 120 V ac; minimum light intensity 30 LUX at f/1.4; video output 1.0 V p-p, 75 ohms unbalanced; audio output −20 dB, 1000 ohms unbalanced; S/N ratio >45 dB; horizontal/vertical resolution >250/>350 lines; 11.6"D × 8.7"H × 8.3"W, including shoulder/hand grip; 5.5 lb with shoulder/hand grip, 2.6 lb extra with optional ac adapter $1,295

PK-957. Light sensitive, newvicon, color video camera features character and time generator that allows red, green or white characters to be displayed full-screen or in corner. Features infared auto focusing; macro function; electronic black and white viewfinder; auto white balance control fade in/fade out control; auto/manual iris control; shock-mounted microphone; flashing tally lamp; shoulder rest with hand-grip; stand-by switch to conserve batteries and indoor/outdoor color temperature switch. Variable speed 8:1 zoom lens with f/1.6 lens opening; 10 lux sensitivity; 5 megahertz newvicon tube produces 300 lines of resolution. Signal to noise ratio 45db $1,250

PK-805. Auto-focus color video camera with ⅔" pick-up tube that resists permanent burning and has low image retention. Features side-mounted adjustable 1.5" diagonal electronic viewfinder/monitor; 6:1 motorized 2-speed f/1.4 zoom lens with macro; fade-in/fade-out control; optional camera remote control (PK-R70) for VCR that gives play/pause, search, frame advance with Panasonic PV-4000 Series VCRs; agc light sensitivity switch for 6-dB gain in low light; color preference control; auto white balance control; indoor/outdoor color temperature switch; auto/manual iris control; standby switch to conserve battery power; telescoping boom microphone. Power source 12 V dc; power consumption 8.7 W operating/0.9 W standby on 12 V dc, 19 W on 120 V ac; minimum light intensity 50 LUX at f/1.4; video output 1.0 V p-p, 75 ohms balanced; audio output −20 dB, 1000 ohms; S/N ratio >43 dB; horizontal/vertical resolution >240/>300 lines; 12"D × 8"H × 7"W, including shoulder/hand grip; 7 lb with shoulder/hand grip, 2.4 lb for optional ac adapter ... $1,200

PK-802. Color video camera with built-in character generator for on-tape titles and built-in time generator for on-tape elapsed time display for sporting events. Features ⅔" special pickup tube that resists permanent burning and has low image retention; positive/negative switch for transferring negatives and slides to film; pistol-grip-mounted variable-speed 6:1 f/1.4 zoom lens with macro and pause switch; pause compatibility switch for use with non-Panasonic VCRs with standard 10-pin connector; front-mounted auto white balance and color preference controls; electronic viewfinder/monitor; auto/manual iris; fade-in/fade-out control; indoor/outdoor color temperature switch; built-in VCR remote control for Panasonic PV-5000 Series portable VCRs; telescoping boom microphone.

Specifications same as for PK-956 except 11.2"D, including shoulder/hand grip; 5.1 lb shoulder/hand grip $1,095

PK-756. Similar to PK-956 except has ⅔" vidicon tube, camera weight 5.5 lb with shoulder/hand grip $1,050

PK-903. Low-light video camera with color (red, green, white) character and time generator for on-tape titles. Special ⅔" pickup tube allows lifelike color in normal indoor, outdoor or studio lighting. Features fullscreen or corner-set display on adjustable electronic viewfinder; built-in remote control capabilities with PV-6000 series portable VTR; normal/reverse video switch for changing picture from positive to negative for direct transfer of negative film or slides onto video tape; 8:1 zoom lens with f/1.6 opening and built-in macro functions; fade in/out; auto white balance; auto iris control; color temperture switch; 2 color preference control; adjustable shoulder rest; extendable, shock-mounted microphone; 7"x 6"x 3" in diameter; weighs less than 6 lb. $1,000

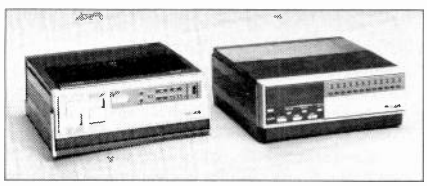
PK-557. Color video camera with ½" high-band newvicon tube and electronic day/date generator that inserts information directly onto video screen. Generator operates on tiny batteries to be replaced annually. Camera features auto infra-red focus; 6:1 power zoom and macro lens; indoor/outdoor filter switch; auto white balance switch;electronic light sensitivity switch ;built-in condenser microphone and adjustable pistol grip. Weighs 4.2 lbs and measures 5.1"x 6.7"x 11.4" $950

PK-503. Color video camera with ½" high-band newvicon tube. Features manual focus system; electronic sensitivity switch; macro lens; manual zoom lens with 6:1 ratio; indoor/outdoor filter switch; auto white balance function; built-in condenser microphone and adjustable pistol grip. $800-850

PHILCO

V1727 Portable VHS Videocassette Recorder

VHS portable videocassette recorder with separate record deck and tuner. Features 3 record speeds; auto fine tuning; still function; 9× cue/review; 4-



function wired remote; digital clock; built-in timer; 14-day/1-event programming; 3-hr battery charging; audio dubbing; audio and video input/output; auto rewind. Record deck with battery 8¼ lbs, tuner 6 lbs $1,060

V1002 VHS Videocassette Recorder

VHS-format videocassette recorder with 3 record speeds and up to 8 hrs of continuous recording and playback. Features soft-touch controls; 12-position electronic VHF/UHF tuner; auto fine tuning; frame advance; digital clock and timer; 14-day/1-event programming; auto rewind; audio input/output jacks; 4-function wired remote. 17½ lbs $599

Color Video Camera

VCC101. Video sound camera with Newvicon tube. Features auto date display; infrared auto focus; record/review; viewfinder with 1" picture tube; f/1.4 zoom lens; macro capability; 6× power zoom (10mm-60mm); auto iris; auto white balance. Required illumination 20 lux; S/N >45 dB; frequency response 100-10,000 Hz. 5"¼W × 6¾"D × 11½"D; 4½ lbs $940

QUASAR

VH5635WW VHS Stereo Videocassette Recorder

Four-head VCR with Dolby noise reduction. Features stereo record and playback; membrane touch controls; 128-channel direct address; field special effects; picture search in all modes; 16-function wireless remote $1,350

VH5235WW VHS Videocassette Recorder

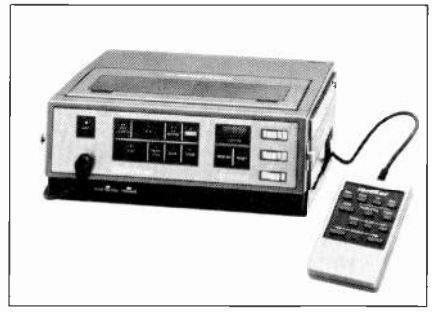
Four-head VCR with field special effects; membrane touch control, 105-channel tuning, one-touch recording, and 10-function wireless remote. $875

VH5031WW VHS Videocassette Recorder

VHS VCR with picture search and still/frame advance in SLP mode, 4-function remote, and one-touch recording. ..... approx. $649

Portable VHS Videocassette Recorders

VP5430WQ. Two-head portable VCR with 14 day/1 program capacity, one-touch recording, picture



search in SLP mode $1,000

VP5435WQ. Stereo VCR with Dolby noise reduction, LCD counter, 4 heads, special effects $950

Color Video Cameras

VK747. Deluxe color video camera with Newvicon tube, auto focus, fade in/out, auto/manual iris, auto white balance, stereo microphone and jacks, low light (10 lux), character generator with cursor .. $1,300

VK727. Color video camera features Newvicon tube, auto focus, auto white balance, low light (20 lux) capability, day and date generator $1,100

Audio Dubbing Microphone

KT476PF. Microphone designed for dubbing audio onto videotape $20

RCA

VGT650 VHS Videocassette Recorder

VHS-format 8-hr videocassette recorder with Dolby stereo playback. Features 4 heads; 14-day/8-event programmable timer; 16-channel electronic tuning; soft-touch transport controls; 2-speed picture search; stop action; variable slow motion; frame advance; cable-ready tuner; wireless remote control $1,500

VJP900 VHS Stereo Videocassette Recorder

VHS-format videocassette recorder with unique wireless electronic connection of the portable deck to the tuner. Features stereo sound; noise reduction; 20-function remote unit; 133-channel capability; 5 video heads; 3-week/8-program timer $1,300

VGT450 VHS Videocassette Recorder

14-day/4-event programmable VHS-format videocassette recorder. Features 16-channel electronic tuning; soft-touch transport controls; picture search; stop action; cable-ready tuner; wireless remote control $1,250

Color Video Cameras

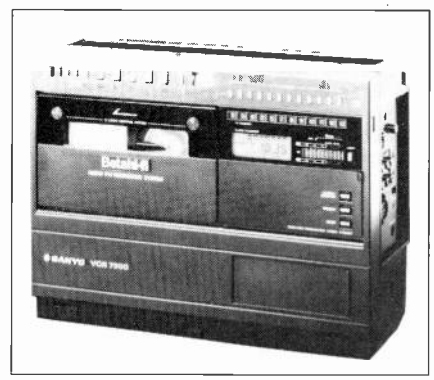
CC015. Video color camera with 6:1 2-speed f/1.4 power-zoom lens; Newvicon pickup tube; ultrasonic AutoFocus system; detachable electronic viewfinder; macro focus; automatic white balance; automatic/manual iris; fade-in/out switch; power saver switch; boom microphone; on-screen status indicators; earphone jack; compatibility switch; built-in VCR controls; clock/timer; calendar and recording-time indicators; positive/negative button $1,400

CC011. Video color camera with 6:8:1 2-speed f/1.8 power-zoom lens. Features Newvicon pickup tube; side-mounted electronic viewfinder; macro focus; automatic white balance switch; fade-in/out button; power saver switch; boom microphone; automatic/manual iris; battery warning indicator; earphone jack; compatibility switch $1,400

SANYO

VCR7300 Beta Hi-Fi Portable VCR

Portable videocassette recorder with Beta Hi-Fi for improved stereo sound. Features 105-channel cable-ready tuner; 7-day/1-event timer; 2 speeds; picture



search at 7× normal speed; 8-function wired remote control; memory rewind; operates from Ni-Cd battery pack, ac power pack, or car battery. Frequency response 20-20,000 Hz; harmonic distortion <0.3%; dynamic range >80 dB; wow and flutter <0.005 (NAB wrms); channel separation >60 dB. 14½"W × 10⅝"H × 16 1/16"D; 15 lbs with battery ... $1,000

VPR4800 Portable Beta Videocassette Recorder

Portable Beta-format videocassette recorder with Ni-Cd battery that recharges in only 1 hr. Features BetaScan high-speed search; feather-touch transport controls; 2-speed operation; moisture sensor and heater; audio dubbing; full-function wired remote control; digital tape counter with memory; soft eject; 2-head, 3-motor transport. Power consumption 9.6 W; 10¾"W × 10½"D × 4"H; 8.75 lb $600

VTT481. Tuner/timer with 12-switch all-electronic varactor vhf/uhf tuner and 14-day/5-event programmability. Features fluorescent display of program timing and time of day; LED power-on, charging, channel-selected displays; clock and timer set buttons; automatic fine tuning; TV/VCR switch; audio and video inputs and outputs; antenna inputs and outputs. Power consumption 60 W; F-type antenna in/out; 10¾"W × 10½"D × 4"H; 16½ lb $200

VCR6300 Beta Videocassette Recorder

Front-loading Beta-format VCR with 10-key frequency-synthesized tuning and 105-channel capability. Features 13-function wireless remote control; 2-speed operation; 7-day/1-event timer; fluorescent display of programming and time; auto fine tuning; all-electronic varactor tuner; microprocessorr-controlled tape transport; picture search at 9× normal speed; freeze frame; quartz-locked speed control; audio output jacks. Video S/N ratio 43 dB luminance, 35 dB chrominace; audio S/N ratio 42 dB; wow and flutter 0.2% wrms (Beta II); power consumption 30 W. 17 15/16"W × 5 3/16"H × 13¾"D; 20.5 lbs $600

VCR6400 Beta Videocassette Recorder

Front-loading Beta-format with 4 heads for clear special effects. Features 7-day programming; picture search at 9× normal speed; 2 speeds; freeze frame; single frame; slow motion; 11-function remote control; 12-station preset tuner; 5-motor quartz-locked drive. Video S/N ratio 45 dB; audio S/N ratio 42 dB; power consumption 37 W. 17 9/16"W × 5 3/16"H × 13 25/32"D; 20 lbs $550

VCR4500 Beta Videocassette Recorder

Front-loading Beta-format VCR with 8-function wired remote control. Features 7-day programming; picture

For an explanation of abbreviations, turn to the list on page 35.

Tape-recording terms are defined in the vocabulary on page 32.

VCRs and Video Cameras

search at 9× normal speed; clear freeze frame in Beta III; 12-station preset electronic tuner with 82-channel capacity; 5-motor quartz-locked drive. Video S/N ratio 45 dB; audio S/N ratio 42 dB; power consumption 37 W. 17 5/16"W × 5 3/16"H × 13 2/3"; 19 lbs $450

VCR4000-II Beta Videocassette Recorder

Top-loading Beta-format VCR with 3-day programmability. Features remote pause control; picture search at 9× normal speed; freeze frame; 2 speeds; quartz-locked speed control; 4 motors; feather-touch controls; extra-compact design; all-electronic varactor tuner; auto fine tuning. Video S/N ratio 43 dB luminance, 35 dB chrominance; audio S/N ratio 42 dB; wow and flutter 0.2% wrms (Beta II); power consumption 29 W. 17 5/16"W × 5 3/16"H × 13"D; 17.1 lbs $400

Color Video Cameras

VSC530. Color video sound camera with remote tape-transport controls and auto iris. Features macro focusing; 6:1 f/1.2 zoom lens; ½" Saticon tube; electronic viewfinder with 1" screen; white balance circuit; indoor/outdoor filter; sensitive condenser mic. Scanning system 525 lines (2:1 interlace); horizontal resolution 250 lines; minimum illumination 50 lux; video S/N ratio 45 dB; power consumption 5.8 W (12 V dc). 2 7/8"W × 9 7/16"H × 12 5/8"D; 3 lbs ... $700

VSC450. Color video sound camera with remote tape-transport controls and 6:1 zoom lens. Features 1½" electronic viewfinder; f/1.4 lens; 2-speed power zoom from 12.5 mm to 75 mm; macro focusing; sensitive telescoping-boom mic. Horizontal resolution 250 lines; scene brightness 10-20,000 foot candles; video S/N ratio 45 dB; power consumption 10.5-15 V dc. 3 3/8"W × 10 7/16"H × 13 3/16"D; 4.6 lbs .. $600

SANSUI

SV-R500 VHS Videocassette Recorder

Programmable VHS-format videocassette recorder with 2/6-hr record and 2/4/6-hr play capability. Features 4-head system; 8-event/14-day programmable timer; 2-speed frame-search function (7× and 21× normal); feather-touch transport controls; wired 10-function remote controller; counter memory; automatic rewind; pause switch; automatic r-f output selection; air-damped cassette holder; 14 preset channels with channel lock; quartz-locked direct-drive motor; up-front audio and video inputs; audio dub; moisture condensation eliminator. Audio: S/N ratio >40 dB; frequency range 100-10,000 Hz. Video: input 0.5-2.0 V p-p into 75 ohms unbalanced; S/N ratio >45 dB; output 1.0 V p-p into 75 ohms unbalanced; 17 3/8"W × 13"D × 5 9/16"H; 21.6 lb $800

SEARS

5360 Portable Beta 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 noiseless special effect; micro-touch controls; audio dub; soft eject; clean edit; auto rewind; dew-protection sensor; tape counter; TV/VCR selector; audio and video outputs; tuning LED; 2-speed BetaScan; time on/off presets; fluorescent timer display; LED channel display. Includes wired 11-function remote-control unit for BetaScan forward/reverse at 5× normal speed; slow-motion playback at 1/3 to 1/30 normal speed; frame-by-frame advance; pause/still functions. Power consumption 85 W ac, 7.5 W on battery; 11"W × 10.6"D × 4.6"H; tuner 9.9, deck 13 lbs $1,100

5368 VHS Portable Videocassette Recorder

*Pro*formance Brand VHS-format VCR with 14-day/6-program timer and 8-hr recording. Features 3 heads for noiseless special effects; infrared wireless remote control with tuning, play, slow motion, fast forward, stop, rewind, pause, still, frame advance, TV/VCR selector; audio dubbing with sound on sound; 1-button record; electronic tape counter with memory; 82-channel electronic tuner. Includes rechargeable battery, car cord, shoulder strap, earphone. Power consumption 4.8 W. Deck and tuner each 10"W × 3¼"H × 10½"D; deck 7.9 lbs with battery . $950

53442 Beta Hi-Fi Videocassette Recorder

Frequency-synthesized 10-key-tuned Beta VCR with Beta Hi-Fi stereo sound recording and playback. Features 4 heads for noiseless special effects; 117-channel cable-ready tuner; auto program search; auto rewind; infrared wireless control with tuning, record, audio dubbing, 5-20× video search in forward and reverse, tracking control, play, double speed play, fast forward, stop, rewind, pause, still, frame advance, TV/VCR selector, variable slow motion (1/3-1/30×). Power consumption 64 W; 16.8"W × 15.6"D × 4.2"H; 31.6 lbs $900

5324 VHS Dolby Stereo Videocassette Recorder

VHS-format VCR with Dolby B stereo playback. Features 14-day/6-program timer; 8-hr recording; 4 heads for noiseless special effects; 105-channel cable-ready tuner; dew sensor; 3 speeds; auto rewind and shutoff; 1-button record; electronic tape counter with memory; infrared 13-function remote control with tuning, record, forward and reverse visual search, play, quick motion, fast forward, stop, rewind, pause, still, frame advance. 17.4"W × 10.8"D × 4.8"H; 27 lbs $800

5319 Beta 4-Head Videocassette Recorder

Beta-format 4-head VCR with 7-day/4-program timer and 5-hr recording. Features noiseless special effects; 105-channel cable-ready tuner; every day timer; electronic tape counter with memory; infrared wireless 16-function remote control with tuning, record, forward and reverse visual search, play, slow motion (1/5, 1/10, 1/30); fast forward, stop, rewind, pause, still, frame advance, TV/VCR selector. Power consumption 39 W. 17.6"W × 14.0"D × 5.2"H; 20.9 lbs $650

5316 VHS Front-Loading Videocassette Recorder

Front-loading VHS-format VCR with 14-day/6-program timer. Features every-week/every-day timer; 3 speeds; auto rewind and shutoff; electronic tape counter with memory; 82-channel tuner; infrared 10-function remote control with tuning, record, forward and reverse visual search, play, fast forward, stop, rewind, pause, still. 17.4"W × 14.8"D × 4.8"H $650

5315 VHS 8-Hour Videocassette Recorder

VHS-format VCR with 8-hr recording capability and 10-day/1-program timer. Features electronic tape counter with memory; every-day timer; 82-channel tuner; remote control with forward and reverse visual search, pause, still. Power consumption 35 W. 17.4"W × 13.6"D × 5.2"H; 23 lbs $580

53121 Beta Videocassette Recorder

Front-loading Beta-format VCR with 14-day/8-program timer and 5-hr recording. Features every-week/every-day timer; auto rewind; mechanical tape counter; 8-function wired remote control with forward and reverse BetaScan, play, fast forward, rewind, pause, still, frame advance. Power consumption 34 W. 16.8"W × 15.6"D × 4.8"H; 21.2 lbs ... $550

53131 VHS Videocassette Recorder

VHS-format VCR with 10-day/1-program timer and 8-hr recording. Features wired remote control for pause and still; 2 speeds; forward and reverse visual search; every-day timer; electronic tape counter with memory; 82-channel electronic tuner. UL listed. Power consumption 35 W. 17.4"W × 13.6"D × 5.2"H; 23 lbs $550

5309 Beta Videocassette Recorder

Beta-format VCR with 3-day/1-program timer and 5-hr recording. Features forward and reverse Beta Scan; pause and still controls; every-day timer; electronic tape counter with memory; 82-channel electronic tuner. UL listed. Power consumption 27 W. 17.4"W × 13"D × 5.4"H; 22 lbs $400

Color Cameras

5387. Color video camera with ⅔" Saticon pickup tube. Features 6× motorized f/1.4 zoom lens with macro; electronic viewfinder; automatic iris; fade-in/out control; VCR stop/start control; battery warning and low-light warning indicators; white balance control; indoor/outdoor-light filters; power-saver switch; boom microphone. Video input/output level 1.0 V p-p; horizontal resolution 300 lines nominal at center; video S/N ratio 46 dB luminance; minimum illumination 50 lux; audio S/N ratio 45 dB; frequency range 100-10,000 Hz; power consumption 8.5 W $1,190

53812. Color-video/sound camera with 6× (16-84 mm) zoom lens with macro setting and manual focus, electronic viewfinder, and built-in front/rear microphone on telescope boom. Features VCR start, low-light, battery warning, and 2-light white balance LEDs in viewfinder and f/1.6 zoom lens. Horizontal resolution 250 lines; video S/N ratio 45 dB; sensitivity 75 lux; 1½" video tube in viewfinder; operating/standby power consumption 7/1 W; 4.18 lb. Separate ac power adapter available $950

SHARP

VC-388 VHS Videocassette Recorder

Dolby stereo VHS-format VCR with 4 double-azimuth heads and 17-function wireless remote control. Features 8-program/14-day timer; front loading; 3 speeds for recording and play; microcomputer-controlled power-assisted drive; soft-touch controls; noiseless, clear still frame in SP and EP; multi-speed play including frame advance, variable slow motion (1/30 to 1/18), double speed and reverse; high-speed search in forward and reverse; 136-channel cable-ready synthesizer tuner; display for tape counter, time remaining, auto repeat, timer, clock, channel; insert editing; auto rewind; mic jack; audio dubbing; auto TV/VCR selector. Horizontal resolution 240 lines; audio frequency range 80-10,000 Hz; video input/output level 0.5-2.0/1.0 V p-p, both into 75 ohms unbalanced; audio input/sensitivity -20 dB/>56k ohms unbalanced line, -70 dB/5k ohms mic; audio output level/impedance -5 dB/<600 ohms unbalanced; video/audio S/N ratio >50/>45 dB, SP mode; power consumption 50 W. 16 15/16"W × 15 1/32"D × 4 29/32"H; 20.9 lbs $1,000

VC-385 VHS Videocassette Recorder

Four-head front-loading VHS-format VCR with 105-channel cable-ready tuner. Features 14-day/4-program/4-channel timer; 10-function remote control; 3 speeds; microcomputer-controlled power-assisted drive; video search at 5× in forward and reverse; still function and frame advance; 1-touch recording; auto fine tuning; auto rewind; auto TV/VCR selector; dew sensor and warning indicator. Horizontal resolution 240 lines; audio frequency range 80-10,000 Hz; video input/output level 0.5-2.0/1.0 V p-p, both into 75 ohms unbalanced; audio input/sensitivity -20 dB/>56k ohms unbalanced line; audio output level/impedance -5 dB/<600 ohms unbalanced; video/audio S/N ratio >50/>45 dB, SP mode; power consumption 35 W. 16 15/16"W × 14 3/16"D × 5"H; 23.1 lbs $600

VC-381 VHS Videocassette Recorder

Front-loading 3-speed VHS-format VCR with microcomputer-controlled power-assisted drive, video search at 5× in forward and reverse and still function. Features 7-day/1-program timer; 82-channel tuner with auto fine tuning; 1-touch recording; dew sensor and warning light; 8-function wired remote control. Horizontal resolution 240 lines; audio frequency range 80-10,000 Hz; video input/output level 0.5-2.0/1.0 V p-p, both into 75 ohms unbalanced; audio input/sensitivity -20 dB/>56k ohms unbalanced line; audio output level/impedance -5 dB/<600 ohms unbalanced; video/audio S/N ratio >50/>45 dB, SP mode; power consumption 35 W. 16 15/16"W × 14 3/16"D × 5"H; 20.46 lbs $600

VC-220 Compact VHS VCR System

Portable VHSC-format videocassette recorder for use with VHSC videotape playable on any VHS VCR with optional adapter. Features 20-min recording time; video search at 3× speed; audio dubbing; assembly editing; microcomputer-controlled power-assist drive;

tape-end warning; powered by ac, dc batteries, car battery. Horizontal resolution >240 lines; audio frequency range 50-10,000 Hz; video input/output level 0.5-2.0/0.9 V p-p, both into 75 ohms unbalanced; audio input/sensitivity -20 dB/20k ohms unbalanced line, -65 dB/600 ohms mic; audio output level/impedance -3 dB/1k ohms; video/audio S/N ratio >46/>40 dB; power consumption 5.9 W with dc battery, 7.5 W with ac adapter. 6 31/32"W × 9 3/8"D × 2 3/4"H; 5.7 lbs with dc battery $700

Compact VHS Accessories

AA-220. Ac adapter with RF converter $190
BT-220. Dc battery pack $35
TC-20HG. Compact videotape $20
VR-222SB. Soft case $20
CC-220E. Car battery cord (12 V) $10

VC-9400 VHS Videocassette Recorder

Front-loading VHS-format tabletop videocassette recorder with four heads. Features power-assisted cassette loading; electronic varactor tuning; up to 8 hrs record/play; 14-button, 142-channel vhf/uhf tuning; LP/EP record/play speeds; soft-touch transport controls; 7-day/1-3 event programmable timer; one-touch recording; 4-digit tape counter; automatic tuner/aux input selector; dew sensor and warning lamp. Horizontal resolution 240 lines; audio frequency range 70-10,000 Hz; video input/output level 0.5-2.0/1.0 V p-p, both into 75 ohms; audio input/sensitivity -20 dB/>50k ohms unbalanced line, -60 dB/2k ohms mic; audio output level/impedance -5 dB/1k ohms unbalanced; video/audio S/N ratio >45/>40 dB, SP mode; power consumption 30 W. 18 1/8"W × 14 9/16"D × 5 29/32"H; 20.9 lbs, ... $700

VC-3500 VHS Portable Videocassette Recorder

Compact portable VHS-format videocassette recorder with wired remote-control unit and up to 8-hr record/play time. Features built-in tuner/timer; high-speed (5× normal) forward/reverse video search on ac power; SP/LP/EP record/play speeds; soft-touch transport controls; pause function; 7-day/1-event programmable timer; 12-button, 82-channel vhf/uhf tuner; still function in EP; auto rewind; 4-digit tape counter; universal 10-pin camera connector; mic jack; audio dubbing; auto TV/VCR input selector; air-damped soft-eject mechanism; 5-minute power back-up for programmable timer; switchable automatic fine tuning. Specs same as for VC-3500 except audio S/N ratio >40 dB; power consumption 19 W at 120 V ac, 10 W at 12 V dc; 14 3/16"W × 10 5/16"H × 5 1/8"H; 15.2 lb $1,000
Package of VC-3500 and QC-50 Video Camera. (See below for data on QC-50 camera.) $1,200

Video Cameras

QC-70. Portable color video/sound camera with through-the-lens optical viewfinder, telescoping microphone, and automatic/manual focus control. Features macro focusing; auto iris control; folding handgrip; 6-dB boost sensitivity switch; 3-position color temperature selector; LED indicators for battery alarm, recording start, and underexposure; universal 10-pin connector; remote start/stop; accessory shoe for external lights; standby pause power saver. Pickup tube 2/3" Vidicon; horizontal resolution 240 lines; minimum illumination 70 lux; video output level/impedance 1.0 V p-p/75 ohms; video S/N ratio 45 dB; audio input level/impedance −20 dB/10k ohms; audio output level/impedance −65 dB/1k ohm; power consumption 5.3 W at 12 V dc; 12"D × 6 19/64"H × 2 27/32"W; 3.52 lb, including lens, handgrip, cable $860
QC-50. Lightweight color video/audio camera with f/1.6 2:1 (16-32-mm) zoom lens and removable high-sensitivity condenser microphone. Features through-the-lens optical viewfinder; auto iris control; LED indicators for battery alarm, recording start, underexposure; universal 10-pin connector; 3-position color temperature switch; remote VCR start/stop trigger switch; folding handgrip; accessory shoe for external lights. Specifications same as for QC-70 except power consumption 5.5 W; 12"D × 8 15/16"H × 2 11/16"W; 2.65 lb $560

SONY

SL-2700 Betamax Videocassette Recorder

Front-loading Betamax VCR with Beta Hi-Fi™ system for frequency-modulated stereo sound. Features 10-key frequency-synthesis express tuning; 2× fast play with sound; peak program meter with separate left and right recording level; FM simulcast recording; stereo/mono audio switching; 14-day/4-event timer; cable-adaptable tuning for access to 107 nonscrambled stations; programmable antenna switch; BetaScan; Crystal-Clear swing search; 5-hour capability on L-830 Beta cassette (at Beta III speed), wireless infrared Remote Commmander®; MPX output jack for stereo TV broadcasts; connections for optional Sony Trinicon® color camera. Dynamic range >80 dB; frequency response 20-20,000 Hz; wow and flutter <.005%; harmonic distortion <0.3% at 400 Hz; channel separation >60dB. 17"× 4 1/8"× 14" $1,500

SL-2500 Betamax Videocassette Recorder

Front-loading Beta-format color videocassette recorder with 5-hr capacity. Features wireless remote control; BetaScan rapid picture search in forward and reverse; Swing Search with slow-motion, frame-by-frame advance; normal and double speed in forward and reverse; Linear Tape Time Counter that shows actual minutes and seconds of elapsed time; Tab Marking Indexing System for rapid accesss of up to 9 different tape segments; 14-pushbutton vhf/uhf tuner; B-I play; B-II and B-III record/play capability; 14-day/4-event programmability. 17"W × 13 3/8"D × 3 1/8"H $950
AG-400. BetaStack programmable videocassette autochanger stacks and automatically changes up to 4 Beta cassettes. Delivers up to 20 hrs of record or play time with SL-2500 Betamax. Programmable operation to record up to 4 different programs on videocassettes of 4 different lengths $170

SL-5200 Betamax Videocassette Recorder

Front-loading VCR with Beta Hi-Fi system for stereo sound using rotating video heads. Features wireless remote control; 3-day/1-event programmability; BetaScan high-speed picture search; 2× fast play with sound for review of programs with fully intelligible voice; feather-touch controls; pause/freeze frame; MPX output enables deck to record stereo TV broadcasts when connected to outboard decoder. Frequency response 20-20,000 Hz; wow and flutter <0.005%; harmonic distortion <0.3% at 400 Hz; channel separation >60dB. 18 1/8"× 6 5/8"× 15 3/8" $900

SL-2000 Betamax Portable Videocassette Recorder

Compact, lightweight portable Beta-format color videocassette recorder with 5-hr capacity. Features 3-way power operation (rechargeable battery pack, car-battery adapter, ac power); feather-touch full-logic microprocessor transport controls; BetaScan rapid picture search in forward and reverse; Swing Search for slow-motion, frame-by-frame advance; normal and double speed in forward and reverse; B-I play; B-II and B-III record and play. 12"D × 8 1/2"W × 3 1/8"H $700

SL-5101 Betamax Videocassette Recorder

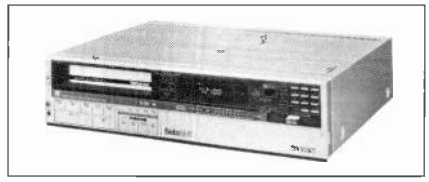
Front-loading Betamax VCR with wireless infrared Remote Commander® and 105-channel cable capability for recording nonscrambled programs through direct cable hook-up. Features PCM switch for use with the Sony PCM-F1 Digital Audio Processor; Express Tuning® system for use of VHF (2-13), UHF (14-83), cable mid-band (A-I) and cable superband (J-W) stations; 7-day/1-event programmable tuner; feather-touch, full-logic, front-mounted microprocessor controls; 5-hour recording capability; connections for optional Sony Trinicon® color camera; audio and video line inputs and outputs $670

SL-5000 Betamax Videocassette Recorder

Front-loading Beta-format color UCR with 5-hr capacity. Features remote control; BetaScan rapid picture search in forward and reverse; feather-touch full-logic microprocessor transport controls; pause/freeze-frame control; 24-hr/1-event 14-button vhf/uhf tuner; B-I play; B-II and B-III record and play. 18 1/8"W × 14 5/8"D × 6 5/8"H $670

SL-2400 Betamax Videocassette Recorder

Front-loading Betamax VCR with wireless infared Remote Commander® and 14-pushbutton Express Tuning™. Features BetaSkipScan™ for instant search and switching of speeds; 3-day/1-event timer; 5-hour re-



cording capability; feather-touch, full-logic microprocessor controls; connections for optional Sony Trinicon® color camera; audio and video line inputs and outputs; 17"× 3 1/4"× 15 1/4" $600
TT-2000. Compact tuner/timer for SL-2000 with 14-day/4-event capacity. Features remote control for both timer and VCR; 14-pushbutton vhf/uhf tuner; conversational programming; auto fine tuning. Sets recording time to accuracy of 1-minute intervals; 12"D × 8 1/2"W × 3 1/8"H $250

Color Cameras

For Betamax videocassette recorders.
HVC-2800. Portable Trinicon color video camera uses MF Trinicon® pickup tube with Saticon™ photoconductive layer. Features macro-focusing; detachable super-directional microphone; detachable electronic viewfinder with 1 1/2" black and white picture tube; 1-touch auto white balance; electronic fade in/out; 1-button record/review function (with Betamax models SL-2000/2001/2500); "green" control positions for simple operation; accepts minimum of 20 lux; shoulder-mount design and aluminum carrying case; 6 lbs $1,350
HVC-2500. Trinicon color video camera uses MF Trinicon® pickup tube with Saticon™ photoconductive layer. Features through-the-lens infrared auto-focus system; built-in macro-focusing; f/1.4 motorized 6:1 zoom lens; detachable electronic viewfinder with 1 1/2" black and white picture tube with instant tape-playback in the field; 1-touch auto white balancing feature; electonic fade in/out; 1-button record/review; "green" control positions for simple operation; 7 7/8"× 14 1/4"; 6 lbs $1,300
HVC-2400 Trinicon Color Camera. Uses MF trinicon pickup tube for high resolution. Features motor-driven 6:1 zoom; macro lens; built-in microphone; multi-function detachable electronic viewfinder; negative-film conversion capability when used with Sony HVT-3000 Video PhotoLab adapter $1,000

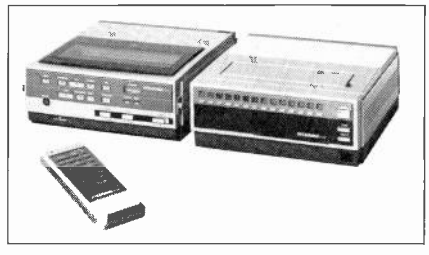
HVT-3000 Video PhotoLab Adapter

Adapter transfers color slides to videotape with HVC-2400 camera. Makes negative-to-positive conversion, framing, cropping, zoom, fade-in, fade-out possible with camera's controls $180

SYLVANIA

VC4526 VHS Videocassette Recorder

Portable VHS-format videocassette recorder offers up to 8 hrs record/play time. Features variable-speed slow motion; still frame; video cue/review; video dub;



audio dub; memory rewind; 16-function wireless infrared remote control; 105-channel tuning capability; 14-day/4-event timer $1,450

(Continued on page 99.)

5 Autosound Tape Components

ALARON

RY-747 AM/FM Radio/Cassette Player
In-dash AM/FM stereo radio with auto-reverse cassette deck. Features short chassis with adjustable shafts; lighted slide-rule dial; LED stereo and tape-direction indicators; pushbutton eject, stereo, rewind, fast-forward, tape program selector, mute switches; tone and balance controls; antenna trimmer; azimuth tape head adjuster; 6"W × 5"D × 1¾"H $80

RY-705C AM/FM Radio/Cassette Player
In-dash AM/FM radio with auto-stop cassette player. Features digital frequency tuning; digital clock; built-in AFC; short chassis with adjustable shafts; mono/stereo switch; front-end antenna trimmer; azimuth tape head adjuster. 7¾" × 5" × 1¾" $80

AIWA

CTR-70 AM/FM Radio/Cassette Player
In-dash AM/FM radio/cassette player with digital synthesizer tuner and auto-reverse cassette deck. Features 6 AM/6 FM station presets; top-side priority-play mechanism; digital frequency display; auto-station search; locking fast forward/rewind; metal-tape capability; local/DX switch. Designed to fit X-body cars. Output power 8 W/channel $270

CTR-50 AM/FM Radio/Cassette Player
In-dash AM/FM radio/cassette player with auto-reverse cassette transport. Features single function forward and rewind; punch-button tuning (4 AM/1 FM or 4 FM/1 AM); local/DX switch; top side priority play mechanism. Designed for X-body cars. Output power 8 W/channel $200

CTR-30 AM/FM Radio/Cassette Player
In-dash AM/FM radio/cassette player with continuous silent reverse mechanism. Features high-sensitivity AM/FM receiver; DX/local and stereo/mono switches; 6½"W × 6¼"D × 1¾"H $180

CTR-20 AM/FM Radio/Cassette Player
In-dash AM/FM radio/cassette player with locking fast forward and automatic motor stop at end of tape play.Output power 5 W/channel; 6¼"W × 4¾"D × 1¾"H..... $125

ALPINE

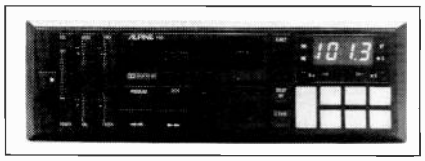
7347 AM/FM Radio/Cassette Player
In-dash PLL frequency-synthesized digitally tuned AM/FM stereo radio with auto-replay cassette deck. Features dbx, Dolby B, and Dolby C noise reduction; programmable music sensor; balanced-mixer FM tuner; dual preamp outputs; LiteTouch memory; 10 station presets; SC tape head; metal-local/distant dual-function switch; engine-noise suppressor; auto cassette glide; key-off eject; separate bass and treble; auto mute. Output power voltage 500 mV/10k ohms; wow and flutter 0.09% wrms; frequency response 40-18,000 Hz ±3 dB (metal, FeCr, CrO_2), to 16,000 normal; S/N ratio 86 dB with dbx, 72 with Dolby C, 64 with Dolby B, 55 with no noise reduction; separation 40 dB at 1 kHz; FM usable sensitivity 16.3 dBf; FM S/N ratio 70 dB with Dolby, 60 without; capture ratio 2 dB. 7⅛"W × 5⅛"D × 2"H . $600

7146 AM/FM Radio/Cassette Player
In-dash PLL frequency-synthesized, digitally tuned AM/FM stereo radio with auto-reverse cassette deck. Features Lite Touch 10-station presets; SCC tape head; memory logic; Dolby noise reduction; auto seek; metal-local/distant dual-function switch; music sensor; preamp fader; bilevel capability; illuminated cassette slot; separate bass and trble; key-off eject; engine noise suppressor. Output power 6 W at 1 kHz with 8% THD; output impedance 4 ohms; wow and flutter 0.1% wrms; frequency response 40-16,000 Hz ±3 db (metal, FeCr, CrO_2), to 13,000 with normal tape; tape S/N ratio 55 dB without Dolby, 65 dB with Dolby; separation 40 dB; FM usable sensitivity 16.3 dBf; FM S/N ratio 60 dB Dolby off, 70 dB Dolby on; capture ratio 2 dB. 7⅛"W × 5⅛"D × 2"H $500

7337 AM/FM Radio/Cassette Player
ETR/PLL AM/FM radio preamplifier/radio with stereo cassette deck. Features SC tape head; metal/stereo dual-function switch; LiteTouch 10-station tuner presets; music sensor; automatic seek and FM mute; Dolby noise reduction; LiteTouch transport controls; separate bass, treble, detented volume controls;local/distant switch; fader control; key-off eject; automatic cassette glide; engine noise suppressor. Frequency response 40-18,000 Hz ±3 dB with metal tape; wow and flutter 0.09% wrms; S/N ratio 65 dB, Dolby on; FM usable sensitivity 16.3 dBf; 6¼"W × 5⅛"D × 2"H $500

7136 AM/FM Radio/Cassette Player
In-dash PLL frequency-synthesized, digitally tuned AM/FM radio radio with automatic-reverse cassette deck. Features 10-station tuning presets; digital-numeric frequency display; SCC tape head; auto reverse at end of play, fast forward, rewind; key-off eject; dual-function metal/stereo switch; balance, preamp fader, Tone Tenor controls; local/distant switch; automatic loudness adjust; noise suppressor; Dolby noise reduction; locking fast forward/rewind; power antenna lead; tape-direction indicators. Output power 6 W at 1 kHz, 8% THD; output impedance 4 ohms; wow and flutter 0.1% wrms; frequency response 40-16,000 Hz ±3 dB metal/FeCr/CrO_2, to 14 kHz normal tape; S/N ratio Dolby off/on 55/65 dB; separation 40 dB; FM usable sensitivity 16.3 dBf; S/N ratio Dolby off/on 60/70 dB; capture ratio 2 dB; 6¼"W × 5⅛"D × 2"H..... $450

7155 AM/FM Radio/Cassette Player
In-dash PLL frequency-synthesized digitally tuned AM/FM stereo radio with auto-reverse cassette deck. Features Dolby B and C; full front DIN; bilevel capabiltiy; preamp fader; separate bass and treble; music sensor; SCC tape head; balanced-mixer FM tuner; auto dimmer; illuminated cassette loading slot; LiteTouch memory; 12 station presets; digital clock; noise suppressor. Output power 6 W at 1 kHz with 8% THD; wow and flutter 0.1% wrms; frequency response 40-16,000 Hz ±3 dB (metal), to 13,000 normal; tape S/N ratio 55 dB Dolby off, 64 dB with Dolby B, 72 dB with Dolby C; separation 40 dB; FM



usable sensitivity 16.3 dBf; FM S/N ratio 60 dB no Dolby, 70 dB with Dolby B; capture ratio 2 dB. 7" × 5¾" × 2" $400

7154 AM/FM Radio/Cassette Player
In-dash PLL frequency-synthesized digitally tuned AM/FM stereo radio with auto-reverse cassette deck. Features full front DIN; bilevel; preamp fader; separate bass and treble; music sensor; SCC tape head; balanced-mixer FM tuner; auto dimmer; illuminated cassette loading slot; 12 LiteTouch station presets; digital clock. Output power 6 W at 1 kHz with 8% THD; wow and flutter 0.1% wrms; frequency response 40-16,000 Hz ±3 dB (metal), to 13,000 normal; tape S/N ratio 55 dB; separation 40 dB; FM usable sensitivity 16.3 dBf; FM S/N ratio 60 dB; capture ratio 2 dB. 7" × 5¾" × 2" $350

7135 AM/FM Radio/Cassette Player
Bilevel ETR/PLL AM/FM radio/cassette player with digital frequency synthesized tuning, auto-reverse transport, and SCC tape head. Features metal-tape compatibility; LiteTouch 10-station tuning preset system; music sensor; auto seek; metal and local/distant dual-function switch; engine-noise suppression; LiteTouch memory system; separate bass and treble controls. Frequency response 40-16,000 Hz ±3 dB with metal tape; wow and flutter 0.01% wrms; tape S/N 55 dB; FM usable sensitivity 16.3 dBf; 6¼"W × 5⅛"D × 2"H..... $350

7138 AM/FM Radio/Cassette Player
Frequency-synthesized AM/FM radio/cassette player with 10-station tuning preset system. Features SCC tape head; memory logic electronics; Dolby noise reduction; automatic seek; metal/stereo switch; stereo indicator; Tenor Tone control; automatic loudness adjust; engine-noise suppression; local/distant switch; digital clock; manual up/down tuning; locking fast forward/rewind; cassette glide loading system; tape-direction indicators; program switch; power antenna lead. Output power 6 W at 1 kHz, 8% THD; output impedance 4 ohms. Wow and flutter 0.1% wrms; frequency response ±3 dB 40-16,000 Hz metal/FeCr/CrO_2, to 13 kHz normal tape; S/N ratio Dolby off/on 55/65 dB; separation 40 dB. FM usable sensitivity 16.3 dBf; alternate-channel selectivity 80 dB; capture ratio 2 dB; 7"W × 5¼"D × 2"H ... $350

7128 AM/FM Radio/Cassette Player
In-dash PLL digital frequency-synthesized AM/FM stereo radio with auto-reverse stereo cassette deck. Features metal-tape compatibility; hard Permalloy tape head; music sensor system; cassette glide lock-in insert; automatic reverse at end of play, fast forward, rewind; metal/CrO_2/FeCr bias switch; locking fast forward/rewind; 5-station tuner preset system; auto local/distant select; FM afc (automatic frequency con-

trol); manual up/down tuning. Output power 2.2 W/channel continuous into 4 ohms, 70-20,000 Hz at 0.8% THD. Wow and flutter 0.1% wrms; frequency response 40-15,000 Hz ±3 dB all tapes; S/N ratio 50 dB; FM usable sensitivity 2.2 μV; selectivity 50 dB; S/N ratio 55 dB; 7"W × 5¼"D × 2"H.. $300

7152 AM/FM Radio/Cassette Player

In-dash PLL frequency-synthesized digitally tuned FM/AM stereo radio with auto-reverse cassette player. Features Dolby B and C; bilevel capability; balanced-mixer FM tuner; SCC tape head; bi-lite dial illumination; music sensor; metal/stereo dual-function switch; engine-noise suppressor; cassette glide. Output power 6 W at 1 kHz with 8% THD into 4 ohms; wow and flutter 0.1% wrms; frequency response 40-16,000 Hz ±3 dB (metal, FeCr, CrO_2), to 13,000 normal tape; tape S/N 55 dB Dolby off, 64 dB Dolby B, 72 dB Dolby C; separation 40 dB; FM usable sensitivity 16.3 dBf; FM S/N 60 dB Dolby off, 70 dB Dolby on; capture ratio 2 dB. 7⅛"W × 5⅛"D × 2"H $270

7225 AM/FM Radio/Cassette Player

High-power bilevel AM/FM-stereo receiver with auto-reverse stereo cassette deck. Features SCC tape head; metal-tape capability; metal and local/distance dual-function switch; locking fast forward/rewind; preamp fader; separate bass and treble controls; engine-noise suppression; FM afc (automatic frequency control); program switch; detented volume control. Output power 16 W rms/channel into 4 ohms at 1 kHz, 8% THD. Other specifications same as for 7135 and 7140; 6¼"W × 5⅛"D × 2"H ... $250

7151 AM/FM Radio/Cassette Player

In-dash AM/FM stereo radio with stereo cassette deck. Features auto reverse; bilevel; balanced mixer FM tuner; Bi-Lite dial illumination; music sensor; SCC tape head; metal/stereo dual-function switch; engine-noise suppressor; separate bass and treble controls; cassette glide. Output power 6 W at 1 kHz with 8% THD into 4 ohms; wow and flutter 0.1% wrms; frequency response 40-16,000 Hz ±3 dB (metal, FeCr, CrO_2), to 13,000 normal tape; tape S/N 55 dB; separation 40 dB; FM usable sensitivity 16.3 dBf; FM S/N 60 dB; capture ratio 2 dB. 7⅛"W × 5⅛"D × 2"H $200

7150 AM/FM Radio/Cassette Player

In-dash AM/FM radio with stereo cassette deck. Features auto reverse; built-in AFC; metal/stereo dual-function switch; cassette glide; power antenna lead; tone control. Output power 6 W at 1 kHz with 8% distortion into 4 ohms; wow and flutter 0.1% wrms; frequency response 40-15,000 Hz ±3 dB (metal, FeCr, CrO_2), to 13,000 normal tape; tape S/N ratio 55 dB; separation 40 dB; FM usable sensitivity 16.3 dBf; FM S/N ratio 60 dB; capture ratio 2 dB. 6¼"W × 4½"D × 2"H $160

5114 Cassette Player/Amplifier

Compact under-dash amplifier and stereo cassette player with auto reverse. Compatible with normal, FeCr, CrO_2, and metal tapes. Features cassette glide; loudness contour; locking fast forward and rewind; tape hiss canceller; separate bass and treble. Output power 6 W at 1 kHz with 8% THD into 4 ohms; wow and flutter 0.1% wrms; frequency response 40-16,000 Hz ±3 dB (metal, FeCr, CrO_2), to 13,000 normal; S/N ratio 55 dB; separation 40 dB. 6¼"W × 5⅜"D × 2"H..... $150

AUDIOVOX

HCC-1250 AM/FM Radio/Cassette Player

In-dash electronic tuning AM/FM/MPX receiver with logic-controlled cassette player, music sensor and quartz clock. Features back-lit "Liquid Crystal Display" panel for read-out of frequency, time and functions; Dolby noise reduction systems; Metal/CrO_2 tape capability; amorphous tape head; Logic controlled cassette mechanism with key-off tape stand-by system; music sensor automatically locates next tape selection in fast wind modes; loudness contours; independent bass and treble controls; superreach FM circuitry with built-in noise canceller and muting; synthesized tuning with 12 station preset memory and auto seek control; built-in 50 watt maximum power amplifier; low distortion pre-amp output leads; compact 5" deep chassis. $400

HCC-1200 AM/FM Radio/Cassette Player

In-dash Hi-Fi electronic tuning Am/FM/MPX receiver with auto-reverse stereo cassette deck and quartz clock. Features in-door LED display for time and frequency; Dolby noise reduction; Metal/CrO_2 tape capability; logic controlled cassette mechanism with key-off tape standby system; loudness contour; independent bass and treble controls; superreach FM circuitry with noise canceller; synthesized tuning with 12 station memory and auto-seek; built-in 40 watt maximum power amp and low distortion pre-amp output leads compact 5" deep chassis $400

AVX-965 AM/FM Radio/Cassette Player

In-dash Hi-Fi electronic tuning AM/FM stereo radio with auto reverse; logic controlled cassette mechanism and quartz clock. Features Dolby noise reduction; music sensor which automatically locates next tape selection in fast-wind modes; separate bass and treble control; 4-way balance control; Metal tape capability; built-in 50 watt maximum amplifier and FLEX installation capabilties..... $350

AVX-955 AM/FM Radio/Cassette Player

In-dash AM/FM stereo receiver/cassette player with electronic tuning and auto-reverse cassette deck. Features built-in LED digital clock and radio frequency display; 12 station preset electronic tuning; superreach FM circuitry; local switch; locking fast forward and rewind; tape direction indicators; compact chassis with FLEX installation capability $280

HCC-1150 AM/FM Radio Cassette Player

In-dash Hi-Fi electronic tuning AM/FM/MPX receiver with auto reverse cassette player and quartz clock. Features back-lit "Liquid Crystal Display" panel for readout of frequency, time and function; DNR system for reduced noise on both radio and tape; Metal/CrO_2 tape capability; Logic controlled cassette mechanism with key-off tape standby system; loudness contours; separate bass and treble controll superreach FM circuitry for optimal FM reception; synthesized tuning with 12 station memory; automatic seek; 4-way balance control; built-in 50 watt maximum power amp; low distortion pre-amp output leads; compact 5" chassis $280

HCC-565 AM/FM Radio/Cassettte Player

In-dash Hi-Fi pushbutton tuning AM/FM/MPX receiver with auto-reverse cassette player. Features Dolby sound reduction; Metal/ CRO_2 tape capability; logic controlled cassette mechanism with key-off tape standby system; loudness contour; independent bass and treble controls; superreach FM circuitry with noise canceller; 5 pushbuttons for preset station selection; built-in 50 watt maximum power amp; low distortion pre-amp output leads; compact 5" deep chassis $280

AVX-940 AM/FM Radio/Cassette Player

In-dash electronic tuning stereo AM/FM/MPX radio/cassette player with back-lit "Liquid Crystal" display for frequencies and function readout; locking fast-forward and rewind; Metal/CrO_2 tape capability; 4-way balancing control; quartz clock; 12 station preset electronic tuning;superreach circuitry; compact 5" deep chassis with FLEX installation capability. $225

AVX-690 AM/FM Radio/Cassette Player

In-dash AM/FM/MPX auto-reverse cassette with built-in amplifier and 5-band graphic equalizer; 40 watt power output; 4-way balance control; locking fast forward and rewind; FM muting; superreach tuner; hi-blend and AM IC circuit; and FLEX installation capability $210

AVX-620 AM/FM Stereo Radio/Cassette Player

In-dash manual tune AM/FM/MPX radio auto-reverse cassette player with switchable FM stereo, superreach circuitry; locking fast forward and rewind; FLEX installation capability; push-button eject; 4-way balance control $175

AVX-3400 AM/FM Radio Cassette Player

In-dash pushbutton AM/FM/MPX radio with auto-reverse cassette player. Features logic controlled auto-reverse cassette mechanism with locking fast-forward and rewind; FM local/distant selector; LED indicators for FM stereo and tape direction; full range tone control; 4-way balance; 14 watt maximum output power; compact 5 ¹/₄" deep chassis with FLEX installation capability $175

AVX-3200 AM/FM Radio/Cassettte Player

In-dash manual tuning AM/FM/PMX radio and auto-reverse cassette player with compact chassis and FLEX installation capability. Features locking fast forward and rewind; full range tone control; side load cassette mechanism; 14 W maximum power amp and 4-way balance control $120

AVX-3100 AM/FM Radio/Cassette Player

In-dash manual tuning AM/FM/MPX radio with compact chassis and FLEX installation capability for installation in nearly all foreign and domestic cars. Features locking fast-forward and rewind on cassette; full range tone control; 4-way balance control and 14 W maximum output power $110

AUTOTEK

CSR5550 AM/FM Radio/Cassette Player

In-dash electronically tuned receiver with automatic reverse stereo cassette deck and PLL tuning with 5 AM and 5 FM station presets. Features station scan; Dolby B noise reduction; SDC ceramic tape head; metal tape compatibility; separate bass and treble controls; loudness switch; dual-gate MOS-FET front end with automatic gain control and range switch; Auto Control Stereo varies separation and audio bandwidth according to signal strength; auto-loud tape with key-off eject; program search on tape; switchable soft mute on FM. Power output 5W/channel at 10% THD, 2.5 W/channel at 1% THD; usable FM sensitivity 16 dBf; capture ratio 1.5 dB; image rejection 60 dB; separation 40 dB at 1 kHz; tape section frequency response 50-12,500 Hz normal tape, 50-15,000 Hz chrome tape; S/N 58 dB, 68 dB with Dolby B and chrome tape; wow and flutter 0.1% wrms; 160mm W × 50mm H × 120mm W..... $390

CSR3300 AM/FM Radio/Cassette Player

In-dash AM/FM-stereo receiver with auto-reverse stereo cassette deck. Features pushbutton preset tuning; Dolby noise reduction; separate bass and treble controls; key-off eject; FET front end; SD tape head; metal-tape capability; loudness, mono/stereo, local/distant switches; variable line outputs. Output power 2 W/channel into 4 ohms, 30-15,000 Hz at 1% THD. Wow and flutter 0.15% wrms; frequency response ±3 dB 31.5-15,000 Hz metal, to 12 kHz normal tape; S/N ratio Dolby off/on 45/55 dB. FM 50-dB quieting sensitivity 22.1 dBf; S/N ratio 60 dB; 178mm W × 130mm D × 50mm H $260

CSR2300. Similar to CSR3300 except no pushbutton tuning presets; FM 50-dB quieting sensitivity 23.3 dBf $240

CSR2200. Similar to CSR2300 except no metal-tape capability $200

CSR3250 AM/FM Radio/Cassette Player

In-dash AM/FM-stereo receiver with automatic-reverse cassette deck. Features pushbutton tuning; locking fast forward/rewind; local/distant switch; ACS (for improved FM reception); built-in IAC (FM noise blanker); automatic loudness contour with variable slope adjustment; automatic cassette loading; 4-way speaker fader control; mini chassis for compact and import cars; adjustable shaft spacing for domestic-car installation; FET front end. Output power 3 W/channel into 4 ohms, 50-15,000 Hz ±3 dB at 1% THD. Wow and flutter 0.15% wrms; frequency response 31.5-12,000 Hz ±3 dB; S/N ratio 45 dB. FM 50-dB quieting sensitivity 17.6 dBf; S/N ratio 60 dB; 160 mmW × 120 mmD × 44 mmH $220

CR3050 AM/FM Radio/Cassette Player

High-power in-dash AM/FM-stereo receiver with stereo cassette deck. Features 5-station preset tuning; ACSII (Automatic Control Stereo); 4-way fader control; soft FM mute; dual-gate MOSFET front end; locking fast forward/rewind. Output power 6.75 W at 1% THD, 50-15,000 Hz; frequency response 30-40,000

Autosound Tape Components

5

Hz ±3 dB. Wow and flutter 0.2% wrms; frequency response 40-14,500 Hz ±3 dB. FM usable sensitivity 17.3 dBf; 160 mmw × 110 mmD × 44 mmH $170

BLAUPUNKT

"Berlin" SQR 83 AM/FM Radio/Cassette Player

In-dash stereo AM/FM radio with auto-reverse cassette player. Features Dolby B; electronic tuning; LCD readout; remote control; metal-tape compatibility; Cassette Program Search; electronic seek tuning; 4 presets; auto volume control keyed to ambient noise; FM noise suppression. Output power 20 W/channel $1850

"Washington" SQR 32 AM/FM Radio/Cassette Player

In-dash AM/FM radio with auto-reverse cassette player. Features Dolby; electronic PLL tuning; LED digital display; metal compatibility; electronic seek tuning; 12 presets; separate bass and treble; balance and fader controls; FM noise suppression $600

"Tucson" AM/FM Tuner/Cassette Player

In-dash AM/FM tuner with auto-reverse cassette player. Features Dolby B for tape and FM; digital display of frequency and time; electronic tuning; metal compatibility; separate bass and treble; loudness, balance, and fader controls; FM noise suppression; Cassette Program Search. Separate amplifier required. Tape frequency response 30-20,000 Hz; wow and flutter 0.15%; FM usable sensitivity 13 dBf (75 ohms) $500

"Richmond" AM/FM Radio/Cassette Player

In-dash AM/FM radio with auto-reverse cassette player. Features Dynamic Noise Reduction; 5 AM/5 FM presets; metal compatibility; separate bass, treble, loudness, balance, and fader controls; FM noise suppression. Output power 7 W/channel; tape frequency response 30-18,000 Hz; wow and flutter 0.15%; FM usable sensitivity 13 dBf (75 ohms) $300

"Manhattan" AM/FM Radio/Cassette Player

In-dash AM/FM radio with auto-reverse cassette player. Features Dolby; 5 AM/5 FM presets; separate bass and treble; loudness switch; balance and fader controls; switchable EQ for normal, chrome, metal tapes; FM noise suppression. Output power 4 W/channel; tape frequency range 30-15,000 Hz; wow and flutter 0.15%; FM usable sensitivity 13 dBf (75 ohms) $300

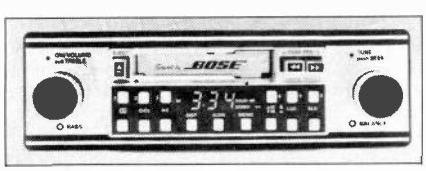
"Seattle" AM/FM Radio/Cassette Player

In-dash manual-tuned AM/FM radio with auto-reverse cassette deck. Features Dynamic Noise Reduction; separate bass and treble controls; switchable loudness contour; FM noise suppression. Power output 7 W/channel; tape frequency range 30-18,000 Hz; wow and flutter 0.15%; FM usable sensitivity 13 dBf (75 ohms) $250

BOSE

CRC Digital Tuner/Cassette Player

DIN-size in-dash AM/FM-stereo tuner with stereo cassette player. Fits most vehicles manufactured since 1975. Features microprocessor-controlled PLL digital tuner with 12-station preset tuning; seek/scan/manual tuning; 4-digit LED frequency/time display;

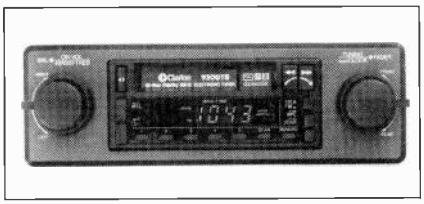


automatic FM muting; local/distant switch; FM fringe blend and noise-cancel switches; power-antenna lead; automatic-reverse cassette mechanism; Dolby noise reduction; normal/CrO_2/metal playback equalization selector; Permalloy tape head; locking fast forward/rewind; volume, balance, bass, treble controls; low-level preamp outputs to connect directly to Bose 1401 booster/equalizer $575

CLARION

9300T AM/FM Radio/Cassette Player

Compact chassis Hi-Way Fidelity MK-II AM/FM-stereo radio with automatic-reverse stereo cassette deck. Features quartz-locked electronic tuning; digital display; 5 AM/5 FM station presets; touchbutton tuning



memory; scan tuning; Magi-Tune™ FM front end; automatic program control; locking fast forward/rewind; Ultra Permalloy tape head; Dolby noise reduction; metal-tape capability $400

9300TB. Same as 9300T except for black finish $400

7500R AM/FM Radio/Cassette Deck

High-power short chassis Hi-Way Fidelity MK-II AM/FM-stereo receiver with auto-reverse stereo cassette deck. Features Magi-Tune™ FM front end; 5-pushbutton tuning; auto program control; locking fast forward/rewind; Ultra Permalloy tape head; Dolby noise reduction; metal-tape capability; separate bass, treble, 4-way balance controls; equalizer accessory terminal. Output power 20 W/channel $329

5700R AM/FM Radio/Cassette Player

Medium-power AM/FM-stereo receiver with stereo cassette deck. Features quartz-lock electronic tuning; digital frequency/time display; 5 AM/5 FM station touch-button presets; Magi-Tune™ FM front end; soft muting; locking fast forward/rewind; auto stop at end of play; tape-end indicator; metal-tape capability; loudness and 4-way balance controls; Traveler's Advisory reception. Output power 6 W/channel ... $309

2500R AM/FM Radio/Cassette Player

Medium-power GM-size (J-car) chassis AM/FM-stereo receiver with auto-reverse stereo cassette deck. Features 5-pushbutton tuning; Magi-Tune™ FM front end; auto program control; locking fast forward/rewind; Dolby noise reduction; metal-tape capability; separate bass, treble, 4-way balance controls; power-antenna lead; Traveler's Advisory reception. Output power 6 W/channel $299

5550R AM/FM Radio/Cassette Player

Mini chassis (designed for Japanese import cars) AM/FM-stereo receiver with auto-reverse stereo cassette player. Features 5-pushbutton tuning; Magi-Tune™ FM front end; auto program control; locking fast forward/rewind; metal-tape capability; loudness and 4-way balance controls; Traveler's Advisory reception $229

R5500R AM/FM Radio/Cassette Player

Compact chassis in-dash Magi-Tune™ (FM only) AM/FM-stereo radio with auto-reverse stereo cassette deck. Features 5-pushbutton tuning; auto program control; metal-tape capability; locking fast forward/rewind; loudness and 4-way balance controls; Traveler's Advisory reception $229

5300R AM/FM Radio/Cassette Player

Compact chassis in-dash AM/FM-stereo receiver with Magi-Tune™ FM front end and auto-reverse stereo cassette deck. Features auto program control; locking fast forward/rewind; Dolby noise reduction; metal-tape capability; separate bass, treble, 4-way balance controls; Traveler's Advisory reception $229

5100R AM/FM Radio/Cassette Player

Medium-power compact chassis AM/FM-stereo receiver with auto-reverse stereo cassette deck. Features locking fast forward/rewind; metal-tape capability; loudness and 4-way balance controls; power-antenna lead; adjustable shafts; Traveler's Advisory reception. Output power 6 W/channel . $179

5105R AM/FM Radio/Cassette Player

Mini chassis AM/FM-stereo receiver with stereo cassette deck. Features auto-reverse cassette mechanism; locking fast forward/rewind; metal-tape capability; loudness and 4-way balance controls; power-antenna lead; Traveler's Advisory tuning $179

3700R AM/FM Radio/Cassette Player

Medium-power compact chassis AM/FM-stereo receiver with 5-pushbutton tuning and stereo cassette deck. Features locking fast forward/rewind; automatic stop at end of play; tape-end indicator; loudness, stereo balance, and tone controls; power-antenna lead; adjustable shafts; Traveler's Advisory reception. Output power 6 W/channel $169

3550R AM/FM Radio/Cassette Player

Medium-power compact chassis AM/FM-stereo receiver with auto-reverse stereo cassette deck. Features locking fast forward/rewind; stereo/mono switch; balance and tone controls; Traveler's Advisory reception. Output power 6 W/channel $159

3500R AM/FM Radio/Cassette Player

Medium-power compact chassis in-dash AM/FM-stereo receiver with auto-reverse stereo cassette transport. Features stereo/mono switch; locking fast forward/rewind; stereo balance and tone controls; adjustable shafts; Traveler's Advisory reception. Output power 6 W/channel $159

2100R AM/FM Radio/Cassette Player

Medium-power in-dash AM/FM-stereo receiver with stereo cassette deck. Designed for GM J cars. Features locking fast forward/rewind; end-of-play stop; tape-end indicator; loudness and 4-way balance controls; power-antenna lead; Traveler's Advisory reception. Output power 6 W/channel $139

3150R AM/FM Radio/Cassette Player

Mini chassis medium-power AM/FM-stereo receiver with stereo cassette deck, designed for Japanese import cars. Features stereo/mono switch; locking fast forward; auto end-of-play stop; tape mode indicator; balance and tone controls; Traveler's Advisory reception. Output power 6 W/channel $109

3100R AM/FM Radio/Cassette Player

Medium-power compact chassis AM/FM-stereo receiver with stereo cassette deck. Features auto local/distant switching; dual-gate FET/balanced-mixer FM front end; stereo/mono switch; locking fast forward; auto end-of-play stop; tape mode indicator; stereo balance and tone controls; adjustable shafts; Traveler's Advisory reception. Output power 6 W/channel $109

CONCORD

In-Dash 100 Series

HPL-130 AM/FM Radio/Cassette Player

Quartz digital synthesized AM/FM-stereo receiver with stereo cassette player. Features seek and scan tuning; 6 AM/6 FM station presets; LED auxiliary and tape indicators; auxiliary in/out switch; exclusive signal-processor circuitry; power eject; auto replay on rewind; preamp fader; locking fast forward/rewind; Dolby noise reduction; metal-tape capability; adjustable line output controls; Sen-alloy tape head; FM mute switch; 3-frequency bass equalizer; loudness control; stereo/mono switch; separate bass and treble controls. Output power 12 W/channel into 4 ohms, 20-20,000 Hz at 0.8% THD; $7\frac{3}{32}$"W × $5\frac{29}{32}$"D × $1\frac{31}{32}$"H $500

HPL-120 AM/FM Radio/Cassette Player

Digitally tuned AM/FM-stereo receiver with stereo cassette deck. Features green LED digital display; dual-gate MOSFET FM front end; r-f auto gain control-

circuit; loudness switch; FM high-blend; tape equalization, AM/FM, local/distant switches; 4 preamplified outputs; separate left-right balance control; 40/80/120-Hz dedicated bass equalizer; bass EQ level control; Dolby noise reduction; treble control; SA tape head; auto eject. Output power 12 W rms into 4 ohms, 20-20,000 Hz at 0.8% THD; 7⅛"W × 5²⁹⁄₃₂"D × 2"H $400

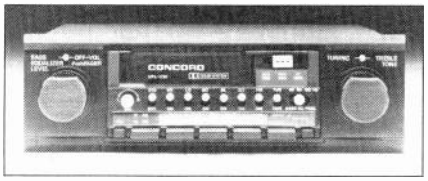
HPL-118F AM/FM Radio/Cassette Player

Medium-power AM/FM-stereo receiver with stereo cassette deck. Features exclusive signal processor circuit for use with dbx® and Dolby C noise-reduction adapters, imaging devices, equalizers, reverb devices; AUX input/output switch; LED AUX and tape indicators; SLT (Station Locked Tuning) switch; tuner/tape, stereo/mono, FM high-blend, local/distant, FM muting switches; SA tape head; Dolby B noise reduction; tape equalization switch; auto eject; loudness switch; 3-band bass equalizer; adjustable line outputs. Output power 12 W/channel into 4 ohms, 20-20,000 Hz at 0.8% THD; 7"W × 5²⁹⁄₃₂"D × 1³¹⁄₃₂"H $400

HPL-119. High-power version of HPL-118F. Consists of HPL-118F receiver/cassette player and HPA-25 plug-in amplifier modules. Output 48 W $550

HPL-118 AM/FM Radio/Cassette Player

Pushbutton preset-tuned AM/FM-stereo receiver with stereo cassette deck. Features 5 AM/5 FM station presets; SLT (Station Lock Tuning) switch; tuner/tape, FM high blend, local/distant, stereo/mono,



loudness, FM mute switches; adjustable line outputs; SA tape head; Dolby noise reduction; 3-band bass equalizer. Output power 12 W/channel into 4 ohms, 20-20,000 Hz at 0.8% THD; 7"W × 5²⁹⁄₃₂"D × 2"H $380

HPL-115 AM/FM Radio/Cassette Player

Medium-power AM/FM-stereo receiver with stereo cassette deck. Features FM high blend, tuner on/off, loudness, local/distant, AM/FM, tape equalization switches; 4 preamplified outputs; dedicated 40/80/120-Hz bass equalizer; dual-gate MOSFET FM front end; Dolby noise reduction; r-f agc (auto gain control) circuit; left-right balance and treble controls; SA tape head; auto eject. Output power 12 W/channel into 4 ohms, 20-20,000 Hz at 0.8% THD; 7⅛"W × 5²⁹⁄₃₂"D × 1³¹⁄₃₂"H $350

HPL-112 AM/FM Radio/Cassette Player

Compact AM/FM-stereo receiver with stereo cassette deck. Features Dolby noise reduction; SA tape head; auto eject; separate bass and treble controls; line output jacks; standard/metal tape selector; loudness switch. Output power 5 W rms/channel; 7³⁄₃₂"W × 4¾"D × 2¹⁄₁₆"H $280

HPL-101 AM/FM Radio/Cassette Player

Compact AM/FM-stereo receiver with stereo cassette deck. Features SA tape head; auto eject; separate bass and treble controls; loudness switch; tape equalization selector; 7³⁄₃₂"W × 4¾"D × 2¹⁄₁₆"H. $250

In-Dash 500 Series

HPL-515 AM/FM Radio/Cassette Player

Digital-display AM/FM-stereo receiver with stereo cassette player. Features digital frequency/time display; quartz-controlled digital clock; dual-gate MOSFET FM front end; dc servo-controlled heavy-duty transport motor; SA tape head; Dolby noise reduction; auto eject; dedicated bass equalizer; equalizer level control; treble control; tape-speed pitch control; 4 preamplified outputs; standard/metal tape selector; loudness, FM mute, FM high-blend, local/distant, AM/FM, biamplifier switches; biamp level control; dedicated 1k/3.5k/10k treble equalizer; treble EQ level control. Output power 12 W rms/channel into 4 ohms, 20-20,000 Hz at 0.8% THD; 7⅛"W × 6½"D × 2"H $470

HPL-508 AM/FM Tuner/Cassette Player

AM/FM-stereo tuner with stereo cassette deck, designed to be used with outboard amplifier. Features dc servo-controlled heavy-duty transport motor; X-cut SA tape head; tape speed pitch control; biamplifier switch and separate level control; treble equalizer level control; soft start/end; dual-gate MOSFET FM front end; Dolby noise reduction; auto eject; dedicated bass equalizer with separate level control; treble control; 4 preamplified outputs; variable line output controls; standard/metal tape selector; loudness, FM mute, stereo/mono, local/distant, AM/FM, tuner/tape switches; dedicated 1k/3.5k/10k Hz treble equalizer. Dimensions 7"W × 6"D × 2"H $370

CRAIG

J-Car Chassis Unit

T861J AM/FM Radio/Cassette Player

Electronically tuned AM/FM radio with auto-reverse cassette player. Features 6 AM/6 FM presets; clock; electronic seek and scan; locking fast forward and rewind; Electronic Search and Play; Dolby for FM and tape; separate controls for loudness, bass, treble, balance, and fader; line-out jacks. $400

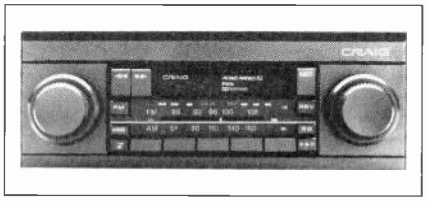
Standard-Size Chassis Units

W460 AM/FM Radio/Cassette Player

Electronically tuned AM/FM radio with auto-reverse cassette player. Features 6 AM/6 FM presets; clock; locking fast forward and rewind; Dolby noise reduction; sendust alloy tape head; separate controls for loudness, bass, treble, balance, and fader; LOC/DX and Mono/Stereo switches. 12 W/channel.... $370

T780 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features Performance Monitoring System; preset tuning; Dolby for FM and tape; line-in/line-out jacks; Electronic Search and Play; separate controls for



loudness, bass, treble, balance, and fader. Twelve W/channel into 4 ohms 80-20,000 Hz with 3% THD; FM usable sensitivity 20 dBf (2.8 μV/75 ohms); alternate channel selectivity 65 dB; capture ratio 2.0 dB; wow and flutter 0.15% wrms $350

T742 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features Dolby for FM and tape; Electronic Search and Play; sendust tape head; separate loudness, bass, treble, balance, and fader controls; line-in and line-out jacks. Twelve W/channel into 4 ohms 80-20,000 Hz with 3% THD; FM usable sensitivity 20 dBf (2.8 μV/75 ohms); FM 50 dB quieting sensitivity 22 dBf (3.5 μV/75 ohms); alternate channel selectivity 65 dB; capture ratio 2.0 dB; wow and flutter 0.15% wrms $280

T760 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features preset tuning; locking fast forward and rewind; Electronic Search and Play; Dynamic Noise Reduction; metal tape EQ; separate loudness, bass, treble, balance, and fader controls; line-out jacks. 3.2 W/channel into 4 ohms 90-20,000 Hz with 3% THD; 4.5 W at 1 kHz 1% THD; FM usable sensitivity 20 dBf (2.8 μV/75 ohms); FM 50 dB alternate channel selectivity 65 dB; capture ratio 2.0 dB; wow and flutter quieting sensitivity 22 dBf (3.5 μV/75 ohms); 0.15% wrms $240

T741 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features locking fast forward and rewind; Dolby for FM and tape; Electronic Search and Play; metal tape EQ; separate loudness, bass, treble, balance, and fader controls; Stereo/Mono switch; auto DX/LOC switching; line-out jacks; 3.2 W/channel into 4 ohms 90-20,000 Hz with 3% THD; FM usable sensitivity 20 dBf (2.8 μV/75 ohms); FM 50 dB quieting sensitivity 22 dBf (3.5 μV/75 ohms); alternate channel selectivity 65 dB; capture ratio 2.0 dB; wow and flutter 0.15% wrms $220

T740 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features locking fast forward and rewind; Electronic Search and Play; separate loudness, bass, treble, balance, and fader controls; Stereo/Mono switch; auto DX/LOC switching; line-out jacks; auto power antenna and dial-dimmer leads. 3.2 W/channel into 4 ohms 90-20,000 Hz with 3% THD; FM usable sensitivity 20 dBf (2.8 μV/75 ohms); FM 50 dB quieting sensitivity 22 dBf (3.5 μV/75 ohms); alternate channel selectivity 65 dB; capture ratio 2.0 dB; wow and flutter 0.15% wrms $200

T721 AM/FM Radio/Cassette Player

Electronically tuned AM/FM radio with auto-reverse tape deck. Features digital display; electronic station seeker; locking fast forward and rewind; IC-controlled soft mute; DX/LOC and Stereo/Mono switches. 3.5 W/channel into 4 ohms 90-20,000 Hz with 5% THD; FM usable sensitivity 23 dBf (4.0 μV/75 ohms); FM 50 dB quieting sensitivity 26 dBf (5.5μV/75 ohms); alternate channel selectivity 65 dB; capture ratio 3.0 dB; wow and flutter 0.16% wrms $200

T640 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features 5 station presets; locking fast forward and rewind; volume, balance, fader, and tone controls; Stereo/Mono and LOC/DX switches; power-off eject. 4 W/channel into 4 ohms 200-20,000 Hz with 5% THD; frequency response 30-15,000 Hz ±6 dB; FM usable sensitivity 18.3 dBf (2.2 μV/75 ohms); FM 50 dB quieting sensitivity 20.2 dBf (2.8 μV/75 ohms); alternate channel selectivity 60 dB; capture ratio 1.8 dB; wow and flutter 0.15% wrms $170

T701 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features locking fast forward and rewind; Electronic Search and Play; volume, balance, fader, and tone controls; Stereo/Mono and LOC/DX switches; IC-controlled soft mute. 3.5 W/channel into 4 ohms 90-20,000 Hz with 5% THD; FM usable sensitivity 23 dBf (4.0 μV/75 ohms); FM 50 dB quieting sensitivity 26 dBf (5.5μV/75 ohms); alternate channel selectivity 60 dB; capture ratio 3.0 dB; wow and flutter 0.16% wrms $150

T700 AM/FM Radio/Cassette Player

Stereo AM/FM radio with cassette player. Features locking fast forward and rewind; volume, balance, and tone controls; loudness switch; LOC/DX switch; Stereo/Mono switch; end-of-tape eject. 3.5 W/channel into 4 ohms 90-20,000 Hz with 5% THD; FM usable sensitivity 23 dBf (4.0 μV/75 ohms); FM 50 dB quieting sensitivity 26 dBf (5.5 μV/75 ohms); alternate channel selectivity 60 dB; capture ratio 3.0 dB; wow and flutter 0.16% wrms $100

E-DIN Chassis Unit

T860E AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features Dynamic Noise Reduction; Electronic Search and Play; locking fast forward and rewind; preset tuning; separate loudness, bass, treble, balance, and fader controls; line-out jacks; power-loading tape deck with power-off eject. Power output 3.2 W/channel into 4 ohms 90-20,000 Hz with 3% THD, 4.5 W/channel at 1 kHz with 1% THD; FM usable sensitivity 20 dBf (2.8 μV/75 ohms); FM 50 dB quieting sensitivity 22 dBf (3.5μV/75 ohms); alternate channel selectivity 65 dB; capture ratio 2.0 dB; wow and flutter 0.15% wrms $270

Autosound Tape Components

5

Import/X-Body Chassis Units

T561 AM/FM Radio/Cassette Player
Stereo AM/FM radio with auto-reverse cassette player. Features preset tuning; locking fast forward and rewind; separate bass, treble, balance, and fader controls; LOC/DX switch; IC-controlled soft mute; power-off eject; power antenna switching; line-level output jacks. 3.2 W/channel into 4 ohms 90-20,000 Hz with 3% THD; FM usable sensitivity 20 dBf (2.8 μV/75 ohms); FM 50 dB quieting sensitivity 22 dBf (3.5 μV/75 ohms); alternate channel selectivity 65 dB; capture ratio 2.0 dB; wow and flutter 0.15% wrms $200

T503 AM/FM Radio/Cassette Player
Stereo AM/FM radio with auto-reverse cassette player. Features convertible nosepiece for import or domestic cars; locking fast forward and rewind; IC-controlled soft mute; power-off eject; power antenna switching; LOC/DX sensitivity switch; Stereo/Mono switch. 3.5 W/channel into 4 ohms 90-20,000 Hz with 5% THD; FM usable sensitivity 23 dBf (4.0 μV/75 ohms); FM 50 dB quieting sensitivity 26 dBf (5.5 μV/75 ohms); alternate channel selectivity 60 dB; capture ratio 3.0 dB; wow and flutter 0.16% wrms $130

T502 AM/FM Radio/Cassette Player
Stereo AM/FM radio with convertible nosepiece for import or domestic cars. Features locking fast forward; LOC/DX switch; auto Stereo/Mono; tape-play indicator. 3.5 W/channel into 4 ohms 90-20,000 Hz with 5% THD; FM usable sensitivity 23 dBf (2.8 μV/75 ohms); FM 50 dB quieting sensitivity 26 dBf (5.5 μV/75 ohms); alternate channel selectivity 60 dB; capture ratio 3.0 dB; wow and flutter 0.16% wrms $80

Small Chassis Unit

T720 AM/FM Radio/Cassette Player
Pushbutton-tuned AM/FM radio with auto-reverse cassette player. Features locking fast forward and rewind; Stereo/Mono switch; LOC/DX switch; fader control. Shafts adjustable from 130 to 148mm. Power output 4 W/channel with 5% THD $170

Dash Pocket/Under-Dash Cassette Amplifier

T103 Stereo Cassette Amplifier
Stereo cassette deck with amplifier. Features auto reverse; separate bass and treble controls; locking fast wind; tape-direction indicators; volume and balance controls; pushbutton eject. 4.0 W/channel into 4 ohms 150-20,000 Hz with 5% THD; THD 5% at 1 kHz at rated output; frequency response 40-10,000 Hz ±3 dB; wow and flutter 0.15% wrms; separation 35 dB; S/N ratio 50 dB (A-weighted); crosstalk -55 dB $110

dbx

Model 22 Car Noise-Reduction Unit
Decoder for dbx-encoded cassettes connects between cassette tuner and power amp or between cassette radio preamp outputs and power-amp inputs. Features bass and treble controls. Power requirements: 12 V dc nominal (10.5 min, 14 max); current draw 150 mA; ground negative; fuse 250 mA in line; connectors 3-pin quick disconnect. Requires at least 50-mV input signal (accepts 1.5 V max); max output 4 V. Dynamic range 100 dB (max rms signal to A-weighted noise); frequency response follows dbx type II decoding curve 20-20,000 Hz ±0.5 dB (pink noise or music); THD <0.15% at 1 kHz; output noise -88 dBV (A-weighted). 6" W × 5¾" D × 1¾" H $159

CA-1 Car Decoder
Decoder for dbx-encoded cassettes, connecting between cassette tuner and power amp or between cassette radio's preamp outputs and power-amp inputs. Features treble and bass controls, spade-lug connectors. Requires at least 20mV input signal, accepts 1 V max; max output >1 V. Dynamic range 100 dB (max rms signal to A-weighted noise); frequency response follows dbx type II decoding curve 30-20,000 Hz ±1 dB (pink noise or music); THD <0.3% at 1 kHz; output noise -100 dBV A-weighted. Power requirements 12 V dc nominal (10.5 min, 15.6 max); current draw <80 mA; ground negative; fuse 250 mA in line. 6"W × 9/16"H × 3 13/16"D $99

FUJITSU TEN

CE-4133 AM/FM Radio/Cassette Player
Under-dash microcomputerized "Mini-Wizard" AM/FM stereo radio with auto-reverse cassette player. Features auto program selector; Dolby noise reduction; auto repeat; normal and chrome/metal tape selector; ceramic tape head; Hall effect IC in tape-end-sensing/auto-reverse control system; soft auto cassette loading; key-off eject; antiroll system for reduced wow and flutter; fast forward/rewind mute; 4-way radio tuning; auto scan tuning and tuning search; 5 AM/5 FM station presets; manual tuning mode; preset program timing; auto separation control; soft mute; r-f auto gain control amplifier circuit; microprocessor-controlled PLL synthesizer tuning; local/distant switch; 5-band graphic equalizer; loudness switch; fader control; digital quartz clock; digital time/frequency display; black front panel. Rear-seat remote controller optional. Wow and flutter 0.09% wrms; frequency response 30-14,000 Hz ±3 dB; S/N ratio Dolby off/on 50/58 dB. FM 50-dB quieting sensitivity 24 dBf; frequency response 30-15,000 Hz ±3 dB; capture ratio 3 dB; alternate-channel selectivity 64 dB; separation 32 dB at 1 kHz, 65 dBf; image/i-f response ratio 65/90 dB. Equalizer center frequencies 60, 250, 1k, 3.5k, 10k Hz; boost/cut range ±12 dB; power consumption 2 A (1 W at 1 kHz); 7"W × 5⅛"D × 2"H; 4.2 lb $800
CE-4130. Same as CE-4133 except silver front panel $800

EP-820 AM/FM Radio/Cassette Player
Microprocessor-controlled AM/FM-stereo radio with preamp and auto-reverse cassette player with Dolby noise-reduction system. Unit features built-in 5-band graphic equalizer with center frequencies at 60, 250, 1k, 3.5k, 10k Hz, ±12 dB; quartz clock and electronic tuning with digital frequency/time display; 7 AM/7 FM station presets; up/down search and scan tuning. Cassette features metal-compatible tape head, equalizer switch for CrO_2 and FeCr tape; locking fast forward/rewind. Radio features FM noise blanker; FM muting; 4-way fader control. Frequency range 40-14,000 Hz $600

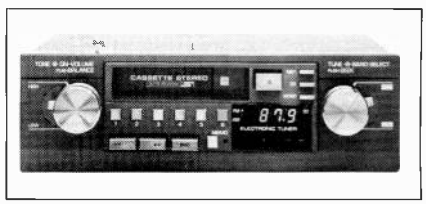
CR-1134 AM/FM Radio/Cassette Player
High-power in-dash AM/FM-stereo receiver with auto-reverse stereo cassette deck. Features Dolby noise reduction; 3 FM/2 AM station presets; normal and CrO_2/metal tape selector; ceramic tape head; ASC circuit; soft mute; fader control; 3-position adjustable shaft; universal DIN size. Output power 25 W × 2 or 7 W × 4 channels $320
CR-1033. Similar to CR-1143 except lower power; has separate bass and treble controls; no fader control. All-black finish $290
CR-1032. Similar to CR-1033 except has no Dolby NR or bass and treble controls; has high-cut filter and loudness switches $250

CE-4432 AM/FM Radio/Cassette Player
Electronic tuned receiver and cassette player with FM noise blanker and dual-gate MOSFET front end. Features Dynamic Noise Reduction; fader control; separate bass and treble controls; digital frequency readout; search tuning; 10-station memory (5 AM, 5 FM); mono/stereo switch; local/distant switch. Cassette section features metal-type compatibility, tape-direction indicator, locking fast forward and rewind. Power output 4 W/channel into 4 ohms from 50-15,000 Hz with <5% THD; maximum power 8 W/channel. 50 ohm specs for tuner section: alternate channel selectivity 60 dB; FM stereo separation 35 dB at 1 kHz; frequency response 30-15,000 Hz; capture ratio 3 dB. Cassette section specs; frequency response 30-12,000 Hz; wow and flutter 0.15%; S/N ratio 50 dB; stereo separation 40 dB. Adjustable shafts; 7"W × 2"H × 4¾"H $300

CR-1130 AM/FM Radio/Cassette Player
In-dash unit with 3 FM/2 AM tuning presets and auto-reverse cassette player. Features separate bass and treble controls; high-cut filter; normal and CrO_2/metal- tape capability; locking fast forward/rewind, FM muting; auto Separation Control (ASC) on FM; dual-gate MOSFET front end with agc action; ceramic filters for FM selectivity; loudness switch; FM stereo and tape-direction indicators. Amplifier output 16 W/channel minimum into 4 ohms at 10% THD; frequency response 40-20,000 Hz ±3 dB; S/N ratio 70 dB A-weighted. FM usable sensitivity 20 dBf; frequency response 30-15,000 Hz ±3 dB; alternate-channel selectivity 60 dB; separation 35 dB at 1 kHz; capture ratio 3 dB. Wow and flutter 0.09% wrms; frequency response 40-14,000 Hz ±3 dB; S/N ratio 53 dB A-weighted; 7"W × 5 45/64"D × 1 11/16"H; 3.8 lb $300
CR-1031. Similar to CR-1130 except lower power (4 W/channel), no fader control. Satin chrome finish $290
CR-1030. Similar to CR-1031 except no separate bass and treble controls or fader control. Tape frequency response 40-14,000 Hz; amplifier output 4 W/channel $240

CM-6530 AM/FM Radio/Cassette Player
AM/FM radio/stereo cassette player with FM noise blanker and dual-gate MOSFET front end. End-of-tape sensing reverses tape autoally when tape slows down. Features Dynamic Noise Reduction; music sensing; fader control; separate bass and treble; loudness switch; line output RCA jacks; antiroll mechanism; key-off pinch-roller release; permalloy tape heads; metal/CrO_2 switch. 50 ohm tuner specs: FM usable sensitivity 20 dBf; alternate channel selectivity 60 dB; FM stereo separation 35 dB at 1 kHz; frequency response 30-15,000 Hz ±3 dB; capture ratio 3 dB. Tape section: frequency response 30-15,000 Hz; wow and flutter 0.09% wrms; S/N ratio 50 dB; stereo separation 40 dB. Power 12 W/channel in 4 ohms from 50-15,000 Hz with <5% THD; maximum power 29 W/channel $270
CM-6430. Similar to CM-6530 except lacks DNR, music sensing, fader, and separate bass and treble controls. Power 12 W/channel into 4 ohms from 50-15,000 Hz with <5% THD. Maximum power is 9 W/channel $200

CE-4431 AM/FM Radio/Cassette Player
Mini-size in-dash AM/FM-stereo radio with auto-reverse cassette player. Features digital frequency display; search tuning; local/distant switch; CrO_2/metal tape selector; mono/stereo switch; FM noise blanker;



locking fast forward/rewind; MOSFET front end; hard permalloy tape head; 6 AM/6 FM station presets; volume, tone, balance controls; tape-direction indicators; adjustable shafts. 180 mmW × 120 mmD × 50 mmH; 5 lbs $260

DP-646 AM/FM Radio/Cassette Player
In-dash AM/FM-stereo radio with auto-reverse cassette deck. Features built-in 44-W amplifier; separate bass and treble controls; DSS switch; normal and chrome/metal tape selector; life time metal tape head; antiroll system; ASC (Auto Separation Control) circuit; soft mute; universal (DIN) size $250

DP-640S4 AM/FM Radio/Cassette Player
In-dash AM/FM-stereo receiver with auto-reverse cas-

sette deck. Features FM noise blanker; locking fast forward/rewind; antiroll system for reduced wow and flutter. Output power 10 W..... $185

GP-1010 AM/FM Radio/Cassette Player

In-dash unit with 5-button preset tuning and illuminated dial in cassette door. Features multi-color AM, FM stereo, tape-end, and tape-run LEDs; soft-touch local/distant and mono/stereo switches; locking fast-forward/eject; FM noise blanker; AM/FM selector behind tuning control and high/low tone switch behind volume/balance control; silver front panel. Output power 4 W/channel into 4 ohms at 10% THD; frequency response 63-20,000 Hz ±3 dB. FM usable sensitivity 26 dBf; frequency response 30-15,000 Hz ±3 dB; alternate-channel selectivity 70 dB; separation 30 dB at 1 kHz; image/i-f response ratio 56/82 dB; capture ratio 6 dB. Wow and flutter 0.15% wrms; frequency response 63-14,000 Hz ±3 dB; S/N ratio 53 dB A-weighted; separation 34 dB; 6 11/16"W × 4 23/32"D × 1 21/32"H; 3.1 lb..... $180

GP-1011. Same as GP-1010 except black front panel..... $180

DP-7872 AM/FM-Stereo Tuner/Cassette Player

Universal in-dash AM/FM-stereo tuner with stereo cassette player. Features auto-reverse cassette deck; built-in noise blanker; locking fast forward/rewind; adjustable shafts..... $175

DP-1006 AM/FM Radio/Cassette Player

In-dash miniature AM/FM-stereo radio/cassette deck. Cassette player features locking fast forward/eject; chrome-tape compatibility; tape-end indicator light; wow and flutter 0.15% wrms; frequency response 60-12,500 Hz ±3 dB; S/N ratio 50 dB. Radio features 5-W/channel output power into 4 ohms, 30-20,000 Hz with 10.0% THD; frequency response 30-10,000 Hz ±3 dB; dial in door; separate bass and treble controls; loudness and local/distant switches; FM muting; LED stereo indicator; FM 50-dB quieting sensitivity 23 dBf; image rejection 70 dB; FM i-f rejection 65 dB; separation 35 dB. Adjustable shafts to fit most cars. 1¾"H × 6¼"W × 4½"D..... $150

DP-1000. Similar to DP-1006 except no loudness switch or bass and treble controls..... $130

DP-620 AM/FM Radio/Cassette Player

In-dash AM-stereo FM radio/stereo cassette deck designed for small imported and domestic cars. Cassette features locking fast forward/rewind; tape-direction indicators; power-off eject; wow and flutter 0.12% wrms; frequency response 60-8,000 Hz ±3 dB; S/N ratio 50 dB; separation 35 dB. Radio features stereo/mono switch; stereo LED; balance and tuning/select controls; 5-W/channel output power into 4 ohms, 150-20,000 Hz with 10.0% THD; FM tuner 50-dB quieting sensitivity 24 dBf; selectivity 64 dB; separation 30 dB; frequency response 30-15,000 Hz ±3 dB; 7"W × 5 25/64"D × 1 47/64"H $150

Cassette Players

SP-572. Auto-reverse stereo cassette player with loudness switch; tape anti-tangle mechanism; antiroll system for reduced wow and flutter; locking fast forward/rewind; program selector switch..... $120

SP-600. Compact stereo cassette player with automatic eject; single fast-forward/rewind/eject lever; improved tone control; green guide light for cassette door; auto power source switching; balance control..... $110

FULTRON

16-7600 AM/FM Radio/Cassette Player

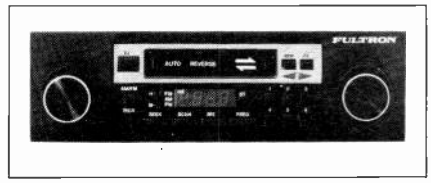
In-dash electronically tuned AM/FM stereo radio with auto-reverse cassette player. Features DNR; 6 AM/6 FM presets; seek and scan station finding; sendust alloy tape head; CrO_2-tape compatibility; auto tape search in forward and reverse; soft auto-load and key-off eject; separate bass and treble controls; built-in stereo/mono circuit; LED digital station frequency and time display; balance and fader controls; locking fast forward/rewind; preamp line output; small chassis to fit most cars. Free lifetime warranty. Output power 4 W/channel into 4 ohms at 1 kHz with <3% THD; FM frequency response 100-14,000 Hz ±3 dB..... $350

16-6900 AM/FM Radio/Cassette Player

In-dash electronically tuned AM/FM stereo radio with auto-reverse cassette deck. Features Dynamic Noise Reduction; preamp outputs; 6 AM/6 FM station presets; LED digital frequency/time display; PLL frequency synthesized tuning; locking fast forward/rewind; CrO_2-tape capability; separate bass and treble, balance, fader controls; local/distant switch; auto FM muting; small chassis that fits most cars. Free lifetime warranty. Specs same as for 16-7600..... $300

16-6800 AM/FM Radio/Cassette Player

In-dash electronically tuned AM/FM stereo radio with auto-reverse cassette deck. Features 6 AM/6 FM station presets; LED digital frequency/time display; locking fast forward/rewind; CrO_2 tape capability; separate bass and treble, balance, fader controls; local/distant switch; auto FM muting; small chassis that fits most cars. Free lifetime warranty. Specs same as for 16-7600..... $250



16-6700 AM/FM Radio/Cassette Player

In-dash pushbutton AM/FM stereo radio with auto-reverse cassette deck. Features DNR; preamp outputs; separate bass and treble controls; mono/stereo switch; balance and fader controls; FM stereo and tape-direction indicators; locking fast forward/rewind; small chassis to fit most cars. Free lifetime warranty. Specs same as for 16-7600..... $200

16-5700 AM/FM Radio/Cassette Player

In-dash AM/FM stereo receiver with auto-reverse cassette deck. Features Dynamic Noise Reduction; preamp outputs; separate bass and treble controls; mono/stereo and FM muting switches; balance and fader controls; illuminated dial; FM stereo and tape-direction indicators; locking fast forward/rewind; small chassis that fits most cars. Specifications same as for 16-7600..... $170

16-6600 AM/FM Radio/Cassette Player

In-dash pushbutton AM/FM stereo radio with auto-reverse cassette deck. Features pushbuttons for 5 AM/5 FM stations; preamp outputs; balance and fader controls; FM stereo and tape-direction indicators; local/distant and mono/stereo controls; locking fast forward/rewind; small chassis fits most cars. Free lifetime warranty. Specs same as for 16-7600..... $170

16-5200 AM/FM Radio/Cassette Player

Compact chassis stereo AM/FM radio with auto-reverse cassette deck. Features locking fast forward/rewind; stereo and tape-direction indicator. Multiple nosepieces for import, vertical and standard installations. Free lifetime warranty. Specs same as for 16-7600..... $120

16-5600 AM/FM Radio/8-Track Player

In-dash AM/FM stereo receiver with stereo 8-track cartridge player. Features mono/stereo, FM muting, program-change and local/distant switches; tape program indicators; small size that fits most cars. Free lifetime warranty. Specifications same as for 16-7600..... $120

16-5000 AM/FM Radio/Cassette Player

In-dash AM/FM stereo radio/cassette player. Features mono/stereo, local/distant, FM muting switches; balance and tone controls; small chassis that fits most cars. One year warranty. Specifications same as for 16-7600..... $90

JENSEN

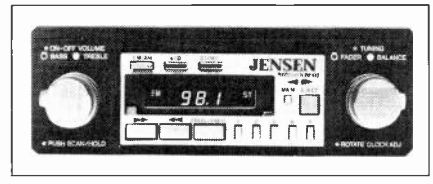
RE530 AM/FM Radio/Cassette Player

In-dash standard-chassis AM/FM radio/cassette player with auto program control which samples the broadcast signal and adjusts the tuner section for optimum FM performance. DNR reduces noise on both radio and cassettes. Radio section features 5 AM and 5 FM station presets; PLL digital quartz-synthesized tuning; feather-touch electronic switches; electronic scan tuning; preset memory scan; noise blanking; digital frequency (and time) display. Cassette section features Dolby noise reduction; auto tape search; locking fast forward and rewind; soft-loading and solenoid eject. Total system power 10 W; 4 W/channel minimum continuous average power into 4 ohms from 50-15,000 Hz with <2.5% THD; tuner frequency response 50-15,000 Hz ±3 dB; tape frequency response 50-18,000 Hz with metal tape..... $499

RE518 AM/FM Radio/Cassette Player

In-dash AM/FM stereo cassette player with PLL digital quartz synthesizer tuning and auto-reverse cassette deck. Features digital time/frequency display; electronic scan tuning; Dolby noise reduction; tape equalization switch; 5 AM/5 FM tuning presets; permalloy tape head; locking fast forward/rewind; separate bass and treble controls; local/distant switch; loudness compensation; stereo/mono switch; separate balance and fader controls; feather-touch transport controls. Output power 10 W; frequency range 30-15,000 Hz; S/N ratio 50 dB; universal chassis; 7 1/16"W × 4¾"D × 1¾"H..... $399

RE512. Similar to RE518 but without Dolby NR, tape EQ, loudness compensation. Mini chassis; 6 9/16"W × 7 17/32"D × 1¾"H..... $369



RE508 AM/FM Radio/Cassette Player

In-dash player with PLL digital quartz synthesizer tuning and auto-reverse transport. Features digital time/frequency display; electronic scan tuning; 4 AM/4 FM station presets; permalloy tape head; locking fast forward/rewind; auto local/distant select; mono/stereo switch; feather-touch transport controls. Specifications same as for RE518, except dimensions 7 3/32"W × 4 23/32"D × 1 23/32"H..... $300

JR115 AM/FM Radio/Cassette Player

In-dash AM/FM stereo receiver with auto-reverse cassette player. Features pushbutton station presets; locking fast forward/rewind; stereo/mono and local/distant switches. Specifications same as for RE518, except dimensions 7 1/16"W × 5 5/16"D × 1 23/32"H..... $240

JR110. Similar to JR115, except no auto-reverse deck, FM muting. Features auto loudness compensation. Output power 8 W; frequency range 50-15,000 Hz; S/N ratio 50 dB; mini chassis; 6 9/16"W × 4¾"D × 1¾"H..... $200

JR105 AM/FM Radio/Cassette Player

In-dash AM/FM stereo receiver with stereo cassette deck. Features auto local/distant select; locking fast forward/rewind; stereo/mono switch; separate bass and treble controls. Specifications same as for RE518, except dimensions 7 1/16"W × 4 23/32"D × 1¾"H..... $170

JR100 AM/FM Radio/Cassette Player

In-dash AM/FM stereo/cassette player. Features auto local/distant select; mono/stereo switch; locking fast forward. Output power 8 W; S/N ratio 50 dB; mini chassis; 6 9/16"W × 4 17/32"D × 1¾"H..... $150

J.I.L.

CD-83F AM/FM Radio/Cassette Player

Concept® in-dash AM/FM stereo/cassette player with auto cassette mechanism and digital tuning with DNR (Dynamic Noise Reduction). Features DCFC dc-controlled function circuit; seek switch; AM/FM station presets; auto-reverse tape mechanism; Sen-Alloy tape

head; locking fast forward/rewind; separate bass and treble controls; key-off eject; digital clock display; fader control; mute switch; local/DX switch. Tuner section: FM 50-dB quieting sensitivity mono/stereo 20/39 dBf; FM S/N ratio mono/stereo 65/55 dB at 65 dBf; THD mono/stereo 0.4%/0.1% at 1 kHz, 50 dB quieting; FM capture ratio 1 dB; adjacent/alternate-channel selectivity 15/75 dB; spurious/image/i-f response 72/73/75 dB; AM suppression 60 dB. Cassette deck section: wow and flutter 0.18% wrms; frequency range 30-15,000 Hz; S/N ratio 50 dB; THD <0.6% at 0 dB output; channel separation 30 dB. Amplifier section: output level >775 mV; THD <0.5% at 0 dB output..... $400

CD-82FN AM/FM Radio/Cassette Player

Concept® in-dash AM/FM stereo/cassette player with auto-reverse cassette mechanism and DNR. Features DCFC dc-controlled function circuit; Sen-Alloy tape head; locking fast forward; separate bass and treble controls; key-off eject; stereo hi-blend switch; fader control; muting switch; PLL circuitry; local/DX switch. Specifications same as for CD-83F $232

CD-80N AM/FM Radio/Cassette Player

Concept® in-dash AM/FM stereo/cassette player with auto-reverse cassette mechanism and DNR. Features DCFC dc-controlled function circuit; locking fast forward/rewind; separate bass and treble controls; key-off eject; mute switch; PLL circuitry; local/DX switch. Specifications same as for CD-83F ... $180

CD-72 AM/FM Radio/Cassette Player

Concept® in-dash AM/FM stereo/cassette player. Features pushbutton tuning and cassette player with DNR system; locking fast forward/rewind; auto stop; key-off eject; adjustable shafts; PLL circuitry; local/DX switch; loudness switch. Specifications same as for CD-83F except output power 8 W rms/channel into 4 ohms; S/N ratio >60 dB; THD 0.5% at 6-W output into 4 ohms..... $134

JVC

KS-R35 AM/FM Radio/Cassette Player

In-dash mini-chassis pushbutton AM/FM radio with auto-reverse cassette player. Features Dolby B; metal-tape compatibility; separate bass and treble controls; low-level preamp output jacks; engine-noise suppressor; key-off release; sendust alloy heads; 4-way fader; biphonic sound. Output power 8 W/channel maximum, 3 W/channel into 4 ohms; frequency response 100-20,000 at no more than 0.8% THD $270

KS-R30 AM/FM Radio/Cassette Player

In-dash mini-chassis AM/FM radio with auto-reverse cassette deck. Features pushbutton presets; Dolby B; metal-tape compatibility; separate bass and treble controls; low-level preamp output jacks; engine-noise suppressor; key-off release; metaperm heads. Output power 8 W/channel maximum, 3 W/channel into 4 ohms; frequency response 100-20,000 at no more than 0.8% THD $240

KS-R15 AM/FM Radio/Cassette Player

In-dash mini-chassis AM/FM radio with metal-capable cassette deck. Features pushbutton presets; Dolby B; music scan; separate bass and treble controls; low-level preamp output jacks; key-off release; sendust alloy heads; 4-way fader. Output power 8 W/channel maximum, 3 W/channel into 4 ohms; frequency response 100-20,000 at no more than 0.8% THD..... $210

KS-R10 AM/FM Radio/Cassette Player

In-dash mini-chassis AM/FM radio with metal-capable cassette deck. Features Dolby B; music scan; separate bass and treble controls; low-level preamp output jacks; Output power 8 W/channel maximum, 3 W/channel into 4 ohms; frequency response 100-20,000 at no more than 0.8% THD..... $180

Audio Express Line

KS-C1000 AM/FM Tuner/Cassette Player

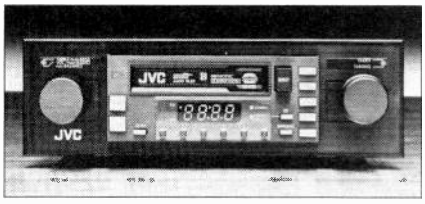
PLL-synthesized AM/FM tuner with auto-reverse cassette player. Requires separate power amp. Features music scan; Dolby B and C; digital clock; metal-tape compatibility; separate bass and treble controls; 4-channel low-level preamp output jacks; engine-noise suppressor; key-off release; sendust alloy heads; 4-way fader..... $400

KS-R75 AM/FM Radio Cassette Player

In-dash mini-chassis AM/FM radio with auto-reverse cassette deck. Features scan and seek; digital clock; PLL digitally synthesized tuner; Dolby B noise reduction; metal-tape compatibility; music scan; separate bass and treble controls; low-level preamp output jacks; engine-noise suppressor; key-off release; sendust alloy heads; 4-way fader; biphonic sound. Output power 22 W/channel maximum, 12 W/channel into 4 ohms from 40-20,000 Hz at no more than 0.8% THD..... $380

KS-R55 AM/FM Radio/Cassette Player

In-dash mini-chassis AM/FM radio with metal-capable cassette deck. Features PLL digitally synthesized tuner; Dolby B noise reduction; separate bass and treble controls; low-level preamp output jacks; engine-noise suppressor; key-off release; sendust alloy heads; 4-



way fader; biphonic sound. Output power 22 W/channel maximum, 12 W/channel into 4 ohms from 40-20,000 Hz at no more than 0.8% THD..... $330

KENWOOD

KRC-1022 AM/FM Tuner/Cassette Player

PLL-synthesized tuner with manual and 12-channel preset tuning, auto-reverse cassette deck; designed for installation in European-sized cars. Features automatic noise reduction system (ANRS); mono/stereo switch; Auto Broadcast Sensor System (ABSS); muting switch; noise killer; balance control; seek tuning; key-off cassette eject; Dolby noise reduction; tape-advance control; fader, bass, treble controls; local/distance and loudness switches; digital frequency display; display dimmer..... $649

KRC-722 AM/FM-Stereo Tuner/Cassette Deck

In-dash unit with PLL-synthesized tuning, digital frequency display, auto-reverse cassette deck, and Dolby noise-reduction system. Features ABSS; ANRS; auto-scanning; 5 AM/5 FM station presets plus manual tuning; key-off eject; bass and treble controls; cassette standby; local/distant switch; metal-tape capability. FM sensitivity 14.8 dBf; frequency response 30-15,000 Hz ±2 dB; S/N 70 dB mono. Wow and flutter 0.12% wrms; frequency response 30-15,000 Hz ±2 dB; separation 35 dB; S/N 70 dB A-weighted, Dolby on..... $499

KRC-922. Similar to KRC-722 except has auto seek/scan; loudness control; ceramic tape head; tape advance; FM tuner S/N ratio 70 dB mono.... $569

KRC-7100 Cassette Receiver

Compact flat-chassis AM/FM radio/cassette deck with PLL-synthesized tuning. Features auto seek; 18 FM/6 AM presets; preset scan; memory address; broadcast monitoring in fast forward and rewind; distant/local switch; auto noise reduction; auto reverse with tape advance; Dolby noise reduction; metal-tape compatibility; separate bass and treble; preout terminal. Output power 5 W/channel. 7 1/16"W × 2"H × 5 1/8"D $469

KRC-712 Cassette Receiver

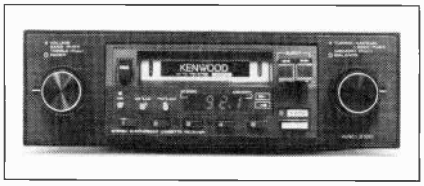
Compact flat-chassis AM/FM radio/cassette deck with PLL-synthesized tuning. Features auto scan; 5 AM/5 FM presets; auto noise reduction; auto reverse; key-off eject; separate bass and treble. Output power 15 W/channel for rear, 5 W/channel for front; frequency response 30-16,000 Hz ±3 dB; wow and flutter 0.12% wrms; 7 1/16"W × 2"H × 5 15/16"D $429

KRC-512 Cassette Receiver

Mini-chassis cassette receiver with PLL synthesized tuning; auto seek; 5 AM/5 FM station presets; Dolby noise reduction; metal-tape capability; auto local/distant switching; hard permalloy head; bass and treble controls; preamp-out jacks; 4-speaker fader control; lighting for all knobs; auto-reverse cassette deck; auto stereo/mono switching; manual tuning. Output power 5 W/channel; 6 1/2"W × 4 3/4"D × 1 3/4"H $399

KRC-3100 Cassette Receiver

Compact flat-chassis AM/FM radio with auto-reverse cassette player. Features PLL-synthesized tuning; auto seek; 5 FM/5 AM presets; auto noise reduction; illuminated cassette door and controls; balance and



fader controls; preout terminal; separate bass and treble. Output power 5 W/channel. 7 1/16"W × 4 15/16"D × 2"H $299

KRC-2100 Cassette Receiver

Compact flat-chassis AM/FM radio with auto-reverse cassette deck. Features high-sensitivity receiver; analog tuning with 5 presets; stereo/mono switch; auto noise reduction; tape advance; key-off eject; separate bass and treble; loudness switch. Output power 5 W/channel; frequency response 30-14,000 Hz ±3 dB; wow and flutter 0.12% wrms; FM usable sensitivity 14.8 dBf. 7 1/16"H × 2"H × 5 5/16"D..... $239

KRC-112 Cassette Receiver

Mini-chassis AM/FM radio with auto-reverse cassette player. Features auto mono/stereo and distant/local switching; auto noise reduction; preamp output terminal; loudness switch. Output power 5 W/channel; frequency response 40-15,000 Hz ±3 dB; wow and flutter 0.12% wrms; FM usable sensitivity 14.8 dBf. 6 5/16"W × 2"H × 4 5/16"W $169

KRACO

KID-597 Designer Series Dashmaster

Pushbutton AM/FM/MPX radio with auto-reverse cassette tape player. Features auto high blend (high-end signal boost); 5 preselect pushbuttons; mute; fader control; local/distant switch; locking fast forward/rewind..... $240

ETR-1089 AM/FM Radio/Cassette Player

Pushbutton electronically tuned AM/FM stereo receiver with auto-reverse stereo cassette deck. Features electronic tune scan; digital clock; digital frequency/time display; 5 AM/5 FM station tuning presets; sendust tape head; auto high-end signal boost; custom designer kit with 4 reversible faceplates $280

KID-597 AM/FM Radio/Cassette Player

In-dash AM/FM-stereo receiver with auto-reverse stereo cassette deck. Features auto high-blend; 5 preselect tuning buttons; FM muting; fader control; local/distant switch; locking fast forward/rewind..... $270

KGE-803 AM/FM Radio/Cassette Player

High-power AM/FM stereo receiver with auto-reverse stereo cassette deck and 5-band graphic equalizer.

Features high-end signal boost; program selector; AM/FM, high-blend, stereo/mono, equalizer switches; AM, FM, EQ, tape-direction indicators; balance and fader controls; custom designer kit with faceplates to match most car interiors. Output power 20 W/channel; equalizer center frequencies 60, 250, 1k, 3.5k, 10k Hz $250

ETR-1088 AM/FM Radio/Cassette Player

Designer Series AM/FM stereo cassette radio with 6 AM and 6 FM pushbutton tuning, DNR, and auto reverse. Features separate bass and treble control; FM muting; loudness control; metal compatibility; super alloy tape head; digital frequency display and clock readout; locking fast forward and rewind; balance and fader controls. Custom designer kit includes four interchangeable face plates. 20 W/channel $250

KHP-1085 AM/FM Radio/Cassette Player

Designer Series AM/FM stereo cassette radio with Dolby noise reduction and metal-tape compatibility. Features separate bass and treble controls; FM muting switch; loudness switch; balance and fader controls; stereo/mono switch; auto reverse; locking fast forward and rewind; tape-direction indicator. Custom designer kit includes 4 interchangeable face plates. 20/W channel $250

KGE-801 Radio/Tape Player/EQ/Amplifier

In/under-dash unit combines stereo cassette player, AM/FM-stereo radio, weather-band radio, 5-band graphic equalizer, 20 W/channel power amplifier. Equalizer has center-frequency slide controls set at 60, 250, 1k, 3.5k, 10k Hz and EQ bypass/on switch with LED; cassette player has locking fast forward/eject button, built-in auto stop, and LED tape play/end indicators; radio features pushbutton FM mute, AM/FM switch with LED indicators; stereo/mono switch; separate weather band; illuminated AM/FM dial scale in cassette door; adjustable shafts $200

KGE-800. Same as KGE-801 except with 8-track player, without weather band $240

KXI-89 AM/FM Radio/Cassette Player

In-dash AM/FM-stereo receiver with auto-reverse stereo cassette deck. Features compact design to fit most small cars; fader control; local/distant switch; locking fast forward; AM/FM, FM mute, stereo/mono switches; FM stereo indicator $190

KID-587 AM/FM Radio/Cassette Player

In/under-dash AM/FM-stereo radio/cassette player. Cassette features fast forward and eject and LED tape run indicator. Radio features 5 AM/FM station presets; tone controls; LED FM stereo indicator; local/distant and AM/FM switches; balance and fader controls $170

KXI-87 AM/FM Radio/Cassette Player

AM/FM-stereo pushbutton radio with auto-stop cassette player. Designed for imported cars, compact X-body, and Citation in-dash installation. Features 5-button AM/FM tuning; fader control; local/distance switch; locking fast forward; auto stop. Comes with nosepieces for all models and in-dash installation hardware $170

KID-588B AM/FM Radio/Cassette Player

In-dash AM/FM-stereo radio with auto-reverse cassette player. Features manual tape select; tape program selector switch; LED tape-play and tape-direction indicators; balance and tone controls; local/distant and FM mute switches; LED stereo, AM, and FM indicators $170

KID-595 AM/FM Radio/Cassette Recorder

Designer Series AM/FM cassette stereo that can record from radio or included handheld microphone. Features Dynamic Noise Reduction; balance and fader controls; fast forward and rewind; local/distant switch; remote on/off. 20 W/channel $160

KCA-8 Cassette Adapter

Allows cassettes to be played in 8-track cartridge tape players. Plugs directly into cartridge slot. Features auto stop or rewind at end of play $50

MARANTZ

CAR302 AM/FM Radio/Cassette Player

In-dash AM/FM-stereo receiver with stereo cassette deck. Features 5-station tuning presets; AIR (Atmospheric Interference Rejection); FM muting; separate bass and treble controls; preamp outputs; Dolby noise reduction; auto eject; locking fast forward/rewind; antenna-power lead; dial-scale dimmer lead. Output power 4 W/channel; THD 0.9%; preamp output level/impedance 500 mV/3k ohms. Wow and flutter 0.15%; frequency response 40-13,000 Hz ±3 dB; S/N ratio Dolby off/on 48/56 dB. FM 50-dB quieting sensitivity 42.13 dBf; capture ratio 2 dB; selectivity/separation 65/30 dB; frequency response 40-14,000 Hz ±3 dB; S/N ratio 60 dB; 7⅛"W × 4¾"D × 2⅞"H $250

CAR322 AM/FM Radio/Cassette Player

In-dash AM/FM-stereo receiver with auto-reverse stereo cassette deck. Features Dolby noise reduction; IMS (Interference Management System); separate bass and treble controls; metal-tape capability; fader control; locking fast forward/rewind; power-antenna lead; dial-scale dimmer lead. Output power 4 W/channel; THD 0.9%. Wow and flutter 0.15%; frequency response 40-13,000 Hz ±3 dB; S/N ratio Dolby off/on 52/60 dB. FM 50-dB quieting sensitivity 42.13 dBf; capture ratio 2 dB; selectivity/separation 70/34 dB; frequency response 40-14,000 Hz ±3 dB; S/N ratio 60 dB; 6¾"W × 4¾"D × 1¾"H $250

CAR312 AM/FM Radio/Cassette Player

In-dash AM/FM-stereo receiver with stereo cassette deck. Features Compuskip; separate bass and treble controls; IMS; CMS (Continuous Music Sytem); locking fast forward/rewind; auto eject; power-antenna lead. Output power 4 W/channel into 4 ohms; THD 0.9%. Wow and flutter 0.15% wrms; frequency response 40-12,000 Hz ±3 dB; S/N ratio 50 dB. FM 50-dB quieting sensitivity 44.31 dBf; capture ratio 2 dB; selectivity/separation 60/35 dB; frequency response 40-14,000 Hz ±3 dB; S/N ratio 60 dB; 6⅔"W × 4¾"D × 1¾"H $200

CAR320 AM/FM Radio/Cassette Player

In-dash AM/FM-stereo receiver with auto-reverse stereo cassette deck. Features IMS; CMS; locking fast forward/rewind; tone control; auto eject; power-antenna lead. Output power 4 W/channel into 4 ohms; THD 0.9%. Wow and flutter 0.15%; frequency response 40-13,000 Hz ±3 dB; S/N ratio 50 dB. FM 50-dB quieting sensitivity 44.3 dBf; capture ratio 2 dB; selectivity/separation 60/35 dB; frequency response 40-14,000 Hz ±3 dB; S/N ratio 60 dB; 6⅔"W × 4¾"D × 1¾"H..... $165

CAR360 AM/FM Radio/Cassette Player

Stereo cassette receiver with Dolby NR for tape. Features auto reverse; 6 AM/FM station presets; auto scan tuning; preamp output and speaker output; speaker fader control; IMS; CMS; separate bass and treble; locking fast forward and rewind; loudness-compensated volume control $360

CAR355 AM/FM Radio/Cassette Player

Stereo cassette receiver with auto-reverse. Features 6 AM/FM station presets; auto scan tuning; preamp output and speaker output; IMS; CMS; locking fast forward and rewind; loudness-compensated volume control $300

MITSUBISHI CAR AUDIO

CZ-747 AM/FM Radio/Cassette Deck

In-dash AM/FM-stereo radio with auto-reverse, metal-compatible stereo cassette deck in compact dual chassis designed to fit almost any domestic or foreign car. Cassette deck features Dolby noise reduction; sendust tape head; tape program search in either direction; normal/CrO_2/FeCr switch; Dolby and metal-tape indicators. Wow and flutter 0.15% wrms; frequency range 40-15,000 Hz with metal tape; S/N ratio 57 dB, Dolby on; stereo separation 35 dB. Radio features 5-button AM/FM electronic tuning with memory; auto electronic and manual electronic scan tuning; LED digital frequency/clock display with auto dimmer; FM Dolby noise reduction; bass, treble, fader, balance controls. FM S/N ratio 60 dB, Dolby on; selectivity 80 dB; frequency response 30-15,000 Hz at −3 dB; separation 35 dB at 1 kHz; capture ratio 2 dB. Unit also features ignition noise killer; key-off/end-of-play pinch-roller release; low-level connectors for separate 8-, 20-, 40-W/channel power amplifiers; 7⅛"W × 4¾"D × 2"H $500

RX-791 AM/FM Radio/Cassette Deck

In-dash high-power unit with 10-W/channel output at 1% THD, DIN chassis to fit most imported cars. Features auto-reverse deck; locking fast forward/rewind; eject button; program selector switch; Dolby noise reduction; tape indicator; cassette door illumination; 5-button AM/FM tuning; bass, treble, fader, balance controls; FM ignition noise killer; separate AM/FM dial illumination; Stereo Reception Control (SRC); adjustable shafts; power antenna lead. Wow and flutter 0.15% wrms; frequency range 50-12,500 Hz at 3 dB; S/N ratio 57 dB, Dolby on; separation 40 dB. FM S/N ratio 64 dB; selectivity 86 dB; frequency range 30-15,000 Hz; separation 35 dB at 1 kHz; capture ratio 3 dB; 7"W × 5⅞"D × 1³¹⁄₃₂"H $350

RX-735 AM/FM Radio/Cassette Player

In-dash AM/FM-stereo receiver with auto-reverse stereo cassette deck. Features quartz PLL frequency-synthesized AM/FM tuning; 6 AM/6 FM presets; auto seek, scan, manual rotary step tuning; super distant/local circuit; distance/local, mono/stereo switches; FM muting; locking fast forward/rewind; program selector switch; "pinch-off" tape protection; tape-running indicator; adjustable shafts; fader and balance controls for 4-speaker system; display dimmer lead. Output power 8 W rms/channel into 4 ohms; 7"W × 4¾"D × 2"H $320

RX-909 AM/FM Radio/Cassette Player

In-dash high-power unit with 10/W channel output at 1% THD, DIN chassis to fit most imported or domestic cars. Features auto reverse; locking fast forward/rewind; program selector switch; Music Program Sensor; "pinch-off" tape protection; Dynamic Noise Reduction; tape indicator; cassette door light; separate AM/FM dial light; FM ignition noise killer; super DX/LOC circuitry; fader and balance controls; separate bass and treble controls; 5-button AM/FM tuning; power-antenna lead; adjustable shafts. Tape section: wow and flutter 0.15% wrms; frequency response 50-10,000 Hz at 3 dB; S/N ratio 55 dB; separation 40 dB. FM section: S/N ratio 64 dB; selectivity 86 dB; frequency response 30-15,000 Hz ±2 dB; separation 35 dB at 1 kHz; capture ratio 3 dB. 7"W × 6"D × 2"H $320

RX-79 AM/FM Radio/Cassette Player

In-dash AM/FM-stereo receiver with auto-reverse cassette player. Features locking fast forward/rewind; 4-speaker capability; separate bass and treble controls; tuning, balance, fader controls with 5-button preset tuning; stereo/mono switch; pushbutton program selector; output power 18 W/channel $290

RX-755 AM/FM Radio/Cassette Deck

In-dash DIN-chassis unit fits most imported cars. Features auto-reverse deck; locking fast forward/rewind; 5-button AM/FM tuning; "pinch-off" tape protection; tape program selector; Music Program Selector; mono/stereo switch; fader and balance controls; cassette door light; separate radio dial light; power-antenna lead; adjustable shafts. Amplifier section: power output 8 W/channel at 1 kHz, 5 W/channel at 5% THD from 100-10,000 Hz, 4 W/channel at 1% THD from 100-10,000 Hz; frequency response 50-30,000 Hz ±3 dB. FM tuner: usable sensitivity 22 dBf; 50 dB quieting sensitivity 22 dBf; frequency response 30-15,000 Hz at 2 dB; capture ratio 3 dB; alternate channel selectivity 86 dB; stereo separation 35 dB at 1 kHz; THD 0.5% at 65 dBf; S/N ratio 60 dB. Tape section specs: frequency response 50-10,000 ±3 dB; wow and flutter 0.15% wrms; stereo separation 40 dB; S/N ratio 50 dB A-weighted; crosstalk 50 dB. 50mm × 178mm × 150mm $270

RX-707 AM/FM Radio/Cassette Deck

In-dash unit with super-compact chassis to fit almost any car. Features auto reverse; locking fast forward/

Autosound Tape Components

rewind; 5-button AM/FM tuner; program selector switch; mono/stereo switch; super DX/LOC circuitry; loudness control; fader and balance controls; FM stereo indicator; power-antenna lead; adjustable shafts. Amplifier: power output 7W/channel at 1 kHz, 4 W/channel at 5% THD from 100-10,000 Hz, 3.5 W/channel at 1% THD from 100-10,000 Hz; frequency response 50-20,000 Hz ±3 dB. FM tuner; usable sensitivity 22 dBf; 50 dB quieting sensitivity 22 dBf; frequency response 30-15,000 Hz at 2 dB; capture ratio 3 dB; alternate channel selectivity 86 dB; stereo separation 35 dB at 1 kHz; THD 0.5% at 65 dBf; S/N ratio 64 dB. Tape section: frequency response 50-10,000 Hz ±3 dB; wow and flutter 0.15% wrms; separation 40 dB; S/N ratio 50 dB A-weighted; crosstalk 45 dB. 50mm × 178mm × 120mm $230

CZ-725 AM/FM Radio/Cassette Deck

In-dash unit features super-compact chassis to fit almost any domestic or foreign car. Features auto-reverse deck; locking fast forward/rewind; eject button; program selector switch; Dolby noise reduction; normal/chrome/ferrichrome selector switch; Dolby tape indicator; manual tuning; bass, treble, fader, balance controls; dial illumination; distant/local switch; loudness control; low-level output for separate power amplifier; optional nosepiece for vertical installation. Wow and flutter 0.15% wrms; frequency range 50-12,500 Hz; S/N ratio 57 dB, Dolby on; 35 dB separation. FM S/N ratio 64 dB; selectivity 80 dB; frequency range 30-15,000 Hz; separation 35 dB at 1 kHz; capture ratio 2 dB; 6 5/16"W × 4 3/4"D × 1 31/32"H $230

RX-726 AM/FM Radio/Cassette Player

Super-compact AM/FM-stereo receiver with auto-reverse cassette player. Features locking fast forward/rewind; tape program selector; metal/CrO_2 equalization switch; hard permalloy tape head; indicators for FM stereo and metal tape; manual tuning; fader and balance controls for 4-speaker system; loudness control; distant/local switch; adjustable shafts; power-antenna lead. Output power 7 W rms/channel into 4 ohms; 6 5/16"W × 4 3/4"D × 2"H..... $200

RX-711 AM/FM Radio/Cassette Player

In-dash AM/FM-stereo receiver with full auto-stop cassette player. Features locking fast forward; tape-end indicator; dial in cassette door; hard permalloy tape head; metal-tape compatibility; 5 AM/5 FM station presets; local/distant switch; stereo indicator; loudness control; fader and balance controls for 4-speaker system; adjustable shafts. Output power 8 W rms/channel into 4 ohms; 7 3/8"W × 4 3/4"D × 2 1/2"H $180

RX-723 AM/FM Radio Cassette Deck

Super-compact in-dash unit with loudness control and 7-W/channel amplifier. Features auto-stop deck; tape-end indicator; locking fast forward; eject button; manual radio tuning; local/distance switch; mono/stereo switch; fader and balance controls; nose piece for vertical installations; adjustable shafts; power-antenna lead. Wow and flutter 0.15% wrms; frequency range 50-15,000 Hz; S/N ratio 50 dB. FM S/N ratio 62 dB; selectivity 68 dB; frequency range 30-15,000 Hz; capture ratio 2 dB; 6 1/4"W × 4 1/2"D × 1 3/4"H. $140

Under-Dash Units

RX-103 FM Radio/Cassette Deck

Under-dash unit combines FM-stereo radio and stereo cassette player. Cassette deck features hard permalloy head; auto eject; 7-W/channel amplifier; bass, treble, balance controls; ignition-noise killer $170

GX-102 Cassette Deck

Under-dash auto-reverse cassette deck features locking fast forward/rewind; tape program selector; hard permalloy head; separate bass and treble controls; low-level DIN connector output; metal/chrome equalization. Output power 7 W/channel at 4 ohms $170

GX-101. Similar to GX-102 except without separate bass and treble controls, auto-reverse deck .. $100

CX-21 Deluxe Cassette Deck

Under-dash deluxe stereo cassette deck. Features hard permalloy tape head; auto reverse; automatic eject; locking fast forward/rewind; program selector switch; dimmer control connection; noise reduction. Wow and flutter 0.15% wrms $140

NAKAMICHI

TD-1200 Mobile Tuner/Cassette Deck

In-dash auto-reverse tuner/cassette deck incorporating much of the technology of the Dragon home cassette deck, including Auto Azimuth Control to automatically and continually align the 0.6-micron playback head to the recorded track on the tape to ensure perfect playback of any tape recorded on any cassette deck. Features Dolby B and C; 120- and 70-μsec equalization; microprocessor-controlled transport driven by unique Super Linear Torque motor and

housed in a slide-out drawer; quartz PLL digital-display tuner with 5 AM/5 FM presets; FM Dolby; FM blend; separate bass, midbass, treble controls; anti-theft system-lock code. Minimum specs: frequency response 20-22,000 Hz ±3 dB; wow and flutter 0.045% wrms; S/N ratio 64 dB Dolby B, 70 dB Dolby C. FM THD 0.13% (stereo); S/N ratio 65 dBf mon; capture ratio 1.5 dB; sensitivity 20 dBf (1 HF); selectivity 60 dB. Main unit 7 1/4" × 2 1/4" × 7 3/16", 5 lbs 8 oz; additional electronics enclosure 7 1/8" × 2" × 5 1/4", 1 lb 14 oz $1260

PANASONIC

CQ-6868 AM/FM Radio/Cassette Player

Compact AM/FM-stereo/cassette player with locking fast forward/rewind and manual-tune AM/FM tuner. Features tape-play and FM-stereo indicators; automatic frequency control on FM; adjustable shafts. Output power 7.5 W/channel max into 4 ohms; wow and flutter 0.13% wrms; tape frequency range 30-15,000 Hz; S/N ratio 45 dB; FM usable sensitivity 10 dBf; 7"W × 5 3/16"D × 1 3/8"H $150

Supreme Elite Series

CQ-S958 AM/FM Radio/Cassette Player

Electronic-tuned AM/FM radio with auto-reverse cassette player. Features Dolby noise reduction; 10 station presets (5 AM/5 FM); seek/scan tuning; digital time and frequency display; FM optimizer; impulse noise-quieting circuitry; 4-way balance; loudness-compensated tone control; separate bass and treble controls; compact chassis with adjustable shafts; Tape Program Search; compatible with normal, chrome, metal tape; locking fast forward/rewind. Power output 3 W/channel into 4 ohms (EIA), 7.5 W/channel at 400 Hz, volume control at max. Radio specs: usable sensitivity 19 dBf; 50 dB quieting sensitivity 19 dBf; frequency response 30-15,000 Hz ±3 dB; alternate channel selectivity 75 dB; stereo separation 35 dB at 1 kHz; image response ratio 40 dB; IF response ratio 100 dB; capture ratio 1.5 dB. Tape player specs: frequency response 40-12,500 Hz ±3 dB; wow and flutter 0.12% wrms; separation 40 dB; S/N ratio 60 dB with Dolby, 50 without. 7"W × 5 15/16"D × 2 1/16"H $540

CQ-S818 AM/FM Radio/Cassette Player

Bantam mini-chassis electronic-tuned AM/FM stereo radio with cassette player compatible with metal, chrome, and normal tape. Digital display of frequency and time. Features 10 station presets (5 AM/5 FM); MOSFET FM tuner; loudness-compensated tone control; Traveler's Information Stations; Daily Priority Station; locking fast forward/rewind; radio monitor; 4-way balance control; preamp out. Power output 3 W/channel into 4 ohms (EIA), 7.5 W/channel at 400 Hz, volume control at max. Radio specs: usable sensitivity 19 dBf; frequency response 30-15,000 Hz ±3 dB; alternate channel selectivity 75 dB; stereo separation 35 dB at 1 kHz; image response ratio 40 dB; IF response ratio 100 dB; capture ratio 1.5 dB. Tape player specs: frequency response 80-12,500 Hz ±3 dB; wow and flutter 0.13% wrms; separation 45 dB; S/N ratio 50 dB. 6 5/16" × 5" × 2 1/16"..... $350

Supreme Series

CQ-S903 AM/FM Radio/Cassette Player

Compact in-dash pushbutton AM/FM-stereo receiver and metal-compatible auto-reverse cassette deck with Dolby noise reduction and hard permalloy head. Cassette deck features locking fast forward/rewind; metal/CrO_2 tape selector; wow and flutter 0.18% wrms; frequency response 40-12,500 Hz ±3 dB; S/N ratio Dolby off/on 50/60 dB. Radio features seek/scan electronic tuning with 6 AM/6 FM preset buttons and digital time/frequency display; FM optimizer circuit; INQ circuit designed to suppress impulse noise on FM band; local/distant switch; fader, bass, treble controls; preamp output 1.0 V at 2,000 ohms; amplifier output power 4 W/channel continuous at 400 Hz, both channels driven into 4 ohms with 1.0% THD; usable sensitivity 19 dBf; frequency response 30-15,000 Hz ±3 dB; i-f rejection 80 dB; separation 35 dB at 1 kHz; 7"W × 5 3/16"D × 2 1/16"H $430

CQ-S761 AM/FM Radio/Cassette Player

Compact AM/FM radio/cassette player with auto-reverse mechanism and pushbutton AM/FM tuning. Features FM optimizer; INQ circuit; MOSFET and adaptive FM front end; automatic gain control on AM; locking fast forward/rewind; Dolby B tape noise reduction; metal/CrO_2/normal tape capability; W-cut hard permalloy tape head; 4-way balance controls (fader); separate bass and treble controls; fully adjustable shafts. Output power 7.5 W/channel into 4 ohms; frequency response 40-35,000 Hz −3 dB. Wow and flutter 0.18% wrms; frequency range 40-12,500 Hz; S/N ratio Dolby on/off 60/50 dB. FM usable sensitivity 15 dBf; 7"W × 5 3/16"D × 2 1/16"H $290

CQ-S763. Similar to CQ-S761 except black .. $270

CQ-S768. Similar to CQ-S763 except new Ambience auto-reverse cassette deck with Ambience control switch; no Dolby NR $290

CQ-S747 AM/FM Radio/Cassette Player

In-dash AM/FM radio/cassette player with high-power Repeatrack™ cassette player and manual pushbutton AM/FM tuning. Features FM optimizer; INQ circuit; MOSFET and adaptive FM front end; distributed-multi-sage automatic gain control on AM; locking fast forward/rewind; Dolby tape noise reduction; metal/CrO_2 tape selector; hard permalloy tape head; 4-way balance controls (fader); separate bass and treble controls; radio monitor; compact chassis; fully adjustable shafts. Output power 20 W/channel into 4 ohms; frequency response 20-40,000 Hz −3 dB. Tape wow and flutter 0.13% wrms; frequency range 80-12,000 Hz; S/N ratio Dolby on/off 60/50 dB. FM usable sensitivity 14 dBf; 7"W × 5 9/16"D × 1 3/4"H $250

CQ-S703 AM/FM Radio/Cassette Player

Ambience Repeatrack™ cassette player with pushbutton AM/FM radio. Features Ambience control switch; FM optimizer; INQ circuit; MOSFET and adaptive front end; distributed multi-stage automatic gain control on AM; locking fast forward/rewind; hard

permalloy head; 4-way balance controls (fader); loudness-compensated tone control; fully adjustable shafts. Output power 7.5 W/channel into 4 ohms; frequency response 40-35,000 Hz −3 dB. Tape wow and flutter 0.12% wrms; frequency range 40-12,500 Hz; S/N ratio 50 dB. FM usable sensitivity 14 dBf; 7"W × 5 1/16"D × 2 1/16"H $230

CQ-S708. Similar to CQ-S703 except has separate bass and treble controls, radio monitor $220

CQ-S682 AM/FM Radio/Cassette Player

Compact Repeatrack™ cassette player with push-button AM/FM radio. Features FM optimizer; INQ circuit; MOSFET and adaptive FM front end; distributed multi-stage automatic gain control on AM; locking fast forward/rewind; hard permalloy tape head; 4-way balance controls (fader); loudness-compensated tone control; fully adjustable shafts; chrome front. Output power 7.5 W/ channel into 4 ohms; frequency response 40-35,000 Hz −3 dB. Wow and flutter 0.18% wrms; frequency range 80-10,000 Hz; S/N ratio 50 dB. FM usable sensitivity 14 dBf; 7"W × 5 1/16"D × 2 1/16"H $190

QS-S687. With black front $190

CQ-S668 AM/FM Radio/Cassette Player

Compact Repeatrack™ cassette player with manual AM/FM radio. Features FM optimizer; INQ circuit; MOSFET and adaptive FM front end; distributed multi-stage automatic gain control on AM; Dolby tape noise reduction; locking fast forward/rewind; hard permalloy tape head; separate bass and treble controls; radio monitor; compact chassis; fully adjustable shafts. Output power 7.5 W/channel into 4 ohms; frequency response 50-35,000 Hz −3 dB. Tape wow and flutter 0.13% wrms; frequency range 80-12,500 Hz; S/N ratio Dolby on/off 60/50 dB. FM usable sensitivity 14 dBf; 7"W × 5 1/16"D × 1 3/4"H $170

Overhead Cockpit Series

RM-710 AM/FM-Stereo Tuner/Cassette Player

Overhead console-type car audio system with auto-reverse cassette player, Dolby B noise reduction, AM/FM-stereo tuner, and stereo preamplifier. Features locking fast forward/rewind; key-off eject; normal/CrO_2 tape selector; tape program sensor; AM/FM-stereo tuner with 5-way electronic soft-touch tuning; 6 AM/6 FM station presets; pushbutton manual tuning; LED tuning indicators; local/DX switch; impulse-noise quieting (INQ) circuit; 5-band graphic equalizer; electronic volume control with LED level indicators; sound- attenuator switch; joystick balance and fader controls; loudness and dimmer switches; stereo power amplifier; 4-position dome light. Preamp frequency response 20-50,000 Hz ±3 dB; THD 0.02% at 1 kHz. Tape wow and flutter 0.13% wrms; frequency response 30-14,000 Hz ±3 dB; S/N ratio Dolby on/off 63/55 dB; separation 40 dB. FM usable sensitivity 16 dBf; THD 0.15%; S/N ratio 72 dB; image rejection 65 dB; frequency response 20-15,000 Hz ±3 dB; separation 40 dB at 1 kHz..... $1400

RM-310 AM/FM Radio/Cassette Player

Ceiling-mount car stereo system with Repeatrack cassette player. Features locking fast forward/rewind; key-off eject; high filter switch; AM/FM-stereo tuner with 3 station reference guides; FM-stereo auto/mono switch; LED function indicators; mute switch; local/DX switch; INQ circuit; center-detented balance and fader controls; 3-band graphic equalizer; loudness switch; stereo power amplifier; audio power indicators; 4-position dome light. Output power 10 W minimum/channel into 4 ohms at 1% THD, 30-20,000 Hz. Tape wow and flutter 0.15% wrms; frequency response 40-12,000 Hz ±3 dB; S/N ratio 55 dB A-weighted; separation 40 dB. FM section: usable sensitivity 16 dBf; S/N ratio 73 dB A-weighted; image rejection 60 dB; frequency response 30-15,000 Hz ±3 dB; separation 35 dB $600

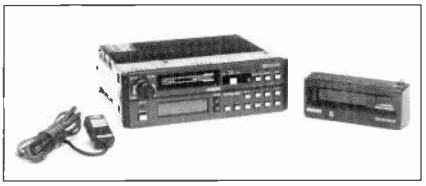
CX-1000 Under-Dash Stereo Cassette Player

Compact under-dash stereo Repeatrack™ cassette player. Features locking fast forward/rewind; separate balance, tone, volume controls; convenient FF/REW/eject mechanism; auto eject at end of play. Output power 5 W/channel into 4 ohms; wow and flutter 0.3% wrms; frequency range 40-10,000 Hz; S/N ratio 45 dB; 5 1/2"W × 6"D × 2"H $90

PHILIPS AUTO AUDIO

AC825 AM/FM Tuner/Cassette Player

Quartz digital AM/FM tuner with Dolby cassette player. Features PLL circuitry; remote LCD frequency readout; microcomputer-controlled wave-band switching; 6 AM/6 FM presets; back-lit buttons; pro-



grammed IF correction; auto adjustment of channel separation and high response; music search; electronic speed control; FSX permalloy head; auto repeat; cassette standby; auto head and capstan release $600

PIONEER

KEX-65 AM/FM Tuner/Cassette Player

In-dash auto-reverse cassette deck with quartz-controlled electronic AM/FM tuner. Features Supertuner II front end; 10 FM/5 AM station electronic preset feather-touch pushbutton tuning; auto/local scan; FM auto/mono switch; auto FM mute; pulse-noise suppression; 4-digit green LED time/frequency display; separate bass and treble slide controls; Dolby noise reduction; metal/chrome tape selector; music search; locking fast forward/rewind; ferrite head; tape guard; key-off pinch-roller release; loudness, volume, balance controls; installation bracket with special security keys; power-antenna activator. Requires separate power amplifier $420

KE-7200 AM/FM Tuner/Cassette Player

In-dash stereo AM/FM Supertuner III with auto-reverse cassette deck. Features 15 station presets (10 FM, 5 AM); feather-touch tuning; digital time/frequency display; auto/local scan; Dolby noise reduction; separate bass and treble control; tape guard; music search; metal-tape compatibility; key-off pinch-roller rpression; FM auto/mono switch; auto muting; volume, balance, and loudness controls; locking fast forward and rewind; power-antenna activator.... $380

KEX-50 AM/FM Tuner/Cassette Player

Digital quartz AM/FM-stereo tuner with cassette deck. Features Supertuner II; 4-digit green LED time/frequency display; LED address indicators on preset buttons; metal/chrome tape selector; quartz-PLL tuning; Dolby noise reduction; separate bass, treble, loudness controls; 10 FM/5 AM station electronic preset feather-touch tuning buttons; auto scan/seek tuning; FM auto/mono and local/scan switches; pulse-noise suppression; locking fast forward/rewind; auto replay after rewind; auto eject; illuminated cassette door; power-antenna activator. Requires separate power amplifier $380

UKE-7100 AM/FM Radio/Cassette Player

Mini in-dash AM/FM-stereo radio/cassette player with Supertuner II and Dolby noise reduction. Features quartz PLL electronic tuning; auto-reverse cassette deck; music search; 4-digit green LED time/frequency display; 10 FM/5 AM station electronic preset feather-touch tuning; separate bass and treble controls; auto/local scan; FM auto/mono switch; auto FM muting; pulse-noise suppressor; hard permalloy head; locking fast forward/rewind; tape guard; key-off pinch-roller release; loudness, balance, volume controls; metal/chrome tape selector; power-antenna activator..... $350

KE-6100 AM/FM Tuner/Cassette Player

In-dash unit with digital quartz AM/FM-stereo Supertuner II and Dolby noise reduction. Features LED address indicators on preset buttons (10 FM/5 AM); 4-digit green LED time/frequency display; local/scan switch; pulse-noise suppression; quartz PLL tuning; chrome/metal-tape selector; parallel fader control that permits use of 2 amplifiers; locking fast forward/rewind; auto replay after rewind; loudness switch; auto eject; power-antenna activator... $330

KE-5100 AM/FM-Stereo Receiver/Cassette Player

In-dash unit with electronically tuned AM/FM-stereo Supertuner II, digital time/frequency display, and pulse-noise suppressor . Features auto scan/seek; preset of up to 5 AM and 10 FM stations; quartz synthesizer tuning system; FM auto/mono switch; auto replay/eject; locking fast forward/rewind; loudness control; parallel fader control for 2 booster amplifiers; power-antenna activator. Output 2.9 W/channel into 4 amplifiers 50-15,000 Hz at 5% THD. Wow and flutter 0.15 wrms; S/N ratio 52 dB; frequency response 50-12,000 Hz ±3 dB. FM usable sensitivity 16.8 dBf (mono); selectivity 70 dB; 7 1/8"W × 6"D × 2"H $300

KEX-20 AM/FM-Stereo/Cassette Player

In-dash AM/FM-stereo electronic Supertuner II with stereo cassette deck. Features electronic tuning with 10 FM/5 AM station presets; Dolby noise reduction; separate bass and treble controls; metal/chrome tape selector; electronic LED pointer and LED AM/FM band indicators; pulse-noise suppression; auto muting on FM; auto/mono switch; locking fast forward/rewind; auto replay after rewind..... $300

UPX-9600 AM/FM-Stereo/Cassette Player

Mini in-dash unit with Supertuner II AM/FM-stereo tuner, Dolby noise reduction, and radio interplay feature. Features auto-reverse cassette deck; 5-station preset tuning; FM auto/mono switch; pulse-noise suppressor; auto FM muting; tape guard; key-off pinchroller release; music search; hard permalloy tape head; separate bass, treble, loudness controls; tape selector; power-antenna activator $300

UKE-3100 AM/FM-Stereo/Cassette Player

Mini quartz-PLL-tuned AM/FM-stereo radio with cassette deck. Features 4-digit green LED time/frequency display; 10 FM/5 AM station presets; auto/local scan; FM stereo/mono switch; auto FM muting; music search; tape guard; auto replay and eject; locking fast forward/rewind; key-off pinch-roller release; hard permalloy head; tape play indicator; volume, tone, balance, loudness controls; power-antenna activator..... $270

KP-7500 AM/FM Radio/Cassette Player

In-dash AM/FM-stereo Supertuner and auto-reverse cassette player with permalloy head and Dolby noise reduction. Features metal/chrome selector; locking fast forward/rewind; auto tape-slack canceler. Radio features pulse-noise suppression; auto muting; loudness; auto stereo/mono; balance, volume, tone, fader controls; playback response 50-12,000 Hz; S/N ratio Dolby off/on 45/52 dB; output power 2.9 W/channel continuous, both channels driven into 4 ohms, 50-15,000 Hz with 5.0% THD; FM 50-dB quieting sensitivity 19.2 dBf; FM selectivity 74 dB; 7 1/8"W × 7 1/8"D × 2"H..... $260

KP-6500. Similar to KP-7500 except without Dolby and auto reverse, 5-station preset tuning, auto eject and replay $220

KP-A700 AM/FM Radio/Cassette Player

In-dash AM/FM stereo radio with Supertuner III® and auto-reverse cassette player. Features 5 station presets; separate bass and treble controls; fader control; auto replay after rewind; RCA-type pre-out; music search; tape guard; key-off pinch-roller release; built-in pulse-noise suppressor hard permalloy head; FM auto/mono switch; locking fast forward and rewind; balance and loudness controls; illuminated cassette door; power-antenna activator $260

KP-A600 AM/FM Radio/Cassette Player

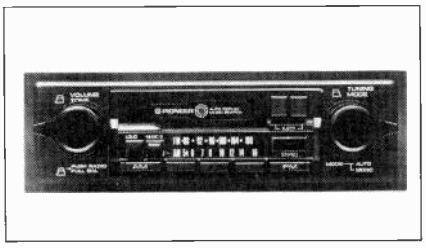
In-dash AM/FM stereo radio with Supertuner III® and auto-reverse cassette player. Features 5 station presets; fader control; auto replay after rewind; music search; tape guard; key-off pinch-roller release; built-in pulse-noise suppressor hard permalloy head; FM auto/mono switch; locking fast forward and rewind; balance, tone, and loudness controls; illuminated cassette door; power-antenna activator $250

Autosound Tape Components

KP-A500 AM/FM Radio/Cassette Player
In-dash AM/FM stereo radio with Supertuner III® and cassette player. Features 5 station presets; separate bass and treble controls; RCA-type pre-out; auto replay after rewind; music search; tape guard; key-off pinch-roller release; built-in pulse-noise suppressor; hard permalloy head; FM auto/mono switch; locking fast forward and rewind balance and loudness controls; illuminated cassette door; power-antenna activator $240

KE-2100 AM/FM-Stereo/Cassette Player
In-dash cassette player with Supertuner AM/FM-stereo radio. Features electronic tuning; 10-station electronic presets; FM mono/stereo, local/DX, muting switches; electronic LED station pointer; locking fast forward/rewind; auto play after rewind; AM/FM LED indicator; auto eject; connector for pulse-noise suppressor; adjustable shafts; power-antenna activator $230

KP-A400 AM/FM Radio Cassette Player
In-dash AM/FM radio with cassette player. Features Supertuner III.; 5 station presets; auto replay after rewind; music search; tape guard; key-off pinch-roller release; hard permalloy head; built-in pulse-noise suppressor locking fast forward and rewind; FM auto/mono switch; loudness control; volume, tone, and balance controls; illuminated cassette door; power-antenna activator $210



KP-5500 AM/FM Radio Cassette Player
In-dash AM/FM radio with Supertuner and cassEtte player. FeaturEs 5-station preset pushbutton tuning; FM/mono/stereo and muting switches; auto replay after rewind; locking fast forward/rewind; auto eject; volume, tone, and balance controls; adjustable shafts; power-antenna activator. $190

KP-4500. Similar to KP-5500 except without auto eject, stereo/mono, station preset buttons; has auto reverse and auto muting; output power 3.2 W/channel; FM sensitivity 19.2 dBf; FM selectivity 50 dB $170

KP-2500. Similar to KP-4500 less auto tape-slack canceler, loudness, auto reverse, auto muting; has auto eject and stereo/mono $150

KP-1500. Similar to KP-2500 except designed for Japanese imports and X-body cars; mini chassis; FM muting; locking fast forward; output power 2.5 W/channel continuous; FM sensltivity 20.7 dBf; 6⅜"W × 5¾"D × 1¾"H $130

KP-4205 AM/FM Radio/Cassette Player
In-dash AM/FM radio with auto-reverse cassette player. Features music search; tape guard; auto replay; cassette eject; loudness control; key-off pinch-roller release; tape-direction LED; locking fast forward and rewind; hard permalloy head; FM mono/stereo switch; FM stereo indicator; volume, tone, and balance controls; power-antenna activator; adjustable shafts $185

KP-3500 AM/FM Radio/Cassette Player
In-dash AM/FM stereo radio/cassette player designed to fit European cars. Features pulse-noise suppression; auto eject and replay; locking fast forward/rewind stereo/mono and local/distant switches; volume, tone, balance controls. Maximum output power 6 W continuous; wow and flutter 0.28% wrms; tape frequency response 50-12,000 Hz; S/N ratio 45 dB; FM usable sensitivity 1.1 μV; (23.2 dBf); FM 50-dB quieting sensitivity 1.4 μV; selectivity 50 dB; capture ratio 4 dB; 7⅛"W × 6¾"D × 2"H; nose dimensions 4⅛"W × 1⅝"H × ¾"D $180

KP-2205 AM/FM Radio/Cassette Player
Stereo AM/FM radio with cassette player. Features music search; tape guard; auto replay; cassette eject; loudness control; key-off pinch-roller release; locking fast forward and rewind; hard permalloy head; FM mono/stereo switch; FM stereo indicator; volume, tone, and balance controls; power-antenna activator; adjustable shafts $160

KP-2000 AM/FM Radio/Cassette Player
Stereo AM/FM radio with cassette player. Features auto replay after rewind; hard permalloy head; locking fast forward and rewind; FM stereo/mono switch; loudness control; volume, balance, and tone controls; power-antenna activator $130

Under-Dash Units

KP-909G Auto-Reverse Cassette Deck
Three-motor, direct-reel-drive auto-reverse cassette deck. Features Dolby noise reduction; tape guard; separate bass and treble controls; microprocessor-controlled music search, music repeat, music scan, blank skip; feather-touch transport controls; high-density ferrite head; metal/chrome tape selector; key-off soft eject; locking fast forward/rewind; loudness, volume, balance controls; illuminated cassette door; Auto-Guard eject; terminal for optional remote-control unit. Requires separate power amp. $380

GEX-90 AM/FM Digital Tuner
Stereo AM/FM digital tuner with Supertuner III® requiring separate power amp. Features 15 station presets (10 FM/5 AM); LED address indicators on preset buttons; electronic feather-touch tuning; digital time/frequency display on 4-digit green LEDs; built-in clock with clock button; pulse-noise suppression; quartz PLL tuning; audio attenuator; auto scan/seek tuning; local scan/seek; FM auto/mono switch; balance control; bass, treble, and loudness controls; input connector for tape deck; terminal for optional remote control unit (CD-R90); power-antenna activator $300

GEX-60 AM/FM Tuner
Under-dash Supertuner® III requiring separate power amp. Features 15 station presets (10 FM/5 AM); LED address indicators on preset buttons; feather-touch electronic tuning; separate bass and treble controls; built-in pulse-noise suppressor; auto tuner/deck switching circuit; FM auto/mono switch; FM stereo indicator; AM/FM LED indicator; input connector for separate tape deck; power-antenna activator . $220

KP-500 FM Radio/Cassette Player
Under-dash unit with FM Supertuner, PLL MPX demodulator. Features bass, treble, balance controls; FM muting; stereo/mono and loudness switches; auto eject; tape-play and stereo indicators. Output power 3 W/channel into 4 ohms 50-15,000 Hz at 5% THD; wow and flutter 0.3% wrms; tape frequency response 50-10,000 Hz ±3 dB; FM usable sensitivity 12 dBf (mono); FM selectivity 74 dB; 7⅝"W × 7½"D × 3"H $190

KP-404G Stereo Cassette Deck
Stereo cassette deck with Dolby noise reduction. Features music search; tape guard; separate bass and treble controls; ferrite head; metal/chrome tape selector; illuminated cassette door; key-off pinch-roller release; auto replay and eject; locking fast forward/rewind; loudness, volume, balance controls. Requires separate power amplifier $160

KPX-600 FM Stereo Tuner/Cassette Player
Under-dash FM-stereo Supertuner and stereo cassette player. Features auto replay and eject; locking fast forward/rewind; tape-play indicator; electronic governor motor; center-detented volume, bass, treble, balance controls; FM muting; loudness contour switch; FM stereo indicator; FM stereo/mono switch. FM S/N ratio 68 dB; capture ratio 1.7 dB; separation 32 dB (65 dBf, 1 kHz); sensitivity 14.3 dBf; selectivity 74 dB. Fast-wind time 120 seconds with C60 cassette; wow and flutter 0.13% wrms; frequency response 30-15,000 Hz −3 dB; S/N ratio 52 dB; 7⅞"W × 6⅞"D × 2⅜"H $140

KP-202G Stereo Cassette Deck
Stereo cassette deck with music search and tape guard. Features metal/chrome tape selector; separate bass and treble controls; illuminated cassette door; key-off pinch-roller release; auto eject; locking fast forward/rewind; loudness, volume, balance controls $140

KP-575 Cassette Player
Under-dash cassette auto-reverse cassette player with auto tape-slack eliminator, locking fast forward/rewind, tape-direction indicators; loudness, volume, tone, and balance controls. Wow and flutter 0.25% wrms; frequency response 50-10,000 Hz; S/N ratio 45 dB; maximum output power 6 W continuous; 6⅛"W × 4⅜"D × 2"H $130

KP-373. Similar to KP-575 except without auto reverse; has auto replay and slide volume control; 4¾"W × 6⅛"D × 2"H $115

PROTON

207 AM/FM Tuner/Cassette Player
AM/FM tuner, cassette player, and preamplifier, with the exclusive Schotz Phase III Variable Bandwidth PLL Detector specifically designed for Proton. Features digital display; memory on all functions; auto reverse; key-off eject; triple J-FET; 4-band tuner; 5 AM/FM presets; scan; muting; Automatic Loudness Compensation; Automatic Program Search; full-logic transport; Dolby B and C; preamp level fader; shock-mounted tape transport. Wow and flutter 0.1% wrms; mono usable sensitivity 0.8 μV @ 106 MHz (75 ohms). $480

212 AM/FM Radio/Cassette Player
Digital AM/FM radio with auto-reverse cassette player. Features the exclusive Schotz Phase III Variable Bandwidth PLL Detector specifically designed for Proton. Four amplifiers, bridgeable to two, biased Class A/B. Features triple J-FET; 4-gang tuner; Automatic Loudness Compensation; 5 AM/FM presets; Automatic Program Search; FM scan; muting; detented volume control; night illumination; separate bass and treble; Dolby B; shock-mounted tape transport; sendust tape head. Power output 4 × 6 W/channel or stereo bridged 18 W/channel and 1 kHz with 8% THD; output impedance 4 ohms; capture ratio 1.5 dB. 6⅔W" × 2"H × 5¾"D $370

204 AM/FM Radio/Cassette Player
Digital AM/FM radio with auto-reverse cassette player. Features the exclusive Schotz Phase III Variable Bandwidth PLL Detector specifically designed for Proton. Amplifier biased Class A/B. Features triple J-FET; 4-gang tuner; Automatic Loudness Compensation; 5 AM/FM presets; Automatic Program Search; FM scan;

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.

muting; detented volume control; night illumination; separate bass and treble; Dolby B; 2 pairs of preamp outputs with preamp; level fader. Power output 6 W/channel at 1 kHz with 8% THD; output impedance 4 ohms; FM 50 dB quieting sensitivity @ 1.9 μV; tape frequency response 35-16,000 Hz ±3 dB; S/N ratio 68.5 dB with Dolby on; wow and flutter 0.12%. 6½"W× 2"H × 5¼D" $300

202A AM/FM Radio/Cassette Player

In-dash AM/FM radio with cassette player; tuner has exclusive Schotz Phase II Variable Bandwidth PLL Detector specifically designed for Proton. Amplifier biased Class A/B. Features Dolby/mute dual-function switch; separate bass and treble; LOC/DX switch; fader; two pairs of preamp outputs; locking fast forward and rewind; permalloy tape head. Power output 6 W/channel and 1 kHz with 8% THD; output impedance 4 ohms; tape frequency response 40-15,000 Hz ±3 dB; S/N ratio 67 dB with Dolby; wow and flutter 0.2%. 6¼"W × 1⅝"H × 5½"D..... $220

REALISTIC

12-1889 AM/FM Radio/Cassette Player

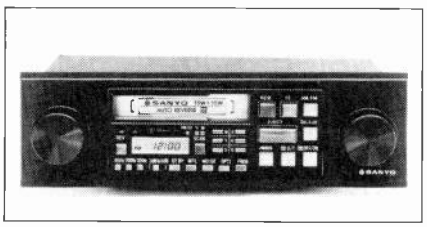
In/under-dash unit combines AM/FM-stereo receiver, stereo cassette player, and LED digital radio frequency/clock display with LED dimmer switch. Cassette section features key-off eject and locking fast forward/rewind; radio has stereo/mono switch; includes speaker and speaker cables. Total power 24 W. $180

SANYO

In-Dash Power Plus Series

FTX 180 AM/FM Radio/Cassette Player

Component-style AM/FM stereo radio with auto-reverse cassette player. Features digital frequency display; quartz clock; Dolby B and C noise reduction; metal-tape compatibility; Auto Music Select; Super Permalloy tape head; bass equalizer with 3 or 6 dB boost at 100/200/300 Hz; separate bass, treble,



balance, fader controls; line-out jacks. Output power 15 W/channel (into 4 ohms, 50-20,000 Hz, at 0.3% THD); amp frequency response 50-20,000 Hz ±1 dB; frequency response 30-20,000 Hz ±3 dB; tape frequency response 63-14,000 Hz ±3 dB; S/N ratio 50 dB (A-weighted); wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 14.8 dBf; 50 dB quieting sensitivity 17.6 dBf; tuner separation 35 dB at 1 kHz; alternate channel selectivity 70 dB; capture ratio 2 dB. 7⅛"W × 5⅛"D ×2"H .. $400

FTX 160 AM/FM Radio/Cassette Player

Component-style AM/FM stereo radio with auto-reverse cassette player. Features Dolby B and C noise reduction; LCD frequency display; quartz clock; metal tape compatibility; Auto Music Select; Super Permalloy tape head; bass equalizer with 3 or 6 dB boost at 100/200/300 Hz; separate bass, treble, balance, fader controls; line-out jacks. Output power 15 W/channel (into 4 ohms, 50-20,000 Hz, at 0.3% THD); amp frequency response 50-20,000 Hz ±1 dB; frequency response 30-20,000 Hz ±3 dB; tape frequency response 63-14,000 Hz ±3 dB; S/N ratio 50 dB (A-weighted); wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 12.8 dBf; 50 dB quieting sensitivity 16.8 dBf; tuner separation 35 dB at 1 kHz; alternate channel selectivity 70 dB; capture ratio 2 dB. 7⅛"W × 5⅛"D × 2"H . $350

FTX 140 AM/FM Radio/Cassette Player

Component-style AM/FM stereo radio with auto-reverse cassette deck. Features Dolby B and C; metal-tape compatibility; Auto Music Select; Super Permalloy tape head; separate bass, treble, loudness, balance, fader controls; anti-jamming system; local/distant and mono/stereo switches; line-output jacks. Output power 15 W/channel (into 4 ohms, 50-20,000 Hz, at 0.3% THD); amp frequency response 50-20,000 Hz ±1 dB; frequency response 30-20,000 Hz ±3 dB; tape frequency response 63-14,000 Hz ±3 dB; S/N ratio 50 dB (A-weighted); wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 12.8 dBf; 50 dB quieting sensitivity 16.8 dBf; tuner separation 35 dB at 1 kHz; alternate channel selectivity 70 dB; capture ratio 2 dB. 7⅛"W × 5⅛"D × 2"H $300

FTX 120 AM/FM Radio/Cassette Player

Component-style AM/FM radio with auto-reverse cassette player. Features ultra-compact EZ-C chassis; Dolby B and C; FM optimizer; Auto Music Select; Super Permalloy tape head; separate bass, treble, loudness, balance, fader controls; anti-jamming system; local/distant and stereo/mono switches; line-out jacks. Output power 10 W/channel (into 4 ohms, 50-20,000 Hz, at 1% THD); amp frequency response 50-20,000 Hz ±3 dB; frequency response 30-20,000 Hz ±3 dB; tape frequency response 63-14,000 Hz ±3 dB with metal tape; S/N ratio 50 dB (A-weighted); wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 12,8 dBf; 50 dB quieting sensitivity 16,8 dBf; tuner separation 35 dB at 1 kHz; alternate channel selectivity 70 dB; capture ratio 2 dB. 6¼"W × 5⅛"D × 2"H $270

In-Dash Components

FT 590 AM/FM Tuner/Cassette Player

AM/FM-stereo tuner/cassette player with LCD frequency display, metal-tape capability, and Automatic Music Select System (AMSS). Features Dolby noise reduction; 5 AM/5 FM statio presets; FM optimizer circuitry; line-level cassette deck inputs; tape-protection system; sendust alloy head; full auto reverse; locking fast forward/rewind; PLL frequency synthesizer tuner; auto-scan tuning; Dolby FM; separate bass and treble controls; loudness switch; function labels that light up when engaged; exclusive EZ Install system. Line output frequency response 30-20,000 Hz ±3 dB at 500 mV. Wow and flutter 0.15% wrms; frequency response 63-14,000 Hz ±3 dB with metal tape; S/N ratio 50 dB A-weighted; separation 40 dB. FM 50-dB quieting sensitivity 20.2 dBf; capture ratio 2 dB; alternate-channel selectivity 70 dB; separation 30 dB at 1 kHz; 7"W × 5⅛"D × 2"H..... $280

FTV 100 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features Auto Music Select; manual reverse if chosen; Dolby noise reduction; fader and balance controls; FM optimizer; locking fast forward and rewind. Output power 9.5 W/channel (into 4 ohms, at 1% THD); tape frequency response 50-20,000 Hz; S/N ratio 50 dB; wow and flutter 0.15% wrms; tape separation dB; usable sensitivity 19.2 dBf; tuner separation 35 dB at 1 kHz; capture ratio 2 dB. 7⅛"W × 5⅛"D × 2"H..... $200

FTC 70 AM/FM Radio/Cassette Player

Stereo AM/FM radio with manual-reverse cassette player. Features Auto Music Select; Dolby noise reduction; 5 AM or FM presets; metal-tape compatibility; FM optimizer; fader control; local/distant and stereo/mono switches; locking fast forward and rewind; EZ-C installation system. Output power 9.5 W/channel (into 4 ohms, 50-20,000 Hz, at 1% THD); frequency response 50-20,000 Hz ±3 dB; tape frequency response 63-12,500 Hz ±3 dB; S/N ratio 50 dB (A-weighted); wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 19.2 dBf; 50 dB quieting sensitivity 21.6 dBf; tuner separation 35 dB at 1 kHz; alternate channel selectivity 70 dB; capture ratio 2 dB. 6¼"W × 4⅞"D × 2"H..... $200

FTV 92 AM/FM Radio/Cassette Player

High-power AM/FM-stereo receiver with auto-reverse cassette deck. Features automatic Music Select System; pushbutton tuning; FM optimizer; manual reverse; fader, bass, treble, loudness controls; locking fast forward/rewind; local/distant and stereo/mono switches; auto-antenna control. Output power 9.5 W/channel into 4 ohms; frequency response 50-20,000 Hz; THD 1%. Wow and flutter 0.15% wrms; frequency response 63-12,500 Hz ±3 dB with normal tape; S/N ratio 50 dB A-weighted; separation 40 dB. FM 50-dB quieting sensitivity 21.6 dBf; alternate-channel selectivity 70 dB; capture ratio 2 dB; separation 40 dB;7"W × 5⅛"D × 2"H. $180

FTV 98 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette deck. Features Dolby; Auto Music Select; FM optimizer; reverse switch; handles all tape types; switchable equalization; RCA line-output jacks; locking fast forward and rewind; separate bass and treble controls; loudness and fader controls; local/distant and stereo/mono switches; backlit function labels. Output power 9.5 W/channel (into 4 ohms, 50-20,000 Hz, at 1% THD); frequency response 50-20,000 Hz ±3 dB; tape frequency response 63-12,500 Hz ±3 dB; S/N ratio 50 dB (A-weighted); wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 19.2 dBf; 50 dB quieting sensitivity 19.2 dBf; tuner separation 35 dB at 1 kHz; alternate channel selectivity 70 dB; capture ratio 2 dB. 7⅛"W × 5⅛"D × 2"H..... $180

FTC 68 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features Dolby; compatible with all tapes; Auto Music Select; FM optimizer; manual reverse; locking fast forward and rewind; fader and loudness controls; separate bass and treble controls; local/distant and stereo/mono switches; RCA line-out jacks; EZ-C installation. Output power 9.5 W/channel (into 4 ohms, 50-20,000 Hz, at 1% THD); frequency response 50-20,000 Hz ±3 dB; tape frequency response 63-12,500 Hz ±3 dB; S/N ratio 50 dB (A-weighted); wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 19.2 dBf; 50 dB quieting sensitivity 21.6 dBf; tuner separation 35 dB at 1 kHz; alternate channel selectivity 70 dB; capture ratio 2 dB. 6¼"W × 4⅞"D × 2"H $180

FTC 48 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features Dolby; Auto Music Select; manual reverse; compatible with all tapes; FM optimizer; locking fast forward and rewind; local/distant switch; fader control; adjustable control shafts; EZ-C installation. Output power 9.5 W/channel (into 4 ohms, 50-20,000 Hz, at 1% THD); frequency response 50-20,000 Hz ±3 dB; tape frequency response 80-10,000 Hz ±3 dB; S/N ratio 50 dB--Dolby off, 58 dB--Dolby on (A-weighted); wow and flutter 0.15% wrms; tape separation 35 dB; usable sensitivity 20.8 dBf; 50 dB quieting sensitivity 23.8 dBf; tuner separation 30 dB at 1 kHz; alternate channel selectivity 60 dB; capture ratio 3 dB. 6⅛"W × 5⅛"D × 2"H..... $160

FTV 88 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features Auto Music Select; locking fast forward and rewind; fader control; pushbutton tuning for 5 AM or FM stations; manual reverse; knurled controls; local/distant and stereo/mono switches; loudness control; indicators for AMSS, tape direction, FM stereo. Output power 3 W/channel (into 4 ohms, 100-20,000 Hz, at 10% THD); frequency response 100-20,000 Hz ±3 dB; tape frequency response 80-12,500 Hz ±3 dB; S/N ratio 50 dB (A-weighted); wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 19.2 dBf; 50 dB quieting sensitivity 21.6 dBf; tuner separation 35 dB at 1 kHz; alternate channel selectivity 70 dB; capture ratio 3 dB. 7"W × 5⅛"D × "H $150

FTV 90 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features Dolby; FM optimizer; compatible with all tapes; Auto Music Select; manual reverse; local/distant switch; locking fast forward and rewind; fader control; tape-direction and stereo indicators; adjustable control shafts. Output power 9.5 W/channel (into 4 ohms, 50-20,000 Hz, at 1% THD); frequency

Autosound Tape Components

sponse 80-10,000 Hz ±3 dB; S/N ratio 50 dB--Dolby off, 58 dB--Dolby on (A-weighted); wow and flutter 0.15% wrms; tape separation 35 dB; usable sensitivity 20.8 dBf; 50 dB quieting sensitivity 23.8 dBf; tuner separation 30 dB at 1 kHz; alternate channel selectivity 60 dB; capture ratio 3 dB. 7⅛"W × 5⅛"D × 2"H $150

FTC 18 AM/FM Radio/Cassette Player

In-dash unit with metal-tape capability, pushbutton tuning, Automatic Music Select System, and FM optimizer. Features auto-reverse cassette deck with Dolby noise reduction; line-level outputs; distant/LOC switch; loudness control; separate bass and treble controls; backlit function labels. Output 500 mV, 30-20,000 Hz ±3 dB; wow and flutter 0.15% wrms; S/N ratio 50 dB A-weighted; frequency response 63-14,000 Hz ±3 dB; separation 46 dB; FM usable sensivity 19.2 dBf; alternate-channel selectivity 60 dB; capture ratio 2 dB; 6¼"W × 4¾"D × 2"H $150

FTC 12 AM/FM Radio/Cassette Player

In-dash unit with digital frequency/time display and auto-reverse cassette deck. Features locking fast forward/rewind; distant/local, frequency/time, FM/AM, reverse switches. Output power 2.4 W/channel into 4 ohms at 5% THD 100-20,000 Hz; frequency response 100-20,000 Hz ±3 dB. Wow and flutter 0.1% wrms; frequency response 80-10,000 Hz ±3 dB; S/N ratio 50 dB A-weighted; separation 35 dB. FM usable sensitivity 17.2 dBf; alternate-channel selectivity 60 dB; capture ratio 3 dB; 6¼"W × 4¾"D × 2"H $150

FTC 46 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Features pushbutton tuning with 5 AM or FM (or combination) station presets; locking fast forward and rewind; fader control; local/distant and stereo/mono switch; EZ-C installation. Output power 9.5 W/channel into 4 ohms, 50-20,000 Hz, at 1% THD; frequency response 50-20,000 Hz ±3 dB; tape frequency response 80-10,000 Hz ±3 dB; S/N ratio 50 dB A-weighted wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 20.8 dBf; 50 dB quieting sensitivity 21.6 dBf; tuner separation 30 dB at 1 kHz; alternate channel selectivity 60 dB; capture ratio 3 dB. 6¼"W × 4¾"D × 2"H $150

FTC 27 AM/FM Radio/Cassette Player

Mini-size high-power AM/FM-stereo receiver with auto-reverse cassette deck. Features FM optimizer; Dolby noise reduction; locking fast forward/rewind; separate bass and treble controls; stereo/mono and local/distant switches; EZ-C Install system; auto-antenna control. Output power 9.5 W/channel into 4 ohms at 1% THD; frequency response 50-20,000 Hz ±3 dB. Wow and flutter 0.1% wrms; frequency response 80-10,000 Hz ±3 dB; S/N ratio 50 dB A weighted; separation 35 dB. FM 50-dB quieting sensitivity 20.2 dBf; alternate-channel selectivity 60 dB; capture ratio 3 dB; separation 30 dB at 1 kHz; 6¼"W × 4⅞"D × 2"H $150

FTV 84 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player compatible with any tape. Features Auto Music Select; manual reverse; separate bass and treble; fader control; locking fast forward and rewind; local/distant and stereo/mono switches; LED function indicators. Output power 9.5 W/channel into 4 ohms, 50-20,000 Hz, at 1% THD; frequency response 50-20,000 Hz ±3 dB; tape frequency response 80-10,000 Hz ±3 dB; S/N ratio 50 dB (A-weighted); wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 20.8 dBf; 50 dB quieting sensitivity 23.8 dBf; tuner separation 30 dB at 1 kHz; alternate channel selectivity 60 dB; capture ratio 3 dB. 7⅛"W × 5⅛"D × 2"H $130

FTC 45 AM/FM Radio/Cassette Player

AM/FM-stereo receiver with auto-eject/auto-replay cassette deck. Features pushbutton memory tuning; auto stereo/mono switching; fader control; locking fast forward/rewind; local/distant switch; separate volume, tone, balance controls. Output power 3 W/channel into 4 ohms at 10% THD; frequency response 100-20,000 Hz ±3 dB. Wow and flutter 0.15% wrms; frequency response 80-10,000 Hz ±3 dB; S/N ratio 50 dB A-weighted; separation 40 dB. FM 50-dB quieting sensitivity 21.6 dBf; alternate-channel selectivity 60 dB; capture ratio 3 dB; separation 30 dB at 1 kHz; 6¼"W × 4⅞"D × 1¾"H $120

FTC 40 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player compatible with all tapes. Features Auto Music Select; manual reverse; auto stereo/mono; local/distant switch; fader control; locking fast forward and rewind; separate bass and treble; EZ-C installation. Output power 9.5 W/channel into 4 ohms, 50-20,000 Hz, at 1% THD; frequency response 50-20,000 Hz ±3 dB; tape frequency response 80-10,000 Hz ±3 dB; S/N ratio 50 dB A-weighted; wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 20.8 dBf; 50 dB quieting sensitivity 21.6 dBf; tuner separation 30 dB at 1 kHz; alternate channel selectivity 60 dB; capture ratio 3 dB. 6¼"W × 4¾"D × 2"H $120

FTV 80 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player compatible with all tapes. Features locking fast forward and rewind; local/distant and stereo/mono switches; manual reverse; function indicators. Output power 9.5 W/channel into 4 ohms, 50-20,000 Hz, at 1% THD; frequency response 50-20,000 Hz ±3 dB; tape frequency response 80-10,000 Hz ±3 dB; S/N ratio 50 dB A-weighted; wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 20.8 dBf; 50 dB quieting sensitivity 21.6 dBf; tuner separation 30 dB at 1 kHz; alternate channel selectivity 60 dB; capture ratio 3 dB. 7⅛"W × 5⅛"D × 2"H $100

FTC 38 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player compatible with all tapes. Features LED function indicators; manual reverse; locking fast forward and rewind; local/distant switch; adjustable control shafts; EZ-C installation. Output power 9.5 W/channel into 4 ohms, 50-20,000 Hz, at 1% THD; frequency response 50-20,000 Hz ±3 dB; tape frequency response 80-10,000 Hz ±3 dB; S/N ratio 50 dB A-weighted; wow and flutter 0.15% wrms; tape separation 40 dB; usable sensitivity 20.8 dBf; 50 dB quieting sensitivity 23.8 dBf; tuner separation 30 dB at 1 kHz; alternate channel selectivity 60 dB; capture ratio 3 dB. 6¼"W × 4¾"D × 1¾"H $100

FTV 76 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-eject cassette player. Features FM stereo indicator; locking fast forward and rewind; local/distant switch; tape-play indicator; adjustable control shafts. Output power 3 W/channel into 4 ohms, 150-20,000 Hz, at 10% THD; frequency response 100-20,000 Hz ±3 dB; tape frequency response 80-10,000 Hz ±3 dB; S/N ratio 50 dB A-weighted; wow and flutter 0.2% wrms; tape separation 33 dB; usable sensitivity 22.8 dBf; 50 dB quieting sensitivity 25.8 dBf; tuner separation 25 dB at 1 kHz; alternate channel selectivity 35 dB; capture ratio 4 dB. 7⅛"W × 4¾"D × 2"H $80

FTC 28 AM/FM Radio/Cassette Player

Mini-size AM/FM radio with auto-reverse cassette player. Features locking fast forward and rewind; manual reverse; auto FM stereo/mono switching; local/distant switch; LED stereo and tape-direction indicators; EZ-C installation. Output power 3 W/channel into 4 ohms, 100-20,000 Hz, at 10% THD; dB; frequency response 100-20,000 Hz ±3 dB; tape frequency response 80-10,000 Hz ±3 dB; S/N ratio 47 dB A-weighted; wow and flutter 0.2% wrms; tape separation 35 dB; usable sensitivity 24.2 dBf; 50 dB quieting sensitivity 26.2 dBf; tuner separation 28 dB at 1 kHz; alternate channel selectivity 35 dB; capture ratio 4 dB. 6¼"W × 4¾"D × 1¾"H $80

FTC 1 AM/FM Radio/Cassette Player

Mini-size AM/FM-stereo receiver with stereo cassette deck. Features auto stop; auto stereo/mono switching; locking fast forward; tone, balance, volume controls; local/distant switch; AM/FM slide-bar band selector. Output power 3 W/channel into 4 ohms at 10% THD; frequency response 300-15,000 Hz ±3 dB. Wow and flutter 0.2% wrms; frequency response 60-8000 Hz ±3 dB; S/N ratio 50 dB A-weighted; separation 40 dB. FM 50-dB quieting sensitivity 26.2 dB; capture ratio 4 dB; separation 35 dB at 1 kHz; 6¼"W × 4½"D × 1¹¹⁄₁₆"H $60

Under-Dash Components

FT 804 AM/FM Radio/Cassette Player

Stereo compact-chassis AM/FM radio with auto-reverse cassette player. Fits in dashboards of most new Japanese cars. Features metal-tape compatibility; separate bass and treble controls; locking fast forward and rewind. Output power 8 W/channel into 4 ohms, 50-20,000 Hz, at 5% THD; frequency response 50-20,000 Hz ±3 dB; tape frequency response 80-10,000 Hz ±3 dB; S/N ratio 50 dB (A-weighted); wow and flutter 0.2% wrms; separation 35 dB. 5¹⁵⁄₁₆"W × 5¾"D × 2"H $100

FT 802 AM/FM Radio/Cassette Player

Stereo AM/FM radio with auto-reverse cassette player. Fits in dashboards of most new Japanese cars. Features locking fast forward and rewind; manual reverse; tape-direction indicators. Output power 3 W/channel into 4 ohms, 10-20,000 Hz, at 10% THD; frequency response 100-20,000 Hz ±3 dB; tape frequency response 80-10,000 Hz ±3 dB; S/N ratio 47 dB A-weighted; wow and flutter 0.2% wrms; separation 35 dB. 5¹³⁄₁₆"W × 5¾"D × 2"H $80

FT50 Cassette Player

Mini-size stereo cassette player with locking fast forward; calibrated tone control; auto stop. Output power 3.8 W/channel into 4 ohms at 10% THD; frequency response 50-15,000 Hz ±3 dB. Wow and flutter 0.2% wrms; frequency response 63-10,000 Hz ±3 dB with normal tape; S/N ratio 45 dB A-weighted; separation 40 dB; 6¼"W × 4¾"D × 1¾"H ..$50

SONY

XR-100 Auto-Reverse Cassette Preamp

Auto-reverse cassette preamp with Dolby B and C noise reduction. Features Diversity Reception System™; dual-adjust tape head; auto music sensor; 6 FM and 6 AM preset tuning; 4-way preamp outputs with fader; bass and treble controls; digital display with quartz clock; night illumination. Black panel. 7⅛" × 2" × 6"; 4 lbs $650

XR-77 AM/FM Cassette Radio

Digital FM/AM cassette radio with 25 W/channel amplifier. Features PLL-synthesis tuner; 5 FM and 5 AM soft-touch presets; local/DX and mono/stereo-mute switches; digital display with quartz clock; auto music sensor system; Dolby noise reduction; metal and CrO_2 tape-EQ switch; separate bass, treble and loudness controls; preamp rear-channel output with fader. Output power 12 W/channel (ad hoc rules) at 0.5% THD; 7⅛" × 2½" × 6"; 4 lbs, 13 oz $500

XR-85 Auto-Reverse Cassette Radio

Black AM/FM cassette player with high power 20 W/channel amplifier (may be used as 10 W × 4 with fader). Features PLL-synthesis tuner; 6 AM and 6 FM soft-touch presets; precision auto-reverse tape transport with key-off eject; dual-adjust tape head; separate bass, treble and loudness controls. 12 W/channel into 4 ohms from 40-20,000 Hz at 0.5% THD; 7⅛" × 2¼" × 6"; 4 lbs, 3 oz $475

XR-75 AM/FM Cassette Radio

Silver AM/FM cassette radio with 4-way RCA preamp output with fader. Features PLL-synthesis tuner; 6 AM and 6 FM soft-touch presets; digital display with quartz clock; local/DX and mono/stereo-mute switches; precision auto-reverse tape transport with key-off eject; dual-adjust head system; Dolby noise reduction system; metal, CrO_2 tape EQ switch; cassette-door

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night light; separate bass, treble and loudness controls. 7⅛" × 2" × 6"; 3 lbs, 5 oz..... $475
XR-75B. Same as above but black..... $475

XR-55 AM/FM Cassette Radio
FM/AM cassette radio with precision auto-reverse tape transport and preamp RCA jack outputs. Features Dolby noise reduction; tape EQ switch; 6 station presets; pushbutton tuning; 10 W/channel into 4 ohms 40-20,000 Hz at 1.0% THD; separate bass, treble, loudness controls; output cable for remote power antenna. 7" × 1¾" × 6"; 4 lbs. $370

XR-65 AM/FM Cassette Radio
Silver AM/FM cassette radio with auto-reverse and preamp output system. Features PLL-synthesis tuner; 5 AM and 5 FM soft-touch presets; dual-adjust head system; LED tone-tuning system; Dolby B noise reduction; auto music sensor; separate bass, treble, fader, system EQ controls. 6 W/channel. 7⅛" × 2" × 5"; 3 lb, 7 oz..... $330
XR-65B. Same as above but in black $330

XR-45 AM/FM Cassette Radio
Silver auto-reverse FM/AM cassette radio with preamp output system. Features PLL-synthesis tuner; 5 AM and 5 FM soft-touch presets; LED tone-tuning scale; separate bass and treble controls; fader. 6 W/channel. 7⅛" × 2"× 5"; 3 lb, 3 oz..... $280
XR-45B. Same as XR-45 but black $280

XR-25 AM/FM Cassette Radio
FM/AM cassette radio with precision auto-reverse tape transport and 3-band step equalizer (center frequencies 100 Hz, 1 kHz, 10 kHz). Features 4-speaker output with fader and balance controls; center-tune indicator tuning system; preamp RCA pin jack outputs; output cable for remote power antenna; compact chassis design. 4 W/channel into 4 ohms 180-10,000 Hz at 1.0% THD. 6¼" × 1¾" × 4 ¾"; 2 lbs, 10 oz $240

XR-15 AM/FM Cassette Radio
Precision auto-reverse tape transport FM/AM cassette with continuously adjustable high filter. Features 4-speaker output with fader and balance control; system EQ switch; metal and CrO_2 tape-EQ switch; night light; output cable for remote power antenna; 4 W/channel into 4 ohms 180-10,000 Hz at 1.0% THD. 7⅛" × 2" × 5¾"; 3 lbs, 6 oz. $200

SPARKOMATIC

SR-308 AM/FM Radio/Cassette Player
High-powered electronically tuned AM/FM radio/cassette player. Features presets for 5 AM and 5 FM stations; PLL tuning; Dynamic Noise Reduction; bass, treble, balance, and fader controls; metal tape selector; locking fast forward and rewind; also controls for FM muting, loudness, local/distant and mono/stereo switching. 45 watts audio power $250

SR-3300 AM/FM/Cassette Player
In-dash AM/FM-stereo radio/cassette player with auto-reverse tape transport and direction control. Features auto stop; pushbutton eject; electronic loudness, muting, high filter, AM/FM controls; locking fast forward/rewind; bass, treble, balance, fader controls; LED stereo indicator. Wow and flutter 0.3% rms; S/N ratio 40 dB; separation 45 dB; output power 40 W continuous at 1% distortion; frequency response 20-20,000 Hz; 5¼"D × 1¾"H $250

SR-305 AM/FM Radio/Cassette Player
High-power AM/FM-stereo/cassette player with 5-band equalizer. Features left-right balance and front fader controls; loudness control; FM muting; local/distant and mono/stereo switches; locking fast forward/rewind; AM/FM switch. Output power 40 W at 1% THD; frequency range 20-20,000 Hz; wow and flutter 0.3% wrms; S/N ratio 38 dB; separation 42 dB; FM sensitivity 4 μV for 30 dB S/N; i-f/image rejection 60/50 dB; 7"W × 5⅛"D × 1¾"H .. $150

SS 31E AM/FM Radio/Cassette Player
Under-dash AM/FM radio/cassette player with Dynamic Noise Reduction. Features auto reverse; locking fast forward/rewind; metal-tape switch; bass, treble, loudness, balance, and fader controls. 45 W rms output power..... $130

C 42 Pre-Wired Car Stereo System
Complete prewired 40 W car stereo system, including AM/FM radio/cassette player, compact door-mount speaker set, 40 W power booster $130

SR-303 AM/FM Radio/Cassette Player
In-dash AM/FM-stereo radio/cassette player. Features continuous play; auto-reverse; auto key-off and pushbutton eject; locking fast forward/rewind buttons with LEDs, wow and flutter 0.3% rms; S/N ratio 38 dB. Radio features local/distant, program, and AM/FM switches; balance and fader controls for 4-way speaker adjustment, volume, tone, tuning controls; output power 8 W at 1.0% THD; FM sensitivity 7 μV for 30-dB S/N; frequency response 60-12,000 Hz; 6¹¹⁄₁₆"W × 4¹³⁄₁₆"D × 1¾"H..... $120

SR-306 AM/FM Radio/Cassette Player
High-power AM/FM stereo radio/cassette player with LED digital frequency display. Features volume, tuning, tone controls; left-right balance and front fader controls; local/distant, mono/stereo, AM/FM switches; locking fast forward. Output power 40 W at 1% THD; wow and flutter 0.3% wrms; frequency range 20-20,000 Hz; S/N ratio 38 dB; FM sensitivity 4 μV for 30 dB S/N ; separation 28 dB at 1 kHz; i-f/image rejection 60/50 dB; 7"W × 5⅛"D × 1¾"H $130

SR-304 AM/FM Radio/Cassette Player
In-dash unit with interchangeable nosepieces and trim plates for Japanese, European, GM X-body, Citation cars. Features volume, tone, balance, tuning controls; locking fast forward/rewind; AM/FM and stereo/mono switches; auto stop at end of play; tape-end light; cassette end loading. Output power 8 W rms at 1% THD, 75-10,000 Hz; FM usable sensitivity 8 μV for 30 dB S/N (mono); separation 24 dB at 1 kHz; i-f/image rejection ratio 45/54 dB: Wow and flutter 0.3% wrms; S/N ratio 35 dB; separation 40 dB. 6⁵⁄₁₆"W × 4⁵⁄₁₆"D × 1⅝"H..... $120

SR-300 AM/FM Radio/Cassette Player
In-dash unit with cassette end loading. Features volume, tone, balance, tuning controls; locking fast-forward/eject button; AM/FM and local/distant switches; stereo and tape-end indicators. Output power 7.5 W rms at 1% THD, 75-10,000 Hz. FM sensitivity 8 μV for 30 dB S/N; separation 24 dB at 1 kHz; i-f/image rejection 50/45 dB. Wow and flutter 0.3% wrms; S/N ratio 35 dB; separation 40 dB. 7"W × 4¹¹⁄₁₆"D × 1¾"H $90

SR-200 AM/FM Radio/Cassette Player
In-dash AM/FM-stereo receiver with cassette player. Features volume, tone, balance, tuning controls; AM/FM, local/distant, mono/stereo switches; illuminated dial in tape door; program-selector and MPX lights. Output power 7.5 W rms at 1% THD, 75-10,000 Hz. FM sensitivity 8 μV for 30 dB S/N; separation 24 dB at 1 kHz; i-f/image rejection 50/45 dB. Wow and flutter 0.3% wrms; S/N ratio 35 dB; separation 40 dB $90

Under-Dash Players

SS 30E AM/FM Radio/Cassette Player
Under-dash AM/FM radio/cassette player with Dynamic Noise Reduction. Features locking fast forward and rewind; metal-tape selector; auto stop; bass, treble, balance, fader controls. 45 W rms.....$90

SS-200 Cassette Player/Amp
Under-dash end-load cassette player with amplifier. Features left and right slide-type controls; fast-forward/eject and high/low tone switches; tape play light; auto stop at end of play. Output power 3 W at 1% THD, 100-8,000 Hz. Wow and flutter 0.35% wrms; S/N ratio 30 dB; separation 35 dB. 6¹⁄₁₆"W × 4⁹⁄₁₆"D × 1¾"H $35

SS-100 8-Track Player/Amp
Under-dash 8-track cartridge player with amplifier. Features slide-type volume, balance, tone controls; program selector; program indicator lights. Output power 3 W at 1% THD, 100-8,000 Hz. Wow and flutter 0.35% wrms; S/N ratio 30 dB; separation 35 dB. 5¾"W × 5½"D × 2¼"H $35

SCA 10 8-Track/Cassette Adapter
Unit allows cassettes to be played in 8-track tape decks. Cassette fits into adapter and adapter fits into home or car deck. Features locking fast forward, auto stop, tape play and stop switch, tape-end indicator light. Comes with embossed pouch for storage and transport $25

YAMAHA

YCT-800 Cassette Tuner
AM/FM stereo standard-chassis tuner with auto-reverse cassette player. Features FM Auto Noise Control System; electronic synthesized tuning; seek and manual tuning; presets for 6 AM/6 FM stations; local/distant switching; adjustable mute threshold; auto tape loading; full-logic controls; soft eject; key-off eject; Dolby B; compatible with normal, metal, CrO_2 tape; Music Search Repeat; blank skip; Maintenance Monitor System; illuminated cassette door; separate bass and treble controls; fader; continuously variable loudness; Spatial Expander circuit; adjustable output voltage; readouts for AM or FM, tape scan mode, tape type, memory in use, mono/stereo, local/distant, tape direction and speed, maintenance condition, tape search, and Dolby. Requires separate amplifier. FM tuner section: usable sensitivity 17.3 dBf, 2μV, 75 ohms; 50 dB quieting sensitivity 20.7 dBf, 3μV, 75 ohms; alternate channel selectivity 80 dB; image response ratio 60 dB; capture ratio 2 dB; S/N ratio 65 dB; THD 0.2% mono, 0.4% stereo; frequency response 30-15,000 Hz; separation 40 dB. AM tuner section: usable sensitivity 30 μV; selectivity 35 dB. Cassette section: wow and flutter 0.12% wrms; frequency response 40-16,000 Hz; S/N ratio 55 dB Dolby off, 65 dB Dolby on. 180mmW × 130mmD × 50mmH $600
YCT-600. Similar to YCT-800 except lacks tape scan and has 5 AM and 5 FM presets. Image response ratio 45 dB; FM tuner frequency response 40-14,000 Hz. 160mmW × 125mmD × 50mmH $450

YCR-900 Cassette Receiver
AM/FM stereo receiver with bottom-loading auto-reverse cassette player. Features Dolby B; electronic synthesized tuning; full-logic controls; auto seek and manual tuning; 6 AM/6 FM presets; adjustable muting threshold; FM Auto Noise Control; tape scan; key-off eject; blank skip; music search/repeat; metal compatibility; Maintenance Monitor System; continuously variable loudness; separate bass and treble; fader; Spatial Expander circuit; display of frequency, tape scan mode, spatial expansion, tape equalization, memory in use, mono/stereo, local/distant, tape direction and speed, maintenance condition, tape search, and Dolby in use. Notched for easy installation. Power output 18 W/channel into 4 ohms with both channels driven at 1 kHz with 8% THD. FM tuner section: usable sensitivity 17.3 dBf, 2μV, 75 ohms; 50 dB quieting sensitivity 20.7 dBf, 3μV, 75 ohms; alternate channel selectivity 80 dB; image response ratio 60 dB; capture ratio 2 dB; S/N ratio 65 dB; THD 0.2% mono, 0.4% stereo; frequency response 30-15,000 Hz; separation 40 dB. AM tuner section: usable sensitivity 30 μV; selectivity 35 dB. Cassette section: wow and flutter 0.12% wrms; frequency response 40-14,000 Hz; S/N ratio 55 dB Dolby off, 65 dB Dolby on. 180mmW × 135mmD × 50mmH $550
YCR-700. Similar to YCR-900 except lacks tape scan and has 5 AM and 5 FM presets. Power output 5 W/channel into 4 ohms with both channels driven at 1 kHz with 8% THD $480
YCR-500. Similar to YCR-700 except lacks blank skip, music search and repeat, separate bass and treble $400

VCRs and Video Cameras

(Continued from page 83.)

VC3630 VHS Videocassette Recorder
Front-loading VCR with 16-function infrared remote control. Features auto rewind; audio balance control; index search; electronic tape counter; tape-rewinding indicator; an editing jack; and a maximum 240-minute tape 1-touch record function; 2-channel audio; Dolby noise reduction; audio dubbing; and all typical high-end special effects modes $1,200

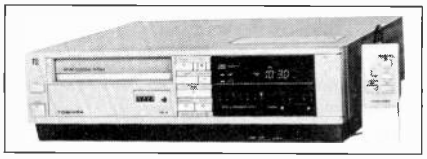
VC2960 VHS Videocassette Recorder
Front-loading VCR features electronic function display; 1-touch record; electronic tape counter; auto rewind..... $780

Video Cameras
VCC120. Portable, compact, full-featured camera with Newvicon tube with 10-lux light sensitivity. Features 8 programmable memories; 43-character title and date generator; fade in/out; macro function; 2-speed 6× zoom f/1.3 lens; 3 lbs $996
VCC130. Video camera combines attached shoulder support with an adjustable top-mount electronic viewfinder and boom stereo microphone. Features Newvicon tube; variable speed 8x zoom with f/1.6 lens; VCR remote control; 5.5 lbs $1,300
VC114. Compact color video camera with f/1.4 zoom lens and electronic viewfinder. Features auto/manual iris; 270-line horizontal resolution; $750

TOSHIBA

V-S36 Beta Hi-Fi Videocassette Recorder
Stereo Beta-format VCR with Beta Hi-Fi system. Features 4 heads; variable slow motion in forward and reverse; super-still Beta in II and II; 117-channel synthesizer tuning; 20-function wireless remote control; 14-day/8-program timer; auto rewind; electronic digital memory counter. Frequency response 20-20,000 Hz; THD 0.03%; wow and flutter 0.005%; dynamic range 80 dB $1,200

V-M32 Beta Videocassette Recorder
Front-loading Beta-format VCR with dual speeds (Beta II and III). Features 14-position electronic tuning with 105-channel capability; 14-day/8-program timer;



rewind; digital tape counter..... $600

IK-2000 Color Video Camera
Portable lightweight color video camera with f/1.4 zoom (10-40mm) lens. Features through-the-lens focusing; ½" saticon tube; auto iris; external mic; auto white balance; low-light capabiliity (50 lux). Horizontal resolution >250 lines; video S/N >46 dB. 2.0 lbs..... $500

ZENITH

VR9775PT Beta Videocassette Recorder
14-day/4-event Beta-format programmable videocassette recorder. Features full-function wireless remote control; electronic index counter with cue marker; direct camera connector; Beta III/II record, Beta I/II/III playback; low-profile design; picture speed search; slow-motion; stop-action; double-speed; frame-by-frame advance in forward and reverse; 14-position touch-command tuning system; feather-touch logic transport controls; LED remaining-tape indicator; electronic tape counter with numeric display; auto clean edit control; fluorescent tape-speed indicator; autorewind at end of play; audio dub; program error indicator; 5 hrs record/play time. Horizontal resolution >240 lines; video input/output level 1.0 V p-p into 75 ohms; audio input/output level −20/−5 dB; power consumption 30 W; 16 11/16"W × 14 3/8"D × 3 5/16"H; 20 lb 4 oz $1,400

VR9760W Beta Videocassette Recorder
Five-hr record/play Beta-format videocassette recorder. Features 14-day/4-event programmability; 14-position touch-command tuning; speed search; triple speed; frame-by-frame advance; variable-speed slow motion; pause/stop action; auto program index; auto rewind; audio dub; electronic tape counter; bright/dim switch; Beta II/III record/play. Horizontal resolution; S/N ratio >45 dB luminance; video input/output 1.0 V p-p; audio input/output −60 dB mic, −10 dB line/−5 dB; frequency range 50-10,000 Hz Beta II, to 7 kHz Beta III; audio S/N ratio >40 dB; audio distortion <4% BII, <4.5% BIII; power consumption 60 W; 19½"W × 15¼"D × 6½"H; 36 lb 6 oz $1,250

VR8900W Beta Videocassette Recorder
Touch-command channel selection Beta-format videocassette recorder with dual-function remote control and 24-hr/1-event programmability. Features Beta III/II record, Beta III/II/I play; speed search in forward/reverse play; pause/stop action; 5-hr record/play time; electronically controlled touch-command channel selection; digital tape counter; front loading; full-logic microprocessor-controlled feather-touch transport controls. Video S/N ratio >45 dB luminance; mic input level −60 dB; audio output impedance <600 ohms; frequency response 50-10,000 Hz Beta II, to 7 kHz Beta III; power consumption 48 W; 18⅛"W × 15"D × 6⅝"H; 30 lb 14 oz $900

VR8500PT Beta Videocassette Recorder
Beta-format videocassette recorder with 5-hr record/play capability, 24-hr/1-event programmability, and Beta II record and Beta III/II playback. Features picture speed search in forward/reverse; optional remote video action control; touch-command channel selection; pause/stop action; digital tape counter; full-logic microprocessor-controlled feather-touch transport controls. Video S/N ratio >45 dB luminance; mic input −60 dB; audio output impedance <600 ohms; frequency range 50-10,000 Hz BII, to 7 kHz BIII; power consumption 48 W; 18⅛"W × 15"D × 6⅝"H; 30 lb 14 oz $800

VR9800/VRT9850 Portable VCR/Tuner System
Beta-format portable videocassette recorder with separate component tuner/timer. VCR features modular design; 4-way ac/dc operation (dc car cord, ac power supply, rechargeable battery pack, tuner/timer); multi-speed playback (picture speed search at about 15× normal speed in BIII and 10× normal speed in BII, pause, frame-by-frame advance, slow motion in forward/reverse, double-speed forward play); dew warning indicator; auto heater to evaporate moisture; battery caution indicator; electronic time counter; tape-speed indicator; auto rewind; auto clean edit control; direct camera connector; audio dub; defeatable display light; Beta III/II record, Beta III/II/I play. Horizontal resolution 240 lines; video S/N ratio >40 dB; mic input level −60 dB; audio frequency range 50-10,000 Hz BII, to 7 kHz BIII; power consumption 8.4 W dc; 12.4"D × 8.75"W × 3.25"H. Tuner/timer features compact modular design; 14-position touch command tuning; 14-day/4-event programmability; wireless infrared remote control; multi-speed playback features (picture speed search, stop action, frame-by-frame advance, normal speed, double-speed forward play); program error indicator; auto rewind; pushbutton signal-seeking vhf/uhf tuning control; power source for VR9800 VCR; quick Ni-Cd battery charger; 400-W unswitched accessory ac outlet; closed-caption recording ability (requires separate decoder for playback). Video input/output level 1.0 V p-p; audio input/output −5 dB; power consumption 20 W normal, 60 W charge; 12"D × 8.46"W × 3.15"H; 7.3 lb. System price $1,425
VRP9852. Ac battery eliminator/recharger for VR9800 VCR $150
VRB9851. Rechargeable Ni-Cd battery pack for VR9800 VCR. Provides up to 1 hr recording or 2 hrs playback time; recharges in 1 hr with ac power supply or tuner/timer unit $50

Video Cameras
VC1800. Color video/sound camera with f/1.4 6:1 variable-speed power zoom lens with macro focus. Features infrared auto-focus system; adjustable-mount electronic viewfinder; telescoping boom microphone; built-in title generator; digital stopwatch display; power-save switch; remote pause/stop/start control; auto iris adjust; record/review; color-correction filter; mic input jack. Minimum illumination 30 lux; microphone input level −65 dB, low impedance; power consumption 6.4 W at 12 V dc; 11.7" D × 8.7" H × 8.3" W; 6 lb..... $1,350
VC1600. Color video/sound camera with combined zoom lens (f/1.4, 11-70 mm) and macro lens; auto/manual iris control; ⅔" single color tube; signal system EIA standards, NTSC color; maximum illumination 40 lux at f/1.4; auto light control range 40-100,000 lux; K-type 14-pin VCR connector; mini-jack microphones (−60 dB); electronic viewfinder (supplied with 1½" 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); 13⅞"D × 8⅞"W × 7⅞"H, including zoom lens, viewfinder, and grip $1,050
VC1200. Color video/sound camera with f/1.8 3.6:1 (14.5-52 mm fl) zoom lens with macro focus; electronic viewfinder; electret condenser microphone; remote pause/stop/start control; power-saver switch; auto iris adjust; tri-electrode pickup tube; mic input jack; record/review switch; warning indicators; white balance indicator; auto light sensitivity control; auto gain control; color temperature control; pistol-grip handle with wrist strap. Video output 1 V p-p unbalanced into 75 ohms; video S/N ratio >45 dB; minimum illumination 100 lux; power consumption 6.7 W at 12 V dc; 305 mm D × 245 mm H × 70 mm W; 1.7 kg..... $750

6 Headphones

AIWA

HP-T10 Stereo Headphones
Deluxe ultra-lightweight mini stereo headphones. Features 3-way acoustic super loudness left/right controls; 2 extra ear covers; headphone jack converter $65

HM-7Y Mini Stereo Headphones with Microphones
Mini ultra-lightweight stereo headphones with binaural microphones. Perfect for concert recording. Features built-in unidirectional condenser mics; mic on/off switch; windscreens $45

HP-A50Y Stereo Headphones
Ultra-lightweight miniature stereo headphones. Features 2 extra ear covers; headphone jack converter $35

HP-V2 In-Ear Type Stereo Headphones
In-ear stereo headphones with stereo/mono switch. Features rotary volume adjustor. Frequency response 20-20,000 Hz. > 0.2 oz (without cord)..... $20

AKG

K-340 Stereo Headphones
Two-way electrostatic/dynamic headphone with fixed-charge electrostatic transducer/dynamic moving-coil transducer and passive diaphragms in each earcup. Plugs into headphone jack of receiver or amplifier or can be connected directly across speaker output terminals. Frequency range 15-25,000 Hz; SPL 117 dB, at 0.1% THD; nominal impedance 400 ohms; maximum continuous input 200 mW/channel at 117 dB SPL; includes three 10-ft 4-conductor cables with 3-conductor ¼" stereo phone plug; 13.5 oz less cable $195

K-4 Mini Stereo Headphones
Two-way electrostatic/dynamic headphones weighing < 2.3 oz. Features 2 fixed-charge electrostatic high-frequency, 2 dynamic moving-coil low-frequency transducers; adapter plug that fits home and portable equipment; unique self-adjusting headband. Frequency response 20-25,000 Hz; nominal SPL 119 dB at < 0.5% THD; impedance 400 ohms; maximum continuous input 200 mW; 10-ft cable with stereo plug and mini-plug adapter $99

K-240 Free-Field Headphones
Free-field stereo headphones; dynamic moving-coil transducer and 6 passive radiators in each circumaural cup. Frequency range 15-20,000 Hz; impedance 4-600 ohms; maximum SPL 119 dB; supplied with 10-ft 4-conductor cable and ¼" phone plug; 10 oz $99

K-141 Monitor Headphones
Supra-aural stereo dynamic professional monitoring headphones with moving-coil transducers. Frequency range 20-20,000 Hz; maximum SPL 120 dB; impedance matches 4-600 ohms; 9.8-ft 4-conductor cable and standard 3-conductor stereo phone plug; 9 oz $80

K-130 Stereo Headphones
Stereo headphones with dynamic moving-coil transducers. Frequency range 20-20,000 Hz; maximum SPL 119 dB; impedance 200 ohms; 10-ft 4-conductor cable with three-conductor stereo phone plug; 4 oz $55

K-40 Stereo Headphones
Ultra-lightweight supra-aural stereo headphones with dynamic moving-coil transducers. Frequency range 30-18,000 Hz; maximum SPL 117 dB; matches 4-200 ohm outputs; 10-ft 4-conductor cable; 3-conductor stereo phone plug; 2.7 oz $35
K-40M. Same as K-40 except with 4-ft cable and mini stereo phone plug $35

K-1 Folding Mini Stereo Headphone
Folding mini stereo headphone with unique scissor-type headband. Fits into carrying case that hangs on belt. Frequency range 30-18,000 Hz; nominal SPL 98 dB at < 1% THD. With 1.4m (about 4 ft 8") cable and mini stereo plug. Includes mini plug-to-plug plug adapter; 1.6 oz $29

AUDIO-TECHNICA U.S.

ATH-7 Stereophones
Electret condenser stereophones. Frequency response 20-22,000 Hz ±2 dB; sensitivity 98 dB SPL at 1 kHz (O dB = 0.00 μbar/V); impedance 4-16 ohms. Includes impedance-matching adapter with headphone/speaker switching and normal/high-level LED indicators; 8¼-ft cord, adapter size 3½"H × 2⅜"W × 7"D; 7.4 oz without cord $150

ATH-6 Stereophones
Electret condenser stereophones. Frequency response 40-22,000 Hz ±2 dB; sensitivity 98 dB SPL at 1 kHz; impedance 4-16 ohms; includes impedance-matching adapter with headphone/speaker switching; 8¼-ft. cord; adapter size 1⅜"D; 7.4 oz without cord $100

ATH-2 Stereophones
Dynamic planar moving-coil stereophones. Frequency range 30-20,000 Hz; sensitivity 93 dB SPL at 1000 Hz; impedance 4-16 ohms; HD 0.7% maximum at 110 -dB SPL; 8.25-ft cord; 7 oz $50

ATH-1 Stereophones
Dynamic planar moving-coil stereophones. Frequency range 30-20,000 Hz; sensitivity 93 dB SPL at 1 kHz; impedance 4-16 ohms; 8¼-ft cord; 4.75 oz ... $30

ATH-0.1 Stereophones
Moving-coil dynamic stereophones. Frequency range 35-20,000 Hz; sensitivity 100 dB at 1 kHz, 1 mW; matching impedance 4-16 ohms; acoustical foam earcushions; 1.5-m cord; ⅛" plug; 1.8 oz without cord; black $30
ATH-0.2F. Folding lightweight stereo headphones with case. Frequency range 35-20,000 Hz; sensitivity 105 dB SPL at 1 kHz, 1 mW; impedance 4-16 ohms $40
ATH-0.3. Pendulum adjustment. Frequency range 30-20,000 Hz; 2.5-m cord; ¼" phone plug; 1.9 oz without cord $50
ATH-0.4. Super-lightweight (1.6 oz) stereo headphones. Frequency range 25-20,000 Hz; 2.5-m cord with mini stereo plug and adapter $60
ATH-0.5. Same as ATH-0.3 except frequency response 25-20,000 Hz; brown $80
ATH-0.6. Same weight as ATH-0.4 but frequency range improved to 20-20,000 Hz; impedance 4-16 ohms matching impedance $90

Eskimo® Stereophone Earmuffs
For cold-weather listening; quickly convert lightweight, portable stereophones to musical earmuffs or to improve fit and increase comfort indoors; fit models with 35- or 45-mm elements; nonallergenic material $8

BANG & OLUFSEN

U-70 Headphones
Orthodynamic stereo headphones. Frequency range 16-20,000 Hz; sensitivity 8 mW for 94-dB SPL; continuous load 2 W; distortion 1% maximum; impedance 140 ohms; 10-ft straight cord with 3-conductor phone jack; 10.6 oz $100

BEYER DYNAMIC, INC.

DT-48 Dynamic Headphones
Moving-coil dynamic headphones. Frequency response 16-20,000 Hz ±2 dB; supplied with 10-ft straight cord $200

DT-880 Dynamic Headphones
Stereo headphones utilize rare-earth magnet and vibrationless membrane. Semi-open design permits close coupling for full bass response with hear-

through external access. Frequency range 15-25,000 Hz; sensitivity 94 dB SPL with <1% harmonic distortion; nominal impedance 600 ohms; 6-ft coiled cord $135

DT-550. Similar to DT-88, except frequency range 10-22,000 Hz; sensitivity 95 dB SPL $93

DT-330 MKII. Similar to DT-550, except frequency range 15-18,000 Hz; sensitivity 90 dB SPL; nominal impedance 40 ohms $60

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 can be independently wired; removable ear cushions; high-impact plastic and stainless steel construction; field serviceable $150

DT-660 MKII Bass-Reflex Stereo Headphones

Stereo headphones with an enclosed bass-reflex system incorporates ducted-port and specially designed venting system to improve bass response. Frequency range 15-25,000 Hz; maximum continuous power level approximately 113 dB at 1 kHz; impedance 600 ohms; sound-pressure level 96 dB at 1 kHz; ambient isolation greater than −16 dB; 6-ft flat cord, extends to 12 ft $123

DT-108 Moving-Coil Mic/Headphone

Moving-coil stereo headphones with noise-canceling microphone. Frequency range 40-12,000 Hz; SPL 120 dB; mic rotates 180°; foam-filled ear cushions and padded headband; field serviceable..... $133

DT-100 Dynamic Headphones

Moving-coil dynamic headphones. Frequency range 30-18,000 Hz; sensitivity 1 mW at 400 Hz for 110-dB SPL; impedance 5, 100, 400, 2000 ohms; maximum input 1 W/phone $110

DT-96A Dynamic Headphones

Moving-coil dynamic headphones. Frequency range 30-17,000 Hz; sensitivity mW at 400 Hz for 110-dB SPL; impedance 5-200 ohms; maximum input 100 mW/phone; 5-ft cord; 8 oz $98

DT-220 Dynamic Headphones

Closed-ear dynamic headphones. Frequency range 20-20,000 Hz; sensitivity 1 mW for 100 dB SPL; 600-ohm impedance; maximum input 42 mW (for 116-dB SPL); 260 g (without cable)..... $75

DT-302 Lightweight Headphones

Open-air high-velocity dynamic headphones connect directly to high- or low-impedance outputs. Frequency range 20-20,000 Hz; rated power 7 mW (2.1 V) for 600 ohms; sponge ear cushions; stereo phone plug; 2.3 oz without cord..... $38

DT303. Same as DT302 but designed for TV listening; has volume control built into its 22.5-ft cable $45

DT-301 Single Headphone

Single earphone for use with portable cassette recorders, transistor radios, dictating machines, TV receivers. Supplied with 5-ft cord and miniature phone plug..... $20

EMPIRE

LW2 Stereo Headphones

Lightweight open-air stereo headphones with leatherette inner band, foam ear cushions, mini-plug adapter..... $35

LW1 Stereo Headphones

Ultra-lightweight stereo headphones with samarium-cobalt magnets, foam ear cushions, and mini-plug adapter..... $20

LW3 Stereo Headphones

In-the-ear type headphones with added foam ear cushions and mini-plug adapter $20

EVG, INC

EP-1 Ear Puffs™ Stereo Headphones

Stereo headphones designed to fit directly in ears without headband. Features samarium-cobalt transducers; 36" cord with 3.5-mm mini stereo plug; extra set of foam earpads. Frequency range 20-20,000 Hz. Total weight 0.5 oz $25

EP-4. Frequency range 80-13,000 Hz $13

GC ELECTRONICS

90-112 Stereo Headphones

High-velocity stereo headphones with 10-ft coiled cord terminated in ¼" phone plug. Frequency range 20-20,000 Hz; maximum input 100 mW; sensitivity 100 dB SPL at 1 V; impedance 4-16 ohms; 6 oz without cord $16.95

90-107 Stereo Headphones

Ultra-lightweight stereo headphones with samarium-cobalt drive elements. Features soft foam ear pads; 3.5-mm stereo plug; ¼" phone plug adapter; 5.5-ft Y cord. Frequency range 20-20,000 Hz; maximum input 100 mW; impedance 4-100 ohms; 1.5 oz without cord $11.95

90-102 Stereo Headphones

Stereo headphones with left, right volume controls, 10-ft coiled cord with ¼" phone plug and stereo/mono switch. Frequency range 30-18,000 Hz; maximum input 550 mW; impedance 4-8 ohms; 11.75 oz without cord $11.95

90-116 Collapsible Headphones

Super lightweight dynamic headphones fold up to fit inside cassette-size storage case. Features 3-ft cord; ¼" phone adapter. Frequency response 20-20,000 Hz; impedance 32 ohms; max input 100 mW. 1.02 oz without cord $10.95

90-115 Micro Stereo Earphones

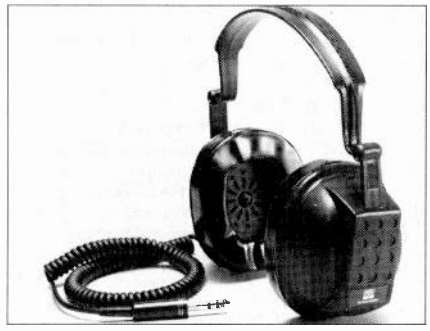
Micro stereo earphones that fit inside the ear with no headband. Features 3.5-ft Y cord with extra foam ear pads; 3.5 mm stereo plug fits all personal portables; comes in cassette-size carrying case. Frequency response 20-20,000 Hz; impedance 32 ohms; max input 50 mW each channel. 0.17 oz without cord $9.95

90-114 Featherweight Headphones

Ultra-lightweight dynamic stereo headphones with samarium cobalt transducers. Features adjustable metal headband; soft foam ear pads; 4.5-ft Y-spiral straight cord; 3.5 mm plug for all personal portables. Includes adapter for ¼" stereo headphones jacks. Frequency response 20-20,000 Hz; impedance 32 ohms; max input 300 mW. 0.88 oz without cord $8.95

90-100 Stereo Headphones

Stereo headphones with padded ear pads, 10-ft



coiled cord with ¼" phone plug. Frequency range 20-15,000 Hz; maximum input 500 mW; impedance 4-16 ohms; 8 oz without cord $8.95

JVC

H-707 Moving-Coil Headphones

Moving-coil design weighs only 5.64 oz and features 46-mm diameter × 38-micron thick diaphragms; open-back design; double headband for added comfort. Frequency range 20-20,000 Hz; impedance 63 ohms; sensitivity 104 dB/mW at 1 kHz; maximum input 100 mW; 9.75-ft cord $60

H-505. Similar to H-707 except 8-ohm impedance; 106-dB sensitivity; 4.58 oz..... $40

H-404. Similar to H-505 except 16-ohm impedance; 102-dB sensitivity; 3.7 oz $30

Super-Lightweight Stereo Headphones

Lightweight stereo headphones designed for portable listening; come with mini-to-standard plug adapter.

H-M9T $50

H-M7T $40

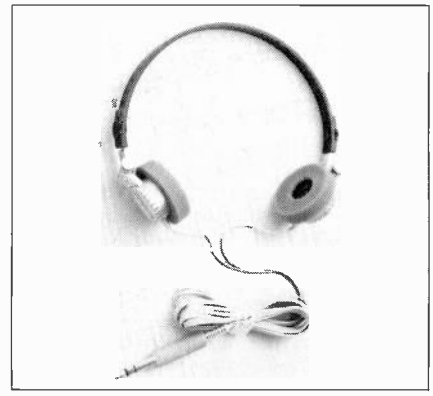
H-F1 In-Ear Stereo Headphones

Lightweight stereo headphones fit directly in ear without headband. Includes plug adapter for use with mono as well as stereo mini-jacks, 4-ft Y cord, and spool for storage. Frequency response 20-20,000 Hz; impedance 32 ohms; sensitivity 102 dB/1 mW. 0.17 oz without cord, 0.5 oz with cord $30

KENWOOD

KH-7L Stereo Headphones

Dynamic stereo headphones with 1¼" 12μ polyester film drivers. Features extra pair of ear pads and ¼" plug; 9.8-ft Y-type cord with standard ⅛" plug. Fre-



quency range 20-20,000 Hz; sensitivity 100 dB/mW; maximum input 100 mW/channel; impedance 30 ohms; 1.6 oz without cord $75

KH-5L Stereo Headphones

Dynamic stereo headphones with 1¼" 12μ polyester film drivers. Features extra pair of ear pads and ¼" plug; 9.8-ft Y-type cord with standard ⅛" plug. Frequency range 25-20,000 Hz; sensitivity 100 dB/mW; maximum input 100 mW/channel; impedance 30 ohms; 1.6 oz without cord $55

KH-3L Stereo Headphones

Dynamic stereo headphones with 1¼" 16μ polyester film drivers. Features extra pair of ear pads and ¼" plug; 4.9-ft Y-type cord with standard ⅛" plug. Frequency range 35-20,000 Hz; sensitivity 102 dB/mW; maximum input 250 mW/channel; impedance 40 ohms; 1.1 oz without cord $33

KH-M5 Stereo Headphones

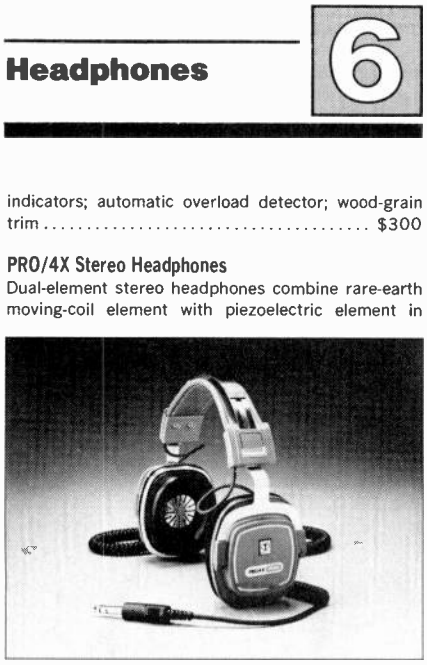
Dynamic stereo headphones with 17/32" high polymer film drivers. Features 4.7-ft Y-type cord with standard ⅛" plug; extra ear pads and ¼" plug. Frequency range to 20,000 Hz; sensitivity 102 dB/mW; maximum input 50 mW/channel; impedance 32 ohms; 5g without cord, 15g with cord $20

KOSS

ESP/10 Electrostatic Stereophones

Electrostatic circumaural stereo headphones with energizer. Headset bandpass response 20-22,000 Hz ±2 dB; sensitivity for 1.9 V rms at 1 kHz into E/10 energizer, 2.0 V rms pink noise 100-dB SPL; THD 0.38% at 1 kHz, 100 dB SPL; radiating surface area of electrostatic element 25 cm²/channel; black with silver accents; 10-ft cord. Energizer bandpass response −3 dB at 15 Hz and 24 kHz; hum and noise 75 dB below sensitivity reference level (100 dB SPL); phase response at +30° at 20 Hz, −30° at 15 kHz; input impedance 2 ohms minimum at 20 and 20 kHz, 180 ohms maximum at 800 Hz; minimum recommended amplifier power 35 W/channel; overload voltage (for relay cutout) 5.3 V rms pink noise into energizer; semipeak-indicating VU meters; LED overload

Headphones



indicators; automatic overload detector; wood-grain trim $300

PRO/4X Stereo Headphones
Dual-element stereo headphones combine rare-earth moving-coil element with piezoelectric element in each earcup to provide a 10-40,000 Hz frequency range. Closed-design headphones weigh only 10 oz, come with coiled cord; labeled left/right earcups; adjustable headband $85

HV/XLC Stereophones
Lightweight high-velocity stereophones. Frequency range 15-35,000 Hz; sensitivity for 100 dB SPL 1.0 V rms at 1 kHz. Features volume, balance controls/cup; variable density contoured circumaural earcushions with twist-lock mechanism for easy removal; 10-ft coiled cord; 8.4 oz less cord $80
HV/X. Same as HV/XLC without volume, balance controls; impedance 90 ohms; 7.7 oz less cord $70

HV/1A Stereophones
High-velocity stereophones with low-mass Decilite drivers for 15-30,000 Hz coverage; operates from outputs of 3.2 to 600 ohms; distortion 0.5% at 100 dB SPL; sensitivity 0.9 V rms for 100 dB SPL, handles 5 V rms continuous with provisions for 14-dB SPL transient peaks; 157-ohm impedance; acoustical sponge ear cushions; extendable headband with self adjusting, pivoting yokes, soft padded vinyl cover; 3-conductor coiled cord (10-ft extended); 10.1 oz $50
HV 1LC. Same as HV/1A except volume/balance control per earcup; sensitivity 1.1 V rms for 100 dB SPL; impedance 132.5 ohms; 10.8 oz $60

K/6XLC Dynamic Stereophones
Dynamic stereo headphones with low-profile (57-mm) element with Mylar diaphragm and separate volume controls. Frequency range 10-22,000 Hz; < 1% THD at 1 kHz, 100 dB SPL; sensitivity 1.0 V rms at 100 dB SPL; 10 oz without cord $40
K/6X. Same as K/6XLC, except lacking volume controls $30

KSP Sound Partner Stereophones
Featherweight stereophone for on-the-go radio, tape listeners. Folds to compact size to fit into denim tote bag (supplied). Frequency range 20-17,000 Hz; sensitivity 100 dB SPL pink noise at 1 volt; impedance 43 ohms; total weight 3.5 oz, including 9-ft cord. Comes with accessory adapters to fit almost any sound system $30

K/20 High-Velocity Stereophones
High-velocity headphones with low-profile element. Features 8-ft Y cord; cushioned washable foam ear pads. Frequency range 18-20,000 Hz; sensitivity 0.8 V rms $20

P/19 Portable Stereophones
For personal, portable listening. Can be used with portable radios, cassette players, TV receivers, home receivers, amplifiers with included 6.36-mm adapter. Frequency range 20-17,000 Hz; impedance 43 ohms (ideal for battery-powered products for low power drain); 6-ft cord with 3.5-mm mini stereo plug . $20

MURA

HV-190 Stereo Headphones
Stereo headphones with ferrite-magnet speaker system. Frequency range 20-20,000 Hz; impedance matching 8-70 ohms; maximum input 250 mW; lightweight 12-ft coiled cord with ¼" stereo plug; 8 oz less cord $30

SB-60 Stereo Buds Headphones
Stereo speakers that fit directly into ears. Features 4-ft cord with 3.5-mm stereo plug $25

HV-100 Stereo Headphones
Lightweight vented high-velocity stereo headphones with thin Mylar diaphragms; voltage control; stereo/mono switch. Frequency range 30-15,000 Hz; 10-ft coiled cord with plug $20

SP-504 Headphones
Stereo headphones with 3" dynamic drivers. Features separate volume, tone controls on each earcup, stereo/mono switch. Frequency range 30-18,000 Hz; impedance 8 ohms; adjustable padded headband; 10-ft coiled cord with plug $22
SP-503. Similar to SP-504 minus tone controls . $17
SP-502. Similar to SP-503 minus stereo/mono switch; has 2¼" dynamic drivers $15
SP-500. Similar to SP-502 minus volume controls; frequency range 35-15,000 Hz; 8-ft cord $12

SP-294 Stereo Headphones
Stereo headphones with 2¼" dynamic drivers; individual volume controls; stereo/mono switch. Frequency range 40-15,000 Hz; adjustable soft leatherette padded headband and earcups; 10-ft cord $14

SP-94 Stereo Headphones
Lightweight dynamic stereo headphones with 2¼" drivers. Frequency range 40-15,000 Hz; impedance 8 ohms; oversize earcups for greater comfort; 8-ft cord with plug $9

Red Set Series

Red Set VII
Deluxe ultra-lightweight (1.6 oz less cord) stereo headphones with rare-earth drivers. Frequency range 20-20,000 Hz; sensitivity 98 dB at 1 kHz; maximum input 0.2 W; matching impedance 4-25 ohms; 4-ft cord with mini plug; 8-ft extension cord with ¼" stereo plug included $35
Red Set V. Similar to Red Set VII except weight 2 oz; 6.6-ft cord; no extension cord $25

Red Set III Stereo Headphones
High-velocity stereo headphones with Mylar diaphragms and subminiature ultra-lightweight samarium-cobalt magnets and anoxic copper wire designed to reduce signal attenuation. Frequency range 20-20,000 Hz; sensitivity 98 dB at 1 kHz; maximum input 0.2 W; matching impedance 4-25 ohms; 6.6-ft cord with ¼" 3-conductor stereo plug; 1.6 oz less cord $25

Red Set IV Stereo Headphones
Stereo ear speakers without headband. Features 4-ft cord with mini plug; flat and domed interchangeable earpads; carrying case. Weighs only 0.85 oz less cord $20

Red Set II Stereo Headphones
Ultra-lightweight stereo headphones with folding headband, cable terminated in 3.5-mm mini plug, comes with ¼" plug adapter. Frequency range 20-20,000 Hz; sensitivity 100 dB at 1 mW; maximum input 0.1 W; matching impedance 4-35 ohms; samarium-cobalt magnets with high-velocity Mylar diaphragms; 6.6-ft cord with 0.138" 3-conductor stereo plug $16
Red Set I. Similar to Red Set II except no folding headband; matching impedance 4-30 ohms; ¼" stereo plug $15

Red Set hs2 Headphones
Ultra-lightweight (1.8 oz less cord) stereo headphones with samarium-cobalt rare-earth drivers. Features 4-ft cord with mini plug; folding headband $14

NAKAMICHI

SP-7 Stereo Headphones
Lightweight stereo headphones designed for broad, flat frequency response, extended dynamic range, and minimal distortion. Utilizes 25-micron-thick polyester film with 40.5 mm diameter and 18.3 mm voice coil. Three-meter cable, standard ¼" phone plug. Frequency response 20-20,000 Hz; impedance 45 ohms; max input 100 mW $70

NUMARK ELECTRONICS

FLS200 Stereo Headphones
Stereo headphones with film diaphragm/samarium-cobalt magnet transducers. Features separate left, right volume controls on cable; adapters for ¼" stereo phone plug to 3.5-mm stereo mini plug and ¼" phone plug to 3.5-mm mono plug adapters; extra ear pads. Frequency range 20-25,000 Hz; sensitivity 100 dB; impedance 20 ohms; maximum power 100 mW; 10-ft cord with ¼" stereo phone plug; 1.5 oz $30

FLS75 Stereo Headphones
Stereo headphones with film diaphragm/samarium-cobalt magnet transducers. Features 7-ft cord with ¼" stereo phone plug; 3.5-mm stereo plug adapter. Frequency range 20-20,000 Hz; sensitivity 96 dB; impedance 35 ohms; maximum power 100 mW; 1.5 oz $25

FLS150 Stereo Headphones
Stereo headphones with film diaphragm/samarium-cobalt magnet drivers; 7-ft cord with 3.5-mm mini stereoplug; ¼" stereo phone plug adapter; folding headband. Frequency range 20-20,000 Hz; sensitivity 96 dB; impedance 35 ohms; maximum power 100 mW; 1.5 oz $20

HV100 Dynamic Stereo Headphones
Ultra-lightweight dynamic stereo headphones with super-thin Mylar diaphragm drivers; 8-ft cord with stereo phone plug. Frequency range 20-20,000 Hz; impedance 32 ohms; 6 oz $18

FLS310 Featherlite Stereo Headphones
Stereoscope-style stereo headphones with film diaphragm/samarium-cobalt magnet drivers; 4¼-ft cord with 3.5-mm mini stereo plug. Frequency range 20-22,000 Hz; sensitivity 100 dB; impedance 20 ohms; maximum power 100 mW; 1.4 oz $17.35

FLS300 Stereo Headphones
Ear-clip-style featherlite stereo headphones with film diaphragm/samarium-cobalt magnet drivers; 4¼-ft cord with 3.5-mm mini stereo plug. Frequency range 20-22,000 Hz; sensitivity 100 dB; impedance 20 ohms; maximum power 100 mW; 0.7 oz... $16.75

FLS25 Stereo Headphones
Stereo headphones with film diaphragm/samarium-cobalt magnet drivers; 7-ft cord with 3.5-mm stereo plug; ¼" stereo phone plug adapter. Frequency range 80-20,000 Hz; sensitivity 92 dB; impedance 30 ohms; maximum power 100 mW; 1 oz..... $14.95

PHILIPS

6301 Mini Stereo Headphones
Dynamic moving-coil compact stereo headphones with samarium-cobalt magnets. Designed for portable use. Supplied with 10-ft cable with mini-plug; ¼" phone plug adapter for home use. Frequency range 20-20,000 Hz; impedance 32 ohms; sensitivity —97 dB SPL at 1 mW; 2 oz $48

6211 Mini Stereo Headphones
Dynamic moving-coil compact stereo headphones with samarium-cobalt magnets. Designed for portable use. Supplied with 10-ft cable with mini-plug; ¼" phone plug adapter for home use. Frequency range

20-20,000 Hz; impedance 32 ohms; sensitivity −92 dB SPL at 1 mW; 2 oz $24

PICKERING

OA-7 Stereo Headphones
Lightweight open-audio design; REE used in permanent-magnet compound; foam-cushioned headband; earpiece yokes incorporate pivoting system enabling snug fit. Nominal impedance 100 ohms; frequency response 20-22,000 Hz ±5 dB; sensitivity 110-dB SPL at 0.2 V; maximum input 0.1 W continuous; distortion 0.5% at 110-dB SPL; supplied with flat 10-ft cord; 6 oz $70

OA-5A Stereo Headphones
Lightweight open-audio stereo headphones with 1.5" samarium-cobalt dynamic drivers. Impedance 100 ohms 10% at 1 kHz; maximum input 0.25 W/channel continuous; sensitivity 110 dB SPL at 0.2 V input, 1 kHz/channel; frequency range 20-22,000 Hz; distortion 0.25% at 110-dB SPL; adjustable padded vinyl headband with pivot yokes and nylon-tricot-covered foam ear cushions; 10-ft 4-conductor cord with no-break connector; includes adapter plug for use with portable radios, TVs, tape recorders; 5 oz (less cord) $60

OA-4 Stereo Headphones
Lightweight stereo headphones with ¾" dynamic high-velocity drivers with synthetic film diaphragms and samarium-cobalt magnets. Frequency range 10-20,000 Hz; distortion 0.5% at 100-dB SPL, 1000 Hz; sensitivity 105 dB at 1 kHz/channel; input impedance 40 ohms at 1 kHz; adjustable lightweight headband with silver-dollar-sized multi-density polyurethane foam earpieces; includes adapter and 7-ft Y-type straight cord with plug; 2 oz (less cord) ...$50

OA-2 Featherfone™ Stereo Headphones
Open-audio stereo headphones. Feature adapter plug for stereo/mono used; adjustable lightweight headband; earcushions with multidensity polyurethane; 7-ft Y-type straight cord with plug adaptors for mono and stereo. Designed for all portable applications. Frequency range 10-20,000 Hz; impedance 40 ohms at 1 kHz; maximum input power 0.5 W; 2 oz $35

OA-202 Stereo Headphones
Open-audio stereo headphones with dynamic high-velocity drivers with 1" polyester diaphragms. Frequency range 10-20,000 Hz; distortion 0.5% at 110-dB SPL, 1 kHz; sensitivity 100 dB SPL at 0.25 V input, 1 kHz/channel; input impedance 50 ohms at 1 kHz; maximum input 0.2 W/channel continuous; adjustable padded vinyl headband with soft vinyl-covered foam earcushions; includes 7-ft Y-type straight cord with plug and special adapter plug for use with portable radios, TV sets, tape recorders; 6 oz (less cord) $30

OA-101 Featherfone™ Stereo Headphones
Lightweight open-air stereo headphones. Feature lightweight headband; acoustically engineered polyurethane foam cushions; 5-ft Y-type straight cord with plug. Frequency range 20-18,000 Hz; distortion less than 0.5% at 100 dB SPL, 1 kHz; sensitivity 100 dB minimum SPL, 0.25 V input at 1 kHz each channel; impedance 40 ohms ±20% at 1 kHz; maximum input power 0.05 W; 2 oz $25

PIONEER

SEL-90 Stereo Headphones
Dynamic open-air ultra-lightweight headphones with miniplug and standard phone plug. Features 90°-rotatable earpieces; double leather headband; 10-ft straight cord. Frequency range 10-22,000 Hz; sensitivity 103 dB SPL at 1 mW. 2.5 oz.....$80

SEL-70 Stereo Headphones
Dynamic open-air ultra-lightweight stereo headphones with miniplug and standard phone plug. Features 90°-rotatable earpieces; double headband; 10-ft Y-type straight cord. Frequency range 10-22,000 Hz; sensitivity 103 dB SPL at 1 mW. 2.5 oz.....$60

SEL-50 Stereo Headphones
Dynamic open-air ultra-lightweight stereo headphones with miniplug and standard phone plug. Features 90°-rotatable earpieces; double headband; 10-ft Y-type straight cord. Frequency range 12-22,000 Hz; sensitivity 103 dB SPL at 1 mW. 2.1 oz.....$50

SEL-30 Stereo Headphones
Dynamic open-air ultra-lightweight stereo headphones with miniplug and standard phone plug. Features 90°-rotatable earpieces; double headband; 8-ft Y-type straight cord. Frequency range 12-22,000 Hz; sensitivity 103 dB SPL at 1 mW. 2.1 oz.....$40

SE-450 Stereo Headphones
Lightweight enclosed stereo headphones with independent left and right volume controls. Features adjustable headband; 9-ft cord. Black or chrome finish. Frequency range 20-20,000 Hz; sensitivity 105 dB/m W. 11 oz $40

SE-4 Stereo Headphones
Open-type stereo headphones with polyester dome drivers. Features 9-ft 5" Y-type cord; adjustable headband. Frequency range 20-20,000 Hz; maximum power 200 mW; sensitivity 96 dB/mW; 7⅗ oz $35

SE-205 Stereo Headphones
Dynamic stereo headphones with adjustable headband and 8-ft 2" cord. Frequency range 20-20,000 Hz. 15 oz without cord.....$25

SEL-10 Stereo Headphones
Dynamic open-air ultra-lightweight stereo headphones with miniplug and standard phone plug. Features 90°-rotatable earpieces; double headband; 8-ft Y-type straight cord. Frequency range 18-22,000 Hz; sensitivity 101 dB SPL at 1 mW. 1.3 oz.....$25

SE-2 Stereo Headphones
Open-air stereo headphones with polyester dome drivers. Features adjustable headband; 9-ft 5" Y-type cord. Frequency range 20-20,000 Hz; maximum power 200 mW; sensitivity 99 dB/mW; 7⅗ oz .$25

PML BY ERCONA

D-42 Stereo Headphones
Dynamic stereo/mono headphones; supplied with detachable, washable soft rubber ear cushions. Frequency range 30-20,000 Hz; output impedance 200 ohms stereo, 100 or 400 ohms mono; power/voltage at normal listening 0.3 mW/0.25V; 100 dB SPL with 0.3 mW input; 5 mW maximum power with 2% distortion; supplied with 6-ft unterminated cable; 9.5 oz $45

NEED MORE INFORMATION?

Write directly to the manufacturer or distributor. A list of names and addresses starts on page 36.

RDF-224 Dynamic Headphones
Dynamic stereo/mono headphones; removable soft-foam-padded vinyl ear cushions; supplied with 8-ft coiled cable, 3-conductor phone plug. Frequency range 20-18,000 Hz; output impedance 8 ohms ±20% at 1 kHz; output level 100 dB at 1 kHz; maximum input 100 mW; 12 oz $30

QUASAR

SV400TQ Lightweight Headphones
Lightweight stereo headphones for portable or home use, with mini- and ¼" plugs. Features fully adjustable headband; 1.5 meter cord. Frequency response 20-20,000 Hz; impedance 16 ohms; sensitivity 0.126 V for 98 dB SPL at 1 kHz. 40 g with cord .$25

REALISTIC

PRO-60 Stereo Headphones
Stereo headphones with variable-density earcushions, "acoustic resistance," 10-ft coiled cord with ¼" phone plug. Frequency range 15-30,000 Hz; THD <0.5%; <8 oz $50

LV-10 Stereo Headphones
High-velocity vented-back headphones with 2" dynamic elements. Frequency range 20-20,000 Hz; distortion 0.5%; 4-16 ohm impedance; acoustic foam earpieces; soft vinyl-covered headband with self-adjusting yokes; 10-ft coiled cord, ¼" plug.....$40

PRO-30 Stereo Headphones
Lightweight uniform-phase stereo headphones with low-mass planar driver; rare-earth magnets; lightweight coiled cord, ¼" plug $30

NOVA-PRO Stereo Headphones
High acoustic isolation stereo headphones with low-mass polyester drivers; volume control on each earcup. Frequency range 20-20,000 Hz; impedance 4-16 ohms; cushioned headband; 10-ft coiled cord $32

NOVA-40 Stereo Headphones
Stereo headphones with 3½" dynamic drivers. Frequency range 30-18,000 Hz; impedance 4-16 ohms; soft cushion earcups; padded adjustable headband; 10-ft coiled cord, ¼" plug.....$25

NOVA-51 Stereo Headphones
Fold-up stereo headphones with rare-earth magnets, 6½-ft cord with ¼" phone plug. Frequency range 50-20,000 Hz; 3 oz $20
NOVA-52. Same as Nova-51 except with ⅛" plug $20

NOVA-50 Stereo Headphones
Micro stereo headphones with rare-earth magnets, Mylar diaphragms, foam earcushions, 6½-ft cord with ¼" phone plug. Frequency range 50-20,000 Hz; 2.8 oz $18

NOVA-10 Stereo Headphones
Stereo headphones with high-efficiency 2" speakers; adjustable vinyl headband with cushioned earpads. Frequency range 50-15,000 Hz; has 6½-ft cord, ¼" plug.....$15
NOVA-16. Similar to Nova-10 except has separate Glide Path® level controls $20

Headphones

6

NOVA-35 Stereo Headphones
Micro stereo headphones with foam earpads, adjustable headband, 5-ft cord with 1/8" plug. Frequency range 50-20,000 Hz; < 3 oz $14

Micro-in-Ear Stereo Headphones
Stereo headphones designed to slip into outer ear. Frequency range 50-20,000 Hz; 0.6 oz $13

Nova-33 Stereo Headphones
Super-lightweight design stereo headphones with foam earcushions, 4-ft cord, 1/8" plug. Frequency range 20-20,000 Hz. 1 1/4 oz $10

RECOTON

ST88 High-Velocity Stereo Phones
Stereo headphones with volume controls. Features lightweight high-velocity samarium-cobalt magnets; stereo/mono switch; volume, tone controls. Frequency range 15-20,000 Hz; sensitivity 102 dB at 1 kHz; impedance 30 ohms; maximum input power 0.5 W; 10-ft cord with stereo phone plug $43

ST66 Ultra-Lightweight Headphones
Designed for all personal portables. Stereo headphones weight only 2.47 oz without cord. Sensitivity 98 dB at 1 kHz; frequency range 20-25,000 Hz; input impedance 25 ohms; maximum input power 0.4 W; 10-ft cord with mini plug, 1/4" stereo adapter $43

ST22 Stereo Headphones
Dynamic stereo headphones with all-aluminum earcups; leathery-soft ear cushions, headband; volume control for each channel. Frequency range 20-22,000 Hz; impedance 8 ohms; matching impedance 4-16 ohms; sensitivity 110 dB at 1 kHz with 1 mW; maximum input 0.5 W; 3" dynamic speakers; 10-ft coiled cord.....$30

ST91 Stereo Headphones
Lightweight stereo headphones with samarium-cobalt magnets. Includes adapter to allow use with portable and home players. Frequency range 20-25,000 Hz; impedance 200 ohms; sensitivity 100 dB at 1 mW; 1.23 oz minus cord.....$27

ST11 Stereo Headphones
Lightweight stereo headphones with volume controls, stereo/mono switch, foam-filled ear cushions. Frequency range 20-20,000 Hz; impedance 8 ohms; sensitivity 100 dB at 1 mW, 1 kHz; 10-ft coiled cord with phone plug $20

ST77 Ultra-Lightweight Stereo Phones
Designed for all personal portables; includes an adaptor for standard receivers. Weighs 1.65 oz without cord. Sensitivity 98 dB at 1 kHz; frequency range 20-25,000 Hz; impedance 25 ohms; maximum power input 0.3 W; 10-ft cord with mini plug, 1/4" stereo adapter.....$20

ST16 Stereo Headphones
Stereo headphones with volume control for each channel; stereo/mono switch. Frequency range 20-18,000 Hz; impedance 8 ohms; soft adjustable padded headband; soft ear cushions; 10-ft coiled cord with stereo phone plug.....$20

ST93 Stereo Headphones
Fold-away lightweight stereo headphones packaged in cassette box. Include 5-ft cord and 1/4" stereo phone adapter for home use. Frequency range 20-22,000 Hz; impedance 32 ohms; sensitivity 100 dB at 1 kHz; 1.02 oz without cord $17

ST98 Stereo Headphones
Lightweight stereo headphones with samarium-cobalt magnets. Includes 2 extra ear pads. Packed in cassette-sized storage box. Frequency range 50-22,000 Hz; impedance 32 ohms; sensitivity 1-2 dB at 1 kHz; .18 oz without cord.....$17

ST90 Stereo Headphones
Fold-away lightweight stereo headphones with samarium-cobalt transducers, super-thin polymer film diaphragms. Designed for use with home and portable players. Frequency range 20-20,000 Hz; impedance 32 ohms; sensitivity 96 dB at 1 mW; 0.83 oz minus cord $17

ST99 Miniature Stereo Headphones
Miniature stereo headphones consisting of a pair of earpieces about the size of a quarter. Earpieces slip into place over ears without headband. Includes lightweight 7-ft cord and mini plug $15

REVOX

RH 310 Stereo Headphones
Open-type lightweight headphones designed for amplifiers rated for 4-to-600-ohm load impedance; frequency range 20-20,000 Hz $100

SANSUI

SS-L5 Dynamic Stereo Headphones
Isolation-free dynamic stereo headphones in around-the-ear design and 1 9/16" drivers. Impedance 100 ohms at 1 kHz; frequency range 20-20,000 Hz; maximum input power 500 mW; sensitivity 104 dB/mW at 500 Hz; 2-m cord; 4.8 oz (without cord) $50

MS-7 Dynamic Stereo Headphones
Lightweight on-the-ear mini-sized dynamic stereo headphones with adapter plug that permits mini stereo phone plug to be used with standard home audio equipment. Impedance 40 ohms; frequency range 30-20,000 Hz; maximum input power 250 mW; sensitivity 100 dB/mW; 2.5-m cord; 1.1 oz (without cord).....$40

SS-L3 Dynamic Stereo Headphones
Isolation-free, around-the-ear stereo headphones with 1 9/16" drivers. Impedance 60 ohms; frequency range 20-20,000 Hz; maximum input power 500 mW; sensitivity 104 dB/mW; 2-m cord; 4.4 oz (without cord).....$30

MS-3 Dynamic Stereo Headphones
Lightweight on-the-ear mini-sized dynamic stereo headphones fitted with mini stereo plug, supplied with adapter for use with standard home audio equipment. Impedance 30 ohms; frequency range 35-20,000 Hz; maximum input power 100 mW; sensitivity 97 dB/mW; 2.5-m cord; 1.8 (without cord) $20

SENNHEISER

HD 224 Stereo Headphones
Dynamic stereo headphones with double-walled circumaural foam earpads covering entire ear; includes steel-stranded detachable 3000-mm cable. Frequency range 16-20,000 Hz; SPL 94 dB at 1 mW; THD 1.0%; nominal impedance 200 ohms. 252 g $153

HD 430 Stereo Headphones
Open-air dynamic stereo headphones. Frequency range 16-20,000 Hz; sensititivy 94 dB with 1 mW input, nominal SPL at 1 kHz; HD 0.5%; impedance 600 ohms; padded earpad rims and adjustable suspension strap; 10-ft cable. 7 oz $134

HD 222 Closed-Earcup Headphones
Stereo headphones with ultra-lightweight diaphragms with powerful cobalt-samarium magnets in closed-earcup design. Wide-range response extremely flat from16-10,000 Hz; impedance 600 ohms. 8.8 oz..... $128

HD 424 Stereo Headphones
Deluxe open-air dynamic headphones. Frequency range 15-20,000 Hz; sensitivity 17.7 μbar/V, 1mW (1.41 V)/channel for SPL of 102 dB; distortion 1% at 22 V, 1 kHz; impedance 2000 ohms; removable head and ear cushions; 10-ft cable. 6.5 oz without cable..... $122

HD 420 Stereo Headphones
Open-air dynamic headphones. Frequency range 18-20,000 Hz; sensitivity 94 dB with 1 mW input, nominal SPL at 1 kHz; HD 1.0%; impedance 600 ohms; adjustable suspension strap and cushioned earpads; 10-ft cable. 4 oz $94

MS 100 Lightweight Headphones
"The Inside-Out"" headphone, designed for portable and home use. Supplied with replaceable 4' stranded-steel cable with stereo mini-plug and 6' extension cable with stereo mini jack and standard 1/4" stereo phone plug. Extra set of ear cushions included. Frequency response 20-20,000 Hz; sensitivity 96 dB with 1 mW input. 1.4 oz $85

HD 414 Stereo Headphones
Open-air dynamic headphones. Frequency range 20-20,000 Hz; sensitivity 17.7 μbar/V, 1 mW (1.41 V)

for SPL of 102 dB; distortion 1% at 22 V, 1 kHz; impedance 2000 ohms; 10-ft cable. 5 oz without cable.....$84

HD 400 Stereo Headphones
Open-air dynamic headphones. Frequency range 20-18,000 Hz; sensitivity 1 mW for SPL of 88 dB; impedance 600 ohms; 10-ft cable. 3 oz without cable.....$49

HD 40 Lightweight Headphones
Open-air stereo headphones. Frequency range 22-18,000 Hz; sensitivity 90 dB with 1 mW input; distortion < 1%. 2 oz without cable $37.50

SIGNET DIVISION, A.T.U.S., INC.

TK33 Stereophones
Dipolar electret condenser stereophones with power adapter feature high-compliance film moving diaphragm, 45 mm diameter, 2 microns thick. Features suede-finish inner headband and pivoting porous vinyl ear pads. Passive impedance matching transformer adapter features stereophone/speaker operation, hi/lo stereophone sensitivity switches; 2 dual-color LED arrays in groups of 6, first 4 indicating medium-to-loud normal reproduction and last 2 indicating high-level peaks; no external power required; can accommodate 2 headsets. Frequency response 20-22,000 Hz ±2 dB; sensitivity 100 dB at 1 V, 1 kHz; THD 0.1% at 110-dB SPL; matching impedance 4-16 ohms; includes 8.2-ft cord with special plug, 3.9-ft adapter cable with 4-conductor plug. Stereophone 9.7 oz with cord; adapter 4 lbs; adapter 8.7"D × 5.5"H × 2.4"W..... $330
TS33S. Additional stereophone for TK33 .... $135

TK22 Stereophones
Moving-coil dynamic stereophones feature high-compliance polyester dome diaphragm, 20 microns thick, 45 mm diameter with 40-micron self-supporting silver/copper voice coil, FXD magnet. Features full-

swivel foam earpieces, soft suede-finish inner headband. Frequency range 20-20,000 Hz; sensitivity 96 dB at 1 mW, 1 kHz; THD 0.4% at 110-dB SPL; matching impedance 4-16 ohms; 11½-ft cord with plug; 9.2 oz with cord..... $105

Miniature Stereo Headphones

TK20. Features fully rotating yoke-and-pivot suspension system; can be compactly folded, fitted into belt pouch (supplied). Frequency range 25-20,000 Hz; 1.5 oz.....$60

TK11. Features unique ball-joint pivot on each earcup; 4.9-ft cord with mini plug, mini-to-standard phone plug adapter. Frequency range 30-20,000 Hz, slightly less than 2 oz.....$35

SONY

MDR Series Headphones

Ultralightweight open-air stereo headphones with samarium-cobalt magnets, high-excursion driver elements, oxygen-free litz wire cables, and minimal headband pressure.

MDR-80T. Top-of-the-line headphones with 30mm drivers, one-sided cable; frequency range 16-24,000 Hz; sensitivity 101 dB/mW; 2.2 oz without cable $85

MDR-70T. Headphones with 30mm drivers; frequency range 16-22,000 Hz; sensitivity 100 dB/mW; 1.8 oz without cable.....$65

MDR-50T. Headphones with 30mm drivers; frequency range 18-22,000 Hz; sensitivity 100 dB/mW; 1.8 oz without cable.....$50

MDR-40T. Headphones with 30mm drivers; Unimatch plug fits all types of equipment; frequency range 18-22,000 Hz $40

MDR-E33. Earphones consist of 2 MDR-type drivers designed to hang comfortably from each ear; no headband to add bulk, interfere with hair styles; especially suited for portables; frequency range 40-18,000 Hz; < 1 oz without cable. Supplied with mini stereo plug only.....$35

MDR-A30L. Lightweight open stereo headphones fold for easy storage; frequency response 18-20,000 Hz; mono and stereo switchable $35

MDR-E255. Water-resistant Fontopia headphones fit snugly and comfortably inside ear; stereo mini plug fits portables.....$35

MDR-E252. Fontopia earphones in both black and white; earplugs fit snugly and comfortably inside ear; special 16mm drivers; stereo mini-plug fits portables $30

MDR-E222. Consists of 2 MDR-type drivers designed to hang comfortably from each ear; no headband to add bulk or interfere with hair styles; especially suited to portables.....$25

MDR-20T. Headphones with 23mm drivers; Unimatch plug firs all types of equipment; frequency range 20-22,000 Hz $20

STANTON

Stereowafer® Eighty Headphones

Open-audio design headphones with samarium cobalt drivers. Features black vinyl-covered foam ear cushions; spring steel headband with black vinyl covering;

silver extendable and adjustable pivot yokes. Frequency response 20-20,000 Hz; sensitivity 110 dB SPL at 0.20 V input; impedance 100 ohms ±10% at 1 kHz; maximum input 0.1 W rms/channel; distortion < ½% at 110 dB SPL at 1 kHz $70

Dynaphase 55/600Ω Headphones

Specially designed for recording professionally, resulting in flat response and superior acoustical behavior of driver elements. Feature 1½" dynamic high-velocity elements with specially formulated synthetic film diaphragms and samarium-cobalt magnets; adjustable headband with pivot yokes and glove-soft padded vinyl cover; soft nylon tricot-covered foam earcushions; 10-ft 4-conductor cord with double molded no-break connector. Frequency range 20-22,000 Hz; distortion <0.25% at 110 dB SPL, 1 kHz; sensitivity 110 dB minimum SPL at 0.2 V, 1 kHz; impedance 600 ohms ±10% at 1 kHz; maximum input power 0.25 W rms/channel; 5.5 oz less cord $70

Stereo/Wafers XXI Headphones

Ultra-lightweight professional-standard headphone; frequency response 20-22,000 Hz ±4 dB; sensitivity 2 V for 100 dB SPL; maximum power input 0.1 W continuous; distortion 0.5% at 200-dB SPL; 100-ohm impedance at 1 kHz; brushed blue denim finish; 10-ft flat cord with heavy-duty plug; 5.9 oz $70

Dynaphase 55 Stereo Headphones

Lightweight open-audio stereo headphones with 1.5" samarium-cobalt dynamic drivers; input impedance 100 ohms ±10% at 1 kHz; maximum input 0.25 W/channel continuous; sensitivity 110 dB SPL at 0.2 V input, 1 kHz; frequency range 20-22,000 Hz; distortion 0.25% at 110-dB SPL at 1 kHz; adjustable padded-vinyl headband with pivot yokes and nylon tricot-covered foam ear cushions; 10-ft 4-conductor cord with no-break connector; includes adapter plug for use with portable radios and tape recorders; 5.5 oz less cord.....$60

Micro/Wafer XII Stereo Headphones

Super-lightweight open-audio stereo headphones with ¾" dynamic high-velocity drivers with synthetic film diaphragms and samarium-cobalt magnets. Frequency range 10-20,000 Hz; disortion 0.5% at 100 dB SPL/mV at 1000 Hz; sensitivity 105 dB SPL/mV at 1 kHz/channel; input impedance 40 ohms at 1 kHz; maximum input 0.15 W/channel 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 25 Stereo Headphones

Lightweight open-audio stereo headphones with dynamic high-velocity drivers with 1" polyester diaphragms. Frequency range 10-20,000 Hz; distortion 0.5% at 110 dB SPL, 1 kHz; sensitivity 100 dB SPL at 0.25 V input, 100 Hz; input impedance 50 ohms at 1 kHz; maximum input power 0.2 W/channel continuous; adjustable padded vinyl headband with soft vinyl-covered foam earcushions; includes adapter plug for use with portable radios, TV sets, and tape recorders; 7-ft Y-type straight cord with plug...$30

Model V Micro Wafer-F Headphones

Super-lightweight stereo headphones with adjustable folding headband. Feature acoustically engineered polyurethane foam cushions; 5-ft Y-type straight cord with plug. Frequency range 20-18,000 Hz; distortion less than 0.5% at 100 dB SPL, 1 kHz; sensitivity 100 dB minimum SPL, 0.25 V input at 1 kHz each channel; impedance 40 ohms ±20% at 1 kHz; maximum input 0.1 W; 2 oz less cord.....$30

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; distortion 0.2%; impedance-matched to CC-81 for 4-16 ohms; isolation-type headphones with fully-adjustable vinyl-covered headband, foam cushions and 15-ft coiled cord; control console has level controls for both channels, speaker/phone rocker, on/off switch; can accommodate 2 sets headphones; requires 5 W/channel minimum drive; console size 11" × 3¼" × 6½" $150

PEP-79E Electrostatic System

Consists of PEP-74 headphones and CC-79E control console; headphone frequency response 15-18,000 Hz ±2 dB, 10-22,000 Hz ±5 dB; negligible distortion; impedance-matched to CC-79E for 4-16 ohms; trans-air lightweight headphones with fully-adjustable vinyl-covered headband, foam cushions, 15-ft coiled cord; control console is designed for use with main amplifier level controls, has self-protecting circuits; 2½"H × 7"W × 4"D $90

SM-700 Headphones

Dynamic headphones with 2¾" Mylar diaphragm. Frequency response 10-22,000 Hz ±3 dB; impedance 35 ohms; sensitivity 10 mW (0.6V) for 110 dB at 400 Hz; 0.25% distortion at 400 Hz, 110-dB SPL; padded, fully-adjustable steel, aluminum headband with foam-filled vinyl cushions; 15-ft cable, clothing clip, molded stereo plug.....$70

PRO B VI Stereophones

Each earcup features dynamic woofer, ceramic tweeter, L/C crossover. Impedance 4-16 ohms; frequency response 15-22,000 Hz; fully adjustable, vinyl-covered, padded spring steel headband with vinyl covered urethane foam cushions; 10-ft coiled cord and plug.....$60

Classic CL-1 Headphones

Lightweight, isolating-type headphones. Frequency range 10-20,000 Hz; impedance 35 ohms; distortion 0.3% at 110-dB SPL 400 Hz; sensitivity 10 mW (0.6V) for 110-dB SPL at 400 Hz; padded fully adjustable steel, aluminum headband with foam-filled vinyl cushions; 15-ft retractable cable with clothing clip; molded stereo plug; 10.6 oz without cable.$60

TRL-99 Headphones

Dynamic headphones with 2¾" Mylar diaphragm. Impedance 35 ohms; frequency response 15-20,000 Hz ±4 dB; sensitivity 6 mW for 100-dB SPL; distortion 0.4% at 400 Hz, 110-dB SPL; padded, fully-adjustable aluminum, steel headband with fabric-faced, foam-filled cushions; 15-ft cable, clothing clip, plug; 10 oz $55

TRL-88 Trans-Linear Headphones

Featherweight open-air stereo headphones with 1.75" Mylar transducers. Frequency response 18-24,000 Hz ±5 dB; dis 0.5%; 7-ft Y cord with molded plug; 4.25 oz $50

TRL-3 Trans-Linear Headphones

Open design headphones. Frequency response 40-20,000 Hz ±5 dB, 5-dB bass boost between 70 and 200 Hz; impedance 80 ohms; distortion 0.6% at 110 dB, 400 Hz; sensitivity 6 mW for 100-dB SPL; maximum input 5 V; padded, fully-adjustable aluminum, steel headband; urethane foam, snap-on cushions; 15-ft retractable cable with clothing clip, molded plug, strain relief; 8.5 oz $45

DP-903 Monitor Phone

Single hand-held earphone with swivel grip; blends left, right channels into single earphone. Frequency range 20-19,000 Hz; impedance 180 ohms; 7-ft cord with stereo plug $20

(Continued on page 116)

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.

7 Microphones

AIWA

CM-Z7 Electret Microphone
One-point stereo-wide-zoom position back-electret condenser microphone with 2 unidirectional, 1 bidirectional mic capsules. Features metal-vaporized polyester film diaphragm; cord with duo-fit plugs; mic stand, holder; wind screen; battery. Weighs 6 oz $150

DM-D6 Dynamic Microphone
Unidirectional dynamic recording microphone with double dome diaphragm. Features solid diecast housing; talk switch; mic holder; Cannon 3-pin XLR-type connector; cable $50
DM-D3. Similar to DM-D6 except has duo-fit plugs instead of Cannon connector $30

CM-Z3 Microphone
Variable directivity mono zoom microphone. Can be used with microcassette recorders, attaches to most VCRs $39

CM-30Y Microphone
Miniature 1-point stereo microphone $39

CM-60 Microphone
Remote-control tie-clip microphone $30

DM-501 Microphone
Dynamic unidirectional moving-coil microphone with on/off switch $20

AKAI

ACM-100 Condenser Microphone
High-impedance electret-condenser type general-purpose microphone $58

ACM-80 Condenser Microphone
Medium-impedance electret-condenser type general-purpose microphone $35

AKG ACOUSTICS

Condenser Stereo Microphones
C422. Large-diaphragm stereo condenser microphone with FET preamplifier. Features 9 polar patterns/channel selected via remote control with M-S or Y-Y recording techniques; 0/−10/−20-dB preattenuator; 9-52 V phantom powered; LED aiming indicator; S-42E remote controller; MK-42/20 66-ft cable; W-42 windscreen; H-15/9 suspension mount/-stand adaptor; foam-lined carrying case. Frequency range 20-20,000 Hz; sensitivity −42 dBm; impedance 200 ohms; 9½"L × 1½" dia; 15.5 oz $2500
C-34. Small-diaphragm stereo condenser microphone similar to C-422 except sensitivity −43.5 dBm; W-34 windscreen; H-15/6 suspension mount/stand adapter; 7¾"L; 9.75 oz $1649
C-33. Same as C-34 except for selectable polar patterns; cardioid capsules for X-Y stereo recording with one capsule fixed to main housing, the other rotatable through 0°-180° angle; MK-32/20 66-ft cable $950

C-414EB Polydirectional Condenser Microphone
FET condenser microphone with large-diaphragm capsule. Features selectable omni, cardioid, hypercardioid, or figure-8 pattern; flat/75/150-Hz) bass roll-off switch; 0/−10/−20 dB attenuator switch. Frequency range 20-20,000 Hz (all patterns); sensitivity −43.5 dBm; maximum 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, case; 1.75" diameter × 5.5"L; 12 oz $795

C-535EB Pre-Polarized Condenser Microphone
Professional cardioid condenser microphone designed for demanding high-performance field use. Features special 4-position output switch for adjustable padding and bass rolloff to prevent possible overload and enable user to tailor response; removable windscreen; field-replaceable shock-mounted

transducer; integral FET preamp. Frequency range 20-20,000 Hz; sensitivity -61 dBV; SPL 130 dB; impedance 200 ohms; power required 9-52 V; supplied with SA-31 stand adapter and case; satin-black finish; 10 oz $295

D-12E Cardioid Dynamic Microphone
Large-diaphragm cardioid dynamic microphone with high proximity effect. For bass drums and other low-pitched instruments and vocal applications. Features shock-suspended transducer and fixed wire-mesh windscreen. Integral XLR-type connector in shaft. Frequency range 40-15,000 Hz; sensitivity -73 dBV; SPL 128 dB; impedance 290 ohms. Includes SA-30 stand adapter and case $295

C-460 Modular Condenser Microphone System
Modular system consists of 2 interchangeable preamps, 9 interchangeable small-diaphragm capsules, and associated accessories. All C-460 FET preamps have 5-30,000 Hz frequency range, 200-ohm source impedance, 500-ohm load impedance; C-451E preamp has 9-52 V power; C-451EB and C-452EB have 2-position bass rolloff; 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-8, CK-5 cardioid with shock-suspended transducer and integrated windscreen/pop filter, CK-8 short shotgun, DK-9 long shotgun and CK-22 omnidirectional with built-in pop filter. Preamps and capsules available either separately or in combinations.
C-460-B preamp $330
CK-9 long shotgun $277
C-451EB preamp $275
CK-5 cardioid $237
CK-8 short shotgun $227
CK-22 omnidirectional $127
CK-1 cardioid $127
CK-1S cardioid $127
CK-3 hypercardioid $127

C-567E Pre-Polarized Condenser Microphone
Professional miniature wide-range omnidirectional lavalier condenser microphone with FET preamplifier. Features durable metal construction with shock/-noise-resistant system and easy field-serviceable capsule. Frequency range 20-20,000 Hz; sensitivity −43.5 dBm; SPL 132 dB with 0.5% THD; impedance 500 ohms; power required 9-52 V; supplied with H-20 tie tack, H-21 tie bar, W-37 wire-mesh windscreen, H-16 belt clip, case; 3.5 oz $235

D-330BT Hypercardioid Microphone
Hypercardioid dynamic microphone with elastomer shock-suspended plug-in field-replaceable transducer system; designed for the professional vocalist. Features dual-band, 3-position equalizer switches and hum- and noise-rejection systems. Frequency range 50-20,000 ohms; dual windscreen/pop filter; nickel-plated zinc alloy die-cast housing; includes SA-31 stand adapter case; 2" dia. × 7.25" L; 12 oz $210

D-320B Hypercardioid Microphone
Hypercardioid dynamic microphone with elastomer shock-suspended field-replaceable transducer; designed for professional entertainer. Features 3-position EQ switch and hum rejecter. Frequency range 80-18,000 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" diameter × 7.5"L; 10.5 oz $170

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 range 80-18,000 Hz; sensitivity −58 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" diameter × 7.5"L; 8.5 oz $150
D-310. Similar to D-310S but without integral on/off switch $135

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; sintered bronze windscreen; nickel-plated housing; supplied with SA-11 stand adapter and case; 1.5" diameter × 6.25"L; 6.5 oz $115
D-190ES. Same as D-109E but with integral on/off switch $130

D-125E Cardioid Microphone
Cardioid dynamic microphone with shock-suspended transducer; for general-purpose applications; hum rejecter and heavy-duty wire-mesh windscreen. Frequency range 100-18,000 Hz; sensitivity −53.5

dBm; 200-ohm impedance; supplied with SA-30 stand adapter and case; 1.75" diameter × 7"L; 8 oz $110

D-130E Omnidirectional Microphone
Omnidirectional dynamic microphone with shock-suspended transducer; designed for field applications. Frequency range 50-15,000 Hz; sensitivity −54.5 dBm; impedance 200 ohms; hum rejecter and sintered bronze windscreen; nickel-plated zinc-alloy diecast housing; includes SA-30 stand adapter and case; 1.75" diameter × 7"L; 9 oz $105

D-40 Stereo-Pair Microphones
Package contains 2 D-40 low-impedance cardioid dynamic microphones, stand adapters, cable $99

AUDIO-TECHNICA U.S.

AT815a Line/Gradient Microphone
Electret condenser shotgun microphone with permanently polarized element. Frequency range 40-20,000 Hz; sensitivity −50 dB; nominal impedance 600 ohms; maximum input SPL 120 dB; S/N 50 dB at 1 kHz, 1 μbar; 1.5-V AA cell powered; 16.5-ft cable with professional XLR/A3F connector at mic end, ¼" phone plug at equipment end; slip-in stand clamp; carrying case; windscreen; battery $205
AT815a/XLR. Same as AT815a except with XLR/A3M connector at output end of cable $210

AT814a Unidirectional Microphone
Moving-coil dynamic cardioid microphone designed for professional recording and broadcasting studios. Frequency range 50-16,000 Hz; sensitivity −56 dB (0 dB = 1 mW/10 dynes/cm$_2$); EIA sensitivity −150 dB; 250-ohm nominal impedance. Features high-efficiency windscreen and balanced low-impedance output and includes 16.5-ft cable with XLR/A3F professional connector with ¼" phone plug, tapered slip-in stand clamp, and carrying case $135
AT814a/XLR. AT814a with XLR/A3M connector on output end of cable $140

AT813 Unidirectional Microphone
Incorporates electret condenser permanently polarized element with 4-micron polymer diaphragm. Frequency range 20-20,000 Hz; sensitivity −55 dB; 600-ohm nominal impedance; input SPL 125 dB; S/N 50 dB at 1 kHz, 1 μbar; AA penlight battery powered. Supplied with 16.5-ft cable with professional XLR/A3F connector with ¼" phone plug, slip-in stand clamp, carrying case, battery $115
AT813/XLR. AT813 with XLR/A3M connector on output end of cable $120
AT813R. Phantom-power version of AT813. External power only (9-65 V dc). Sensitivity −49 dB; impedance 200 ohms; maximum SPL 141 dB. Supplied with A3F/A3M connectors on cable $165

AT831 Miniature Unidirectional Microphone
Electret condenser permanently polarized element. Frequency range 50-18,000 Hz; sensitivity −58 dB; nominal impedance 600 ohms; maximum input SPL 130 dB; S/N 45 dB at 1 kHz, 1 μbar; 1.5-V N-type battery powered; balanced output via battery holder/belt clip with recessed on/off switch. Includes clothing clip, musical instrument adapter for acoustic guitar, saxophone, etc.; windscreen; battery; carrying case; 0.3" diameter × 0.9"L $115

AT812 Unidirectional Microphone
Incorporates moving-coil dynamic element. Frequency range 50-18,000 Hz; sensitivity −60 dB; 600-ohm nominal impedance. Suppled with 16.5-ft cable with professional XLR/A3M connector on output end of cable $105
AT812/XLR. AT812 with XLR/A3M connector on output end of cable $110

AT811 Unidirectional Microphone
Incorporates electret condenser permanently polarized element. Frequency range 50-20,000 Hz; sensitivity −56 dB; 600-ohm nominal impedance; maximum input SPL 130 dB; S/N 50 dB at 1 kHz, 1 μbar; battery powered. Supplied with 16.5-ft cable with professional XLR/A3F connector with ¼" phone plug, slip-in stand clamp, carrying case, battery $100
AT811/XLR. AT811 with XLR/A3M connector on output end of cable $105

AT803S Subminiature Microphone
Electret condenser permanently charged element; omnidirectional pattern; 5-micron polymer diaphragm. Frequency range 50-15,000 Hz; sensitivity −57 dB; 600-ohm impedance; balanced output; battery holder/belt clip with on/off switch; uses 1.5-V N-type penlight cell. Includes clothing clip, windscreen, battery, carrying case; 16.5-ft cable; mic 0.4" diameter × 0.8"L $100

AT801 Omnidirectional Microphone
Incorporates electret condenser permanently polarized element. Frequency range 40-18,000 Hz; sensitivity −48 dB; 600-ohm nominal impedance; maximum input SPL 125 dB; S/N 50 dB at 1 kHz, 1 μbar; AA penlight battery powered. Supplied with 16.5-ft cable with professional XLR/A3F connector, slip-in stand clamp, carrying case $90
AT801/XLR. AT801 with XLR/A3F connector on output end of cable $95

AT802 Omnidirectional Microphone
Microphone with moving-coil dynamic element. Frequency range 50-16,000 Hz; sensitivity −56 dB; impedance 600 ohms. Supplied with 16.5-ft cable with professional XLR/A3F connector; slip-in stand clamp; carrying case $85
AT802/XLR. AT802 with XLR/A3M connector on output end of cable $90

AT805S Miniature Microphone
Electret condenser permanently charged element; omnidirectional pattern. Frequency range 50-15,000 Hz; sensitivity −57 dB; 600-ohm impedance; unbalanced output; built-in switch. Uses E675 battery. Includes clothing clip, lavalier cord, windscreen, belt clip, battery, carrying case, 16.5-ft cable with ¼" phone plug; mic 0.6" diameter × 2"L $60

BEYER DYNAMIC, INC.

M-130 Bidirectional Ribbon Microphone
Figure-8 bidirectional ribbon microphone incorporating two 0.012" aluminum ribbons that move one above the other with 0.020" separation; designed for studio broadcasting or recording. Frequency range 40-18,000 Hz; polar pattern provides 3-dB attenuation at 90°; ribbon design protects from overload or mechanical shock; supplied with standard 3-pin Switchcraft connector; 5.04"L $420

M-160 Super Cardioid Ribbon Microphone
Super-cardioid dynamic double-microphone. Frequency response 40-18,000 Hz ±2.5 dB; sensitivity −152 dBm (EIA); 200 ohm impedance; low sensitivity at 120° to axis; suitable for stereo recording; Cannon XLR termination $360

M-88 Super Cardioid Moving-Coil Microphone
Super-cardioid dynamic type. Frequency response 30-20,000 Hz ±2.5 dB; sensitivity −144 dBm (EIA); special transducer mounting eliminates body noise; withstands rough handling, humidity, temperature changes; for studio work, recording artists, instruments $320

M600 Unidirectional Dynamic Microphone
True hypercardioid characteristic dynamic microphone with built-in presence boost; hum bucking coil; pop filter; lockable on/off switch; adjustable 3-position bass attenuator. Frequency range 40-16,000 Hz; side attenuation > 24 dB at 120°, 1 kHz; output level ±56 dBm; EIA sensitivity −149 dB; impedance 250 ohms; load impedance > 1k ohms; bass attenuation −8/−12/−16 dB; aluminum case with steel mesh grille, black anodized finish; XLR or equivalent male connector $270
M600S. Same as M600, except that it has an on/off switch $280

M-500 Unidirectional Ribbon Microphone
Hyper cardioid dynamic ribbon microphone with professional-application tailored presence boost. Frequency range 40-18,000 Hz; integral 4-stage blast filter for high-level sound sources; sensitivity −152 dBm (EIA), −60 dBm (1mW/Pa); 20-dB side attentuation at 120°; matte black aluminum case; 16½-ft, 2-conductor cable with XLR-type connector; leatherette carrying case; 7.4"L $240

M-260-S Super Cardioid Ribbon Microphone
Super cardioid dynamic design. Frequency response 50-18,000 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 $200

M-101 Omnidirectional Moving-Coil Microphone
Omnidirectional type. Frequency range 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" × ⅞"; Cannon XLR termination .. $199

M-201 Hypercardioid Dynamic Microphone
Professional-application unidirectional dynamic microphone with hum-bucking coil construction. Frequency range 40-18,000 Hz; sensitivity −149 dBm (EIA), −56 dBm (1mW/Pa); impedance 200 ohms electrical, 1k ohm or more load; > 20 dB side attenuation at 120°; 16½-ft, 2-conductor cable and Switchcraft A3F connector; matte-black brass case with windscreen, clamp, case. 6.3" long $189

M-111 Omnidirectional Lavalier Microphone
Miniature omnidirectional dynamic lavalier microphone with filter providing flat frequency response when suspended over chest; designed for TV broadcasting. Frequency range 60-15,000 Hz (decreases 6 dB between 700-800 Hz and rises to 8 dB from 1000 to 10,000 Hz); output −62 dBm; 200-ohm impedance; spring-mounted inner casing suspended within outer housing; available with standard Cannon 3-pin connector or 1-m cable and 6-pin connector for use with company's TS 73 or TS 83 wireless pocket transmitter; clamp and cord in black leatherette case; black matte finish; 3.35"L $200

MCE-5 Omnidirectional Tie-Clip Microphone
Broadcast-quality clip-on omnidirectional electret condenser microphone designed for on-camera applications. Frequency range 20-20,000 Hz; S/N ratio 62 dB; maximum SPL 116 dB at 1 kHz; EIA sensitivity 141 dBm; electrical impedance 700 ohms; load impedance 2500 ohms; supplied with detachable windscreen and 1-m cable with 6-pin male connector to interface with MES5VNC pocket power supply $160
MCE-5.1. Same as MCE-5 but with detachable windscreen and 3-meter cable terminated in ¼" phone jack; self-contained battery compartment $190
MCE-5.9. This version has 3-meter open-ended cable for interface with wireless units $140
MCE-5.11. Same as MCE-5.1 except for 3-pin XLR connector that operates on 48-V phantom powering or on self-contained battery (Mallory PX 23) . $250
MES5VN(C). Pocket power supply for MCE-5; 9-volt $100

M-69 Cardioid Moving-Coil 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 ... $160
M-69-SM. Same as M-69 but with on/off and bass-cut switch $172

M-400 Moving-Coil Cardioid Microphone
Moving-coil dynamic super-cardioid type. Frequency range 50-15,000 Hz; sensitivity −146 dB (EIA); 200-ohm impedance; on-off switch; 3-pin XLR termination; blast filter; 24.6-ft cable; black anodized aluminum case and clamp $128
M-400S. Same as M-400 except with on/off switch $133

M-818 Matched-Pair Microphone
Cardioid dynamic matched-pair microphones. Frequency range 150-16,000 Hz; output level −55.8 dBm; 500-ohm impedance; front-to-back separation 18 dB; comes with attached 6.5-ft cables with ¼" phone plug, 2 table stands, mic clamps, stereo adap-

tor cable, mounting bar, presentation case; 5.47"L ..... $150/pr.

CERWIN-VEGA

Professional Series

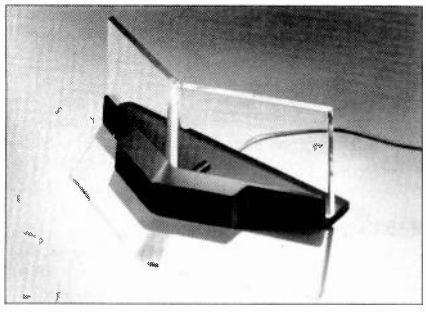
UE-1 Cardioid Microphone
Uni-electret cardioid microphone designed for stage instruments. Features pop filter; on/off and tone impedance switches. Frequency range 80-20,000 Hz; impedance switchable 600/10k ohms; sensitivity—70 dB 3 dB into 600 ohms (O dB=1V/μbar); 16-ft cable with ¼" 3-conductor phone plug and Cannon XLR-3-11C equivalent connector; 7.914"L x 1.930" diameter $125

UD-1 Cardioid Microphone
Unidirectional cardioid dynamic microphone designed for live vocal applications or studio use. Features built-in pop filter and on/off switch. Frequency range 70-15,000 Hz; sensitivity -73 dB 3 dB (O dB=1 V/μbar); impedance 600 ohms; 16-ft cable with ¼" 3-conductor phone plug and Cannon XLR-3-11C equivalent connector; 7.323"L x 1.575" diameter $100

CROWN

Pressure Zone™ Microphones
Hemispherically patterned electret microphones engineered to respond to coherent wavefront at surface of acoustic boundary to eliminate comb filtering. Designed for television, theater, concert and PA applications. Features 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 150-dB SPL. Equipped with battery and phantom power supply arranged in cylindrical metal tube with XLR connectors; available in gold or black.

PZM® 2.5 Microphone
Low-profile, minimum-visibility Pressure Zone Microphone® designed to improve directional pickup.



Features a nearly invisible corner boundary; transformer-balanced low-impedance output; permanently attached 15-ft multidirectional cable. Plugs directly into a 12-48 V phantom power supply.
PZM® 2.5 BR4. Brass base 4", clear boundary $399
PZM® 2.5 B4C. Black base 4", clear boundary $359
PZM® 2.5 B8C. Black base 8", clear boundary $359
PZM® 2.5 B4D. Black base 4", dark boundary $359

General Purpose (PZM®-30GP). XLR connector, electret capsule, and mike cantilever mounted on ⅛" aluminum plate 5" x 6"; wall or floor positioning or suspension above choir or orchestra $350

Low Profile (PZM®-6LP). Cantilever holding electret capsule, mounted on 2" x 3" aluminum plate; XLR connector at end of several feet of cable; suitable for conference rooms or TV programming $350

Flush Mount (PZM®-20RMG). All connections at section of mic extending below level of capsule, ensuring invisibility of mic; suitable for mounting into podium, lectern, or pulpit; cantilever capsule protected from objects or papers by 3 small metal pegs $350

Lavalier (PZM®-2LG). Designed to be worn on tie, scarf, or coat $350
Tie Bar (PZM®-3LV). Smallest PZM® microphone $350

PZM®-31S Pressure Zone Microphone
Designed to complement the PZM 30GP to provide a frequency response with a deeper low end. Active element is an electret capsule mounted on a 6" x 5" plate so that it faces boundary defined by plate and surface on which plate rests. Sound pickup pattern is hemispheric. Mic is usable with either PX-18 transformer or PA-18 active power supply. Frequency range 20-20,000 Hz; sensitivity -76 dB open circuit (O dB=1V/μbar); normal loading impedance 1k ohms; THD 3% at 150 dB SPL; S/N <125 dB SPL; electrical impedance 150 ohms with PA-18 and PX-18; cable length 5.5 ft $350
PZM®6S. Similar to PZM® 31S, smaller size .. $350

ELECTRO-VOICE

PL20 Dynamic Supercardioid Microphone
Supercardioid condenser microphone designed for critical recording, musical sound-reinforcement applications. Features integral blast filter; <160-dB miking; nonreflecting gray finish. Frequency range 50-20,000 Hz $570

PL80 Dynamic Supercardioid Microphone
Supercardioid microphone designed for real-life use. Features professional low impedance, integral blast filter, snow-gray finish, contrasting charcoal Memraflex grille. Frequency range 50-20,000 Hz ... $216

PL77B Condenser Cardioid Microphone
Designed for phantom or battery powering. Has recessed on/off switch that controls battery power only. Features 2-position bass-contour switch; blast filter; nonreflecting snow-gray finish, Memraflex grille. Frequency range 50-20,000 Hz $210

PL11 Dynamic Supercardioid Microphone
Instrument microphone that can double for vocal applications. Features variable-D directionality that virtually eliminates boost at bass frequencies when used up close; blast filter; low impedance; steel case finished in nonreflecting gray. Frequency range 50-15,000 Hz; output level -56 dB..... $204

PL76B Condenser Cardioid Microphone
Condenser microphone designed for vocal applications. Features nonreflecting snow-gray-finished diecast case. Frequency range 50-20,000 Hz; distortion <1% at 136 dB SPL; power source 1.5-V AA cell $177

PL95A Dynamic Cardioid Microphone
Special-element and 2-piece diaphragm dynamic cardioid microphone designed for wide-range linear frequency response. Features rugged steel case; pop filter; Memraflex steel grille; nonreflecting snow-gray finish. Frequency range 70-20,000 Hz; output level -60 dB $180

PL9 Dynamic Omnidirectional Microphone
Omnidirectional instrument microphone with professional low-impedance, high-output characteristics. Features turned-steel case; Memraflex steel grille; nonreflecting gray finish. Frequency range 50-20,000 Hz; output level -58 dB..... $169

PL91A Dynamic Cardioid Microphone
Vocal microphone with strong bass boost when held close. Features directional, antifeedback performance; locking on/off switch; diecast case; snow-gray finish, charcoal Memraflex grille. Frequency range 50-15,000 Hz; low-impedance output; output level -60 dB $132

PL6 Dynamic Supercardioid Microphone
Continuously Variable-D directional microphone without up-close bass boost. Features extra-tight supercardioid directional pattern that minimizes feedback; rugged diecast case; Memraflex grille; nonreflecting gray finish. Frequency range 50-17,000 Hz; low impedance output; output level -56 dB..... $119

PL5 Dynamic Omnidirectional Microphone
Professional instrument microphone designed for high sound-pressure levels. Features pop filter; low-impedance input/high output level; rugged steel case; Memraflex steel grille; nonreflecting gray finish. Frequency range 40-15,000 Hz; output level -55 dB; SPL-handling range up to 160 dB $110

PL88L Dynamic Cardioid Microphone
Vocal microphone with on/off switch. Offered in 2 versions: PL88L low impedance and PL88H high impedance. Features snow-gray finish, contrasting charcoal grille. Frequency range 50-14,000 Hz.....$84

GC ELECTRONICS

30-2372 Dynamic Microphone
Low-impedance unidirectional dynamic moving-coil microphone with professional 3-pin connector, 20-ft 2-conductor cable with ¼" phone plug. Frequency range 60-15,000 Hz; output -75 dB at 1 kHz..$70

30-2382 Stereo Microphone
Stereo electret microphone with matched unidirectional elements, 9.9-ft cable with two ¼" phone plugs. Frequency range 50-16,000 Hz; output level -68 dB at 1 kHz; impedance 600 ohms $43

30-2373 Cardioid Microphone
Cardioid unidirectional dynamic microphone with 2-pin screw connector. 16.5-ft cord with ¼" phone plug. Frequency range 50-17,000 Hz $40

30-2388 Omnidirectional Microphone
Dynamic omnidirectional microphone with dual impedances, 4-pin screw connector, 15-ft cord with ¼" phone plug. Frequency range 100-10,000 Hz; output level/impedance -78 dB/250 ohms, -60 dB/50K ohms.....$38

30-2376 Dynamic Microphone
Low-impedance dynamic unidirectional moving-coil microphone with 2-pin screw connector, 15-ft low-noise cord with ¼" phone plug. Frequency range 100-13,000 Hz; output level —85 dB at 1 kHz $38

30-2378 Unidirectional Microphone
Electret condenser microphone with fixed 20-ft heavy-duty cable with ¼" phone plug. Frequency range 30-16,000 Hxz; output level —68 dB at 1 kHz; impedance 600 ohms.....$31

30-2374 Unidirectional Microphone
Hihg/low-impedance dynamiv moving-coil microphone iwth 4-pin screw connector, 20-ft 2-conductor shielded cable with ¼" phone plug. Frequency range 80-15,000 Hz; output level/impedance —72 dB/500 ohms, -52 dB/50k ohms.....$28

30 Series Microphones
30-2398. Electret mic with 20-ft heavy-duty cord and ¼" phone plug.....$24
30-2308. Matched-pair omni moving-coil mics with 4.3-ft cords.....$22/pr
30-2383. Lavalier dynamic moving-coil mic with 16.5-ft cord $17
30-2302. Omnidirectional moving-coil mic with 4.5-ft cord $11

JVC

M-510 Electret Condenser Microphone
Super-directional/unidirectional pattern. Frequency range 40-20,000 Hz; sensitivity -68 dB super, -71

For an explanation of abbreviations, turn to the list on page 35.

Tape-recording terms are defined in the vocabulary on page 32.

dB uni; S/N ratio > 50 dB; 13-dB gain loss in passive mode $190

M-201 Electret Condenser Microphone
Frequency range 40-18,000 Hz; sensitivity -71 dB; S/N ratio >47 dB at 1 kHz; output impedance 600 ohms $60

MURA

DX-118 Cassette Microphone
Type B microphone designed to fit most cassette recorders and supplied with dual plugs for audio, remote control. Impedance 500 ohms; sensitivity -70 dB at 1 kHz; frequency range 60-12,000 Hz; remote switch; 5-ft cable $6

DX-211 Microphone
Type E single-plug microphone designed for tape recorders requiring high-quality mic with single miniature plug. Supplied with adapter to convert from miniature to standard ¼" phone plug; on/off switch; 5-ft cable. Impedance 500 ohms; sensitivity -70 dB at 1 kHz; frequency range 60-12,000 Hz $6

DX-242 Stereo Microphones
Type F matched-paired stereo microphones for stereo recorders. Supplied with adapters to convert from miniature to standard ¼" phone plug; 5-ft cable. Impedance 500 ohms; sensitivity -70 dB at 1 kHz; frequency range 60-12,000 Hz $20

EX-279 Lapel Microphone
Omnidirectional electret condenser microphone with clothing clip, 10-ft cable, mini plug, battery. Frequency range 30-16,000 Hz; impedance 600 ohms. $26

NAKAMICHI

CM-300T Electret Tri Microphone
Tri-microphone system with 3 CM-300 microphone recording system; supplied with carrying case with space for headphones, cables, accessories ... $465
CM-300S. Similar to CM-300T except single-mic version $170

DM-1000 Dynamic Cardioid Microphone
Cardioid moving-coil microphone with low-mass diaphragm, voice coil for extended high-end response; designed for vocals. Features triple metal screen pop, blast, wind filter; double casing, foam suspension for reduced sensitivity to vibration; immunity to hum and magnetic fields. Frequency response 30-20,000 Hz ±3.5 dB; sensitivity -76 dB at 1 kHz (0 dB = 1V/μbar); impedance 250 ohms; supplied with Cannon-type XLR-3 connector; anodized black matte finish; 10.4 oz $300

CM-300 Electret Condenser Microphone
Studio-type system with interchangeable capsules. Basic set comes with CP-1 cardioid and CP-2 omnidirectional capsules, windscreen, 15-ft cable, XLR connector, battery, stand adapter. Features 10-dB attenuator pad; low-cut proximity effect compensator. Frequency response ±3.5 dB 30-18,000 Hz (CP-3); 30-20,000 Hz (CP-4) ±3.5 dB; impedance 200 ohms balanced; sensitivity ±2.5 dB -76 dB (CP-1, CP-2, CP-4), -74 dB (CP-3); 138-dB SPL maximum (CP-1, CP-2); 136 dB SPL maximum (CP-3); 118-dB SPL maximum (CP-4) at 3% distortion; dynamic range 114 dB (CP-1, CP-2), 107 dB (CP-3), 94 dB (CP-4) $170
CP-2. Omni capsule for CM-100 (included with CM-300) $20
CP-3. Optional small-diameter, super-omnidirectional capsule $40
CP-4. Super-directional (shotgun) capsule $60
CM-100. Similar to CM-300 but powered by 1.5-V cell; maximum SPL 118 dB at 3% distortion; dynamic range 94 dB; supplied with CP-1 cardioid capsule; accepts CP-2, CP-3, CP-4 ..... $110

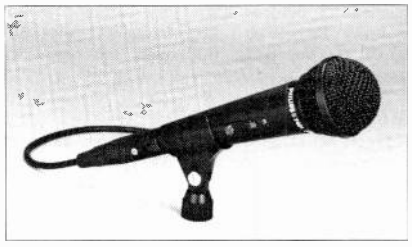
DM-500 Super Cardioid Microphone
Dynamic moving-coil microphone with windscreen, super-cardioid polar pattern. Frequency response 50-15,000 Hz ±5 dB; impedance 250 ohms; sensitivity -73 dB ±2.5 dB $100

NEUMANN

Fet 80 Condenser Microphones
Line of studio microphones that come in many configurations (omnidirectional, figure-8, cardioid, multiple pattern, multiple pattern stereo); can be battery or phantom (separate power supplies) powered except U 87 (which contains a switchable battery compartment).
KM 83. Omnidirectional $349
KM 84. Cardioid $349
KM 85. Cardioid, low-frequency rolloff $349
KMS 84. Pop-proof cardioid $835
U 47FET. Cardioid $969
KMR 81. Hyper/supercardioid short shotgun . $695
KMR 82. Shotgun $755
KM 88. Switchable 3-pattern $1000
KM 86. Switchable 3-pattern $915
KMF 4. Cardioid system $655
KMA. Omni tie-clasp $300
KU 81. Binaural artificial head $2570
U 87. 3-pattern $1047
U 89. 5-pattern $1098
SM 69 fet. Multipattern stereo $2850
USM 69. Multipattern stereo $2590
N80G2. 117-V ac portable power supply for powering 1 or 2 fet 80 microphones $89

PHILIPS

7401 Cardioid Dynamic Microphone
Cardioid dynamic microphone suited to rough handling. Applications include vocal and instrumental sound reinforcement for traveling groups. Features



zinc diecast housing. Frequency range 50-16,000 Hz; impedance 600 ohms; sensitivity -73 dBm; 15-ft cable; XLR termination; 6½" × 2" $135

7301 Cardioid Dynamic Microphone
Cardioid microphone designed for vocal, instrumental recording and sound reinforcement. Available in XLR to ¼" phone plug, XLR connector, or Hi-Z phone plug. Frequency range 50-15,000 Hz; impedance 600 ohms; sensitivity -57 dBm; 15-ft cable; 6 7/16" × 2"; 8½ oz $110

8200 Lavalier Electret Condenser Microphone
Battery-powered electret condenser microphone with alligator clip for broadcast, public address, and instrumental amplification and recording. Battery and windscreen included. Battery module includes belt clip. Nine-ft cable ends in XLR. Frequency range 50-12,000 Hz; impedance 200 ohms (balanced); sensitivity -54 dBm; microphone 1⅛" × ½", battery module 3" × ¾"; 3 oz complete weight; $66

PIONEER

DM-61 Dynamic Microphone
Unidirectional dynamic microphone. Frequency range 80-12,000 Hz; sensitivity 75 dB/μbar at 1 kHz; impedance 600 ohms $130

DM-51-Dynamic Microphone
Unidirectional dynamic microphone. Frequency range 80-12,000 Hz; sensitivity 75 dB/μbar at 1 kHz; impedance 600 ohms $100

DM-21 Dynamic Microphone
Unidirectional dynamic microphone. Frequency range 100-15,000 Hz; sensitivity 75 dB/μbar; impedance 500 ohms $30

PML by ERCONA

DC-63 Condenser Microphone
Condenser mic with adjustable direction permitting the mic to be used in cardioid, bidirectional and omnidirectional patterns. With the use of 2 ring switches built around 4 reed switches and the directional potentiometer, 44 distinct combinations are possible. In cardioid A pattern: directivity index 18-20 dB; frequency response 30-20,000 Hz; sensitivity −48 dB/Pa (over 200 ohms at 1 V); output 4.0 mV/Pa (over 200 ohms at 1 V); dynamic range 126 dB. For the cardioid B patterns: directivity index 18-20 dB; frequency response 30-20,000 Hz; sensitivity −52 dB/Pa (over 200 ohms at 1 V); output 2.5 mV/Pa (over 200 ohms at 1 V); dynamic range 130 dB. Bidirectional: directivity index 22-25 dB; frequency response 30-20,000 Hz; sensitivity −52 dB/Pa (over 200 ohms at 1 V); output 2.5 mV/Pa (over 200 ohms at 1 V) dynamic range 130 dB. Omnidirectional: frequency response 30-20,000 Hz; sensitivity −52 dB/Pa (over 200 ohms at 1 V); output 2.5 mV/Pa (over 200 ohms at 1 V); dynamic range 130 dB. Output impedance (balanced) 200 ohms. 158 × 31 mm; 325 grams; blasted chrome finish ... $890

DC96/12 Condenser Microphone
Cardioid mic which reproduces equal sound quality within an area coverage of 180°. SYMSI power supply. Directivity index 18-20 dB; frequency response 30-20,000 Hz ±2 dB; sensitivity −42 dB/Pa (over 200 ohms at 1 V); output 8.0 mV/Pa (over 200 ohms at 1 V); dynamic range 120 dB; output impedance balanced 200 ohms; 5¾" × 1"; 7.5 oz; satin-chrome finish $600
DC-96. Similar to DC-96/12 except with SYMSI 48; sensitivity −44 dB/Pa (over 200 ohms at 1 V); output 6.3 mV/Pa (over 200 ohms at 1 V); dynamic range 122 dB; 5" × 1"; 7 oz $520

VM-40 Condenser Microphone
Omnidirectional mic with choice of 2 power supplies, voice/music switch, integral attenuator for close-mic voice technique, and 4-position ring switch that allows 10 dB attenuation and/or low frequency roll-off. The mic can be powered by the SYMSI 12 (providing +10 V up to +48 V) or the SYMSI 48 (a +48 power supply). With the SYMSI 12: frequency response 30-20,000 Hz; sensitivity -42 dB/Pa (over 200 ohms at 1 V); output 8.0 mV/Pa (over 200 ohms at 1 V); dynamic range 118 dB; output impedance balanced 200 ohms; 135mm × 19mm; 120 gr. With the SYMSI 48: frequency response 30-20,000 Hz; sensitivity -48 dB/Pa (over 200 ohms at 1 V); output 4.0 mV/Pa (over 200 ohms at 1 V); dynamic range 124 dB; output impedance balanced 200 ohms; 110mm × 19mm; 95 gr; satin-chrome finish. With the SYMSI 12 ..... $380
VM-40 with SYMSI 48 ..... $300

VM-41. Similar to the VM-40 except with a cardioid pattern and a directivity index of 12-15 dB. With SYMSI 12 ..... $405
VM-41 with SYMSI 48 ..... $325

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.

Microphones

7

FP-92CO Condenser Microphone
Cardioid condenser mic with internal 15V power supply that allows equipment connection as in any dynamic mic. Power supply shuts off when Cannon XLR3-12 connector is detached. Directivity index 10-12 dB; frequency response 30-20,000 Hz ±3 dB; sensitivity -38 dB/Pa (over 200 ohms at 1 V) and -18 dKB/Pa (over 10 kilohms at 1 V); output 12.6 mV/Pa (over 200 ohms at 1 V) and 126 mV/Pa (over 10 kilohms at 1 V); dynamic range 116 dB; output impedance unbalanced 200 ohms and 10 kilohms; 6¾" × ¾"; 4 oz; satin-chrome finish $380
FP-92KO. Similar to FP-92CO except omnidirectional pattern. Sensitivity −42 dB/Pa (over 200 ohms at 1 V) and -22 dB/Pa (over 10 kilohms at 1 V); output 8.0 mV/Pa (over 200 ohms at 1 V) and 80.0 mV/Pa (over 10 kilohms at one V) $365

DC-20 Omnidirectional Microphone
Small, light omnidirectional mic with 33-ft fixed 2-conductor cable and nonreflective satin-chrome finish. Frequency response 30-20,000 Hz ±3 dB; sensitivity −46 dB/Pa (over 200 ohms at 1 V); output 5.0 mV/Pa (over 200 ohms at 1 V); dynamic range 124 dB; output impedance 200 ohms balanced. 70 × 18 mm; 2 oz $265
DC-21. Similar to DC-20 except cardioid pattern, with directivity index 10-15 dB. Sensitivity -44 dB/Pa (over 200 ohms at 1 V); output 6.3 mV/Pa (over 200 ohms at 1 V); dynamic range 122 dB $275

REALISTIC

33-984 Highball Cardioid Microphone
Unidirectional dynamic microphone with on/off switch, ball-type screen pop/blast filter, rubber antishock ring. Frequency range 80-13,000 Hz; switchable impedance 600 ohms low, 10k ohms high (low impedance balanced option); XLR-type connector; 16.5-ft cable with plug $50

33-1070 Super Omni Dynamic Microphone
Omnidirectional dynamic microphone with all-metal body, rubber shock ring, windscreen/blast filter. Frequency response 40-17,000 Hz ±3 dB; impedance 500 ohms, unbalanced with balanced option; XLR-type connector; 16.4-ft cable with plug $40

33-919 Dual Pattern Microphone
Stereo electret condenser microphone with 2 internal capsules. Features switchable wide/normal pickup pattern. Frequency range 30-15,000 Hz. Requires AA cell $40

33-1071 Cardioid Microphone
Cardioid microphone with pop filter. Features wire-mesh grille; heavy-duty diecast body; on/off switch; balanced low-impedance capacity; 12-ft cable with ¼" phone plug; stand adapter. Frequency range 50-15,000 Hz $30

33-1066 Compact Stereo Microphone
Cardioid back-electret microphone with one-point placement to simplify stereo recording. Designed for excellent transient response. Frequency response 50-18,000 Hz; impedance 600 ohms. Includes built-in desk stand; standard $^{5}/_{8}$"-27 mounting threads; 8.2-ft cable with 2 $^{1}/_{8}$" (3.5mm) plugs; foam windscreen; on/off switch.....$30

33-992B Supercardioid Microphone
Tight directional pattern microphone designed for PA/recording use. Features windscreen; all-metal body; on/off switch; 6-ft cable with ¼" plug; stand adapter. Frequency range 80-14,000 Hz $25

33-985C Omnidirectional Microphone
High-ball omnidirectional microphone with wire-mesh windscreen. Features pop filter; chromed body; on/off switch; 6-ft cable with ¼" plug; stand adapter. Frequency range 50-13,000 Hz $20

33-1065 Microphone
Dual-head electret condenser microphone adjusts up to 90° for optimum stereo separation. Features built-in table-top stand; 6½-ft cord with 2 mini plugs; 2 foam windscreens. Frequency range 50-15,000 Hz; Requires AA cell.....$20

33-1050 Electret Microphone
Lightweight electret microphone with windscreen, adjustable stand, on/off switch, 9-ft cable with ¼" plug. Supplied with battery. Frequency range 20-13,000 Hz $18

RECOTON

MM-670 Unidirectional Dynamic Microphone
Unidirectional dynamic microphone with on/off, high/low impedance switches, black satin finish, wind filter. Frequency range 30-18,000 Hz; 20-ft cable with standard phone plug $70

MM-3000 Unidirectional Dynamic Microphone
Unidirectional dynamic microphone with on/off switch, wind filter, aluminum finish. Frequency range 30-18,000 Hz; 20-ft cable with standard phone plug.....$65

MM-660 Cardioid Microphone
Unidirectional electret condenser stereo microphone designed for outdoor use; 1.5-V battery-powered; sensitivity -68 dB at 1 kHz; frequency range 50-16,000 Hz; impedance 600 ohms. Includes windscreen and 3-m cord; aluminum casing; 295 g .$60

MM-620 Cardioid Microphone
Unidirectional cardioid electret microphone designed for performing, broadcasting, PA, home recording. Sensitivity -68 dB; frequency range 30-16,000 Hz; impedance matches 200-600 ohms; operates on 1.5-V AA battery. Supplied with 18-ft shielded cable with standard phone plug, swivel mic adapter, vinyl case; satin gold finish $50

MM-770 Miniature Stereo Microphone
Ultraminiature stereo electret condenser microphone with 2 pickup elements. Features matrix circuit to provide superior stereo separation; color-coded on/off switch; 2 color-coded 3.5-mm plugs; 2 standard phone-plug adapters; foam windscreen; vinyl storage case. Frequency range 48-18,000 Hz; impedance 600 ohms; sensitivity -80 dB at 1 kHz; dc power source 1.35-V mercury cell; 76 mm L × 22m W × 22m D (including stand); <3 oz; 1-m cord.....$50

MM-610 Unidirectional Microphone
Sensitive slimline unidirectional cardioid electret microphone with brushed satin gold aluminum finish, shielded cable, windscreen, swivel mic adapter, vinyl carrying case. Frequency range 40-15,000 Hz; sensitivity -66 dB; impedance matches 200-600 ohms; dc power 1.5-V AA cell; 18-ft cable with standard phone plug.....$41

MM-330 Cardioid Microphone
Unidirectional dynamic cardioid microphone designed for performers. Features hi/lo and on/off switches; ball-head design; triple-mesh construction; 18-ft shielded cable with standard phone plug; swivel mic adapter; vinyl case; silver finish $38

MM-680 Omnidirectional Microphone
Electret condenser omnidirectional microphone with on/off switch, wind filter, black aluminum finish. Frequency range 50-16,000 Hz; low impedance 20-ft

NEED MORE INFORMATION?

Write directly to the manufacturer or distributor. A list of names and addresses starts on page 36.

MM-600 Unidirectional Microphone
Unidirectional cardioid electret microphone with on/off switch, swivel stand adapter, satin gold aluminum finish. Frequency range 50-13,000 Hz; impedance 200-600 ohms; power source 1.5-V AA cell; 9-ft cable with standard phone plug $32

MM-760 Ultraminiature Electret Microphone
Omnidirectional tie clip electret microphone. Output level 65 dB, frequency range 30-16,000 Hz; powered by 1.5-V AA battery (in plug assembly); 15-ft shielded cable; standard phone plug; vinyl case; brush gold finish; ⅜" diameter × ⅝"L $32

MM400 Stereo Microphone Set
Matched pair of microphones with universal plugs and adapters. Feature on/off switches, 500-ohm impedance, 3-ft cords $29

MM-750 Miniature Microphone
Very small lavalier microphone. Frequency range 50-12,000 Hz; impedance 600 ohms; sensitivity -72 dB; power source 1.5-V cell; 1¾L × ⅝" Diameter; 20-ft cable with 3.5-mm mini plug.....$26

DM150 Dynamic Microphone
Replacement microphone designed for voice, music. Features on/off switch, desk stand, 3.5-mm phone plug, 2.5-mm remote-control plug. Impedance 500 ohms; 3-ft cord $17

MM100 High Impedance Microphone
Replacement for crystal or other high-impedance microphone. Features on/off switch; desk stand; phone plug; 5-ft cord $16

DM100 Dynamic Microphone
Features desk stand, 5-ft cord, 3.5-mm phone plug, 2.5-mm remote-control plug. Impedance 500 ohms.....$9
DM120. Same as DM100 except impedance 50k ohms.....$15
DM130. Same as DM100 except impedance 200 ohms.....$9

DM133 Budget Cassette Microphone
Inexpensive microphone with desk stand, 3-ft cord, 3.5-mm phone plug, 2.5-mm remote-control plug. Impedance 200 ohms.....$7

REVOX

M3500 Dynamic Cardioid Microphone
Dynamic unidirectional hypercardioid moving-coil microphone. Frequency range 40-18,000 Hz; impedance 600 ohms. Comes with windscreen, clamp, table stand, case; Cannon XLR connector. Supplied with frequency-response curve. All-metal construction with matte-black finish $200

SANSUI

EM-5 Electret Condenser Microphone
Unidirectional single-point electret condenser microphone. Frequency range 70-15,000 Hz; impedance 1k ohms balanced; frontal sensitivity -72 dB; power source 1.5-V R-1 cell $77

DM-3 Dynamic Microphone
Unidirectional dynamic microphone. Impedance 500 ohms unbalanced; frequency range 100-10,000 Hz; frontal sensitivity -77 dB; 3-m cord with 6.3-mm phone plug $20

SCHOEPS by POSTHORN

Colette Series Microphones
Studio condenser microphones with interchangeable capsules and amplifiers. Can be 12-volt phantom or parallel powered, or 48-volt phantom powered. Transformerless construction for low output impedance; insulated transducer and 60-V polarization.
CMC 38. Figure-8 microphone. Frequency range 40-16,000 Hz; sensitivity 1.0 V/μbar; S/N ratio 75 dB; 132 dB SPL at 0.5% distortion; 80 g; 5.57"L × 0.79" diameter $780
CMC 341. Hypercardioid microphone. Frequency range 40-20,000 Hz; sensitivity 1.3 mV/μbar; S/N

77 ratio dB; 131 dB SPL; 80 g; 5"L × 0.79" diameter $730

CMC 34. Cardioid microphone. Frequency range 40-20,000 Hz; sensitivity 1.2 mV/μbar; S/N ratio 76 dB; 131 dB SPL; 80 g; 5"L × 0.79" diameter. .. $640

CMC 33. Special omnidirectional microphone designed for distant field placement. Frequency range 20-20,000 Hz; sensitivity 1.0 mV/μbar; S/N ratio 76 dB; 132 dB SPL; 80 g; 5"L × 0.79" diameter $640

BLM 3 Boundary Layer Microphone

Condenser microphone using diaphragm within the boundary surface of the plate to eliminate comb-filter and interference effects. Uniform hemispherical polar response. Frequency range 20-16,000 Hz; sensitivity 10mV/Pa; S/N ratio 77 dB; 134 dB SPL at 0.05% distortion; 200mmW × 200mmL × 5mmH; 580g $450

SENNHEISER

MD 441 U Supercardioid Microphone

Supercardioid dynamic microphone. Frequency range 30-20,000 Hz; sensitivity 0.2 mV/μbar ±3 dB; brilliance switch for nominal 5-dB boost at 5 kHz; 5-position bass attenuator; front-to-back ratio 20 dB −3 dB. Supplied with quick-release mount for floor stand or MZT-441 table stand; takes MZW-441 windscreen; 1.3"H × 1.4"W × 9.6"L..... $469

MD 211 U Omnidirectional Microphone

Omnidirectional dynamic microphone. Frequency range 40-20,000 Hz; sensitivity −58 dBm (0.13 mV/μbar) ±2.5 dB. Supplied with Cannon XLR connector..... $364

MD 431 U Supercardioid Microphone

Supercardioid dynamic vocal microphone. Frequency range 40-16,000 Hz; sensitivity 1.4 mV at 94-dB SPL; output −55.5 dB at 1 mW/10 dynes/cm²; 200-ohm source impedance at 1 kHz. Features bass/proximity cutoff and pop filters; on/off switch with lock; metal housing with replaceable stainless-steel grille screen; double-housed and shock-mounted; can be used in mobile situations; includes quick-release clip with lock, XLR connector, phone plug $355

MD 421 U Cardioid Microphone

Cardioid dynamic microphone. Impedance 200 ohms; frequency response 30-17,000 Hz ±5 dB; 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, variable bass attenuator; XLR connector; 7" × $1\frac{7}{8}$" × $1\frac{13}{16}$". $332

MD 429 U Supercardioid Microphone

Dynamic moving-coil microphone designed for recording-studio use. Features extended grille, internal shock suspension, satin-black finish. Supplied complete with snap-in stand adapter and 15-foot XLR-to-XLR cable. Frequency range 50-16,000 Hz; nominal impedance (1 kHz) 200 ohms; sensitivity at 1 kHz 1.4 mV/Pa -57 dBV; $7\frac{7}{8}$"L, $1\frac{1}{4}$" maximum shaft diameter, $1\frac{15}{16}$" head diameter $310

MD 416 U Cardioid Microphone

Cardioid dynamic microphone designed for close miking. Frequency range 50-15,000 Hz; sensitivity 0.13 mV/μbar ±3 dB; 200-ohm impedance. Features isolation system to eliminate handling noise; pop filter; Cannon XLR connector; threaded stand mount with quick-release clip..... $305

Electret Condenser Microphone System

One common powering module in balanced version (K3U) or unbalanced version (K1) serves 3 different compact heads. ME20 omnidirectional head frequency range 50-15,000 Hz; sensitivity 49 dBm; S/N ratio 64 dBm minimum. ME40 supercardioid head frequency range 50-15,000 Hz; sensitivity 49 dBm; S/N ratio 64 dBm minimum. ME80 shotgun head frequency range 50-15,000 Hz; sensitivity 45 dBm; S/N ratio 70 dB minimum

K3U. Powering module $172

ME20. Ominidirectional head $92

ME40. Supercardioid head $130

ME80. Shotgun head $201

ME88. Spot microphone head $270

MD 427 U Supercardioid Microphone

Supercardioid dynamic microphone with triple-layer steel-mesh windscreen. Features internal hum-bucking coil, all-metal outer housing, black finish. Supplied complete with snap-in stand adapter and 15' XLR-to-XLR cable. Frequency range 50 to 16,000 Hz; nominal impedance 200 ohms; $7\frac{9}{32}$" L, $1\frac{1}{4}$" maximum shaft diameter, $1\frac{15}{16}$" head diameter $232

MKE 2 Miniature Electret Lavalier Microphone

Miniature (0.24" in diameter × 0.43"L) electret microphone with 0.08" diameter wire. Matte-black finish. Frequency range 20-20,000 Hz; power requirements +1 to +15 V; approximately 150 μA. Available in three versions.

MKE 2-PT. Includes 3-meter lead terminating in stripped and tinned leads for connection to wireless-microphone transmitters. Sensitivity 10 mVPa*; nominal impedance 1000 ohms; minimum load impedance 4700 ohms $202

MKE 2-3. With conector for K3U powering module. Includes 3-position 12 dB/octave low-frequency rolloff switch. Cable length approximately 3 meters. Sensitivity with K3U 1.5 mV/Pa* -55.5 dBm; nominal impedance with K3U 200 ohms; minimum load impedance with K3U 1000 ohms $242

MKE 2-6. With in-line battery supply with on/off switch and approximately 4 meter cable terminating in mini-plug. Sensitivity 3.5 mV/Pa*; nominal impedance 1000 ohms; minimum load impedance 2000 ohms..... $168

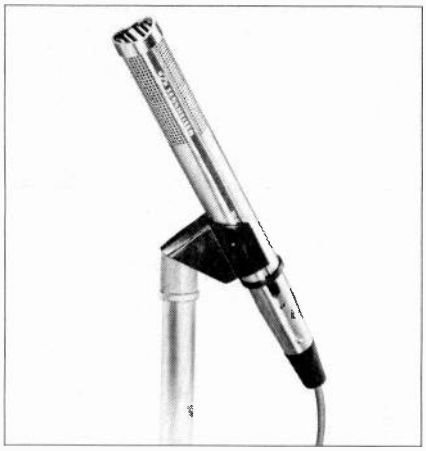
*1 Pa=10μb=10 dynes/cm²=94 dB SPL.

Microphones

7

MKE 10-3 Clip-On Lavalier Microphone
Ultra-compact design clip-on microphone. Steel reinforced cable and snap-proof clamp connection. Frequency response 60-18,000 Hz ±4 dB; S/N ratio 64 dB $173

MD 402 Supercardioid Microphone
Supercardioid dynamic microphone. Frequency range



50-15,000 Hz; output level −57 dBm at 94 dB SPL; windscreen, 15-ft cable; quick-release clamp ... $85

MD 200 Microphone
Frequency range 60-13,500 Hz; pressure transducer; omnidirectional pickup pattern; output level 2.5 mV/pA ±3 dB at 1 kHz; impedance 600 ohms; phone-plug connector; 1.9" diameter; 4 oz $33
MD 400. Same as MD 200 except supercardioid with 22-dB rejection at 1 kHz, 120°; pressure-gradient transducer $41

SHURE

Unisphere® I Series Microphones
Dynamic cardioid microphone for high-quality recording, reproduction. Has built-in pop filter; dual impedance. Frequency range 50-15,000 Hz; power level -57 dB low impedance; 15-ft cable
565D. $130
565SD. Same as 565D plus on/off switch in handle $133
565SD-CN. Same as 565D plus on/off switch, 20-ft cable with 3-pin professional connector. $139
565SD-LC. Same as 565SD-CN less cable ... $118

516EQ E-Qualidyne® Microphone
Unidirectional cardioid dynamic equalizer microphone for tape recording. Features equalization, response-shaping control; 4 switches on 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 windscreen; swivel adapter; cable; mini-plug adapter cable; carrying case . $124
516EQ-PR. Pair of 516EQ microphones $221

Unidyne® III Series Microphones
Dynamic cardioid microphone for high-quality music, voice recording, reproduction. Dual impedance. Frequency range 50-15,000 Hz; power level -58.5 dB in low impedance. Supplied with 15-ft cable.
545D. $118
545SD. Same as 545D plus on/off switch in handle $121
545SD-LC. Same as 545SD less cable $106
545SH. Same as 545D but with on/off switch in permanently attached stand mount $126
545SD-CN. Same as 545D plus on/off switch, 20-ft cable with 3-pin professional connectors $127
545L. Same as 545D but low impedance. Supplied with lavalier cord, clip, permanently attached 20-ft cable $98

578 Omnidyne® Omnidirectional Microphone
Omnidirectional hand-held microphone for music, speech. Power level -60 dB; frequency range 50-15,000 Hz; dual impedance; 15-ft cable; accessory swivel bracket; chrome finish $110

579SB "Vocal Sphere" Omnidirectional Microphone
Omnidirectional microphone with snap-in stand attachment, on/off switch, pop/blast filter. Designed for speech, rock vocal, music use. Power level -57 dB; frequency range 50-14,000 Hz; low impedance; 20-ft cable and connector; chrome finish $97

Unisphere® A Cardioid Microphones
Hand-held cardioid microphones with slip-in stand attachment, pop/blast filter, on/off switch. Designed for speech, rock vocal, music use. Power level -59.5 dB; frequency range 50-13,000 Hz; 20-ft cable with connectors, chrome finish.
586SB-CN. Low impedance with 3-pin plug... $113
586SB-LC. Less cable $92
586SA-C. High impedance with ¼" plug $106
586SA-LC. Less cable $92

Unisphere® B Cardioid Microphones
High-impedance cardioid microphones. Power level -60.5 dB; frequency range 80-13,000 Hz. Handheld with slip-in stand attachment; use for speech, rock vocal, music; has pop/blast filter; on/off switch; comes with 15-foot cable and connector. Chrome finish.
588SA. High impedance $78
588SB. Low impedance $78
588SAC. 588SA with ¼" plug $81
588SB-CN. 588SB with 3-pin plug $84
588SB-LC. Less cable $63

515SAC Unidyne® B Microphone
Dynamic cardioid microphone for good-quality sound systems, tape recordings. Has locking on/off switch. Power level -61 dB; frequency range 80-13,000 Hz; high impedance. Comes with 15-ft cable with ¼" phone plug, built-in shock mount $57

575S Omnidirectional Microphone
Dynamic microphone designed for wall/panel mount, on desk or floor stand, or lavalier or handheld use. Features slide-to-talk on/off switch; high impedance. Frequency range 40-15,000 Hz; output -58 dB; black ARMO-DUR® finish with satin anodized cap, stainless-steel grille; 7¾ oz. Includes stand adapter, lavalier assembly; 7-ft single-conductor shielded cable.. $37
575SB. Similar to 575S but low impedance $37

SP19 "Sound Bridge" Unidirectional Microphones
Lightweight microphones with cardioid pickup pattern. Features on/off switch; integral shock mount; 15-ft cable and plug; swivel adapter; silver Armo-

Dur® case with steel-mesh grille. Power level -62.5 dB; frequency response 80-13,000 Hz.
SP19H-C. High impedance with ¼" plug $48
SP19L-CN. Low impedance with 3-pin plug $48

Professional Microphones

SM7 Dynamic Cardioid Microphone
Unidirectional microphone with flat, bass rolloff, presence-boost, bass rolloff/presence-boost response tailoring. Power level -57 dB (0 dB = 1 mW/10 μbar); frequency range 40-16,000 Hz; impedance 150 ohms for inputs of 19-300 ohms; dark gray foam windscreen, dark gray enamel finish $495

SM81-CN Condenser Cardioid Microphone
Unidirectional low-noise, low-distortion microphone with selectable 10-dB attenuator, 3-position low-frequency-response switch. Power level -40.5 dB; frequency range 20-20,000 Hz; impedance 150 ohms; low r-f susceptibility; range of power sources 12-48 V. Supplied with attenuator lock, pop-filter grille, swivel adapter, cable. Metallic vinyl finish $348
SM81-LC. Less cable $327
PS1. Power supply for two SM81 microphones. 108-132 V ac, 50/60 Hz $142

SM10A-CN Unidirectional Head-Worn Microphones
Close-talking cardioid microphones for noise reduction. Power level -66 dB; frequency range 50-15,000 Hz; impedance 150 ohms $130
SM12A-CN. Same as SM10A-CN plus 1 ear monitor $170
SM14A-CN. Same as SM10A-CN plus 2 ear monitors $225

SM59-CN Dynamic Cardioid Microphone
Unidirectional microphone with mechano-pneumatic shock-mount design, pop filter. Power level -61 dB; frequency range 50-15,000 Hz; impedance 150 ohms; aluminum, zinc, stainless-steel construction; champagne enamel finish $205
SM59-LC. Same as SM59-CN but less cable .. $184

SM63-CN Dynamic Omnidirectional Microphone
Miniature lightweight omnidirectional microphone with hum-bucking coil, shock mount, breath/pop filter. Output power -56.5 dB; frequency range 50-20,000 Hz; impedance 150 ohms; Veraflex® grille damage resistant to drops and impact, rust, moisture, corrosion; champagne finish aluminum case .. $126
SM63-LC. Same as SM63-CN except no cable $105

SM11-CN Miniature Lavalier Microphone
Dynamic omnidirectional microphone with lavalier, tie-bar, tie-tack mounting options. Frequency range 50-15,000 Hz; power level -64 dB; low impedance. Weighs 0.28 oz. Comes with 48" cable, mounting accessories $95
SM17-CN. Similar to SM11-CN but includes musical instrument mounting accessories, 10-ft. cable $100

SM57-CN Unidirectional Microphone
Dynamic microphone with cardioid polar pattern, suitable for instrument pickup. Frequency range 40-15,000 Hz; output -56.5 dB; dual low impedance. Comes with 20-ft cable with 3-pin professional connectors $142

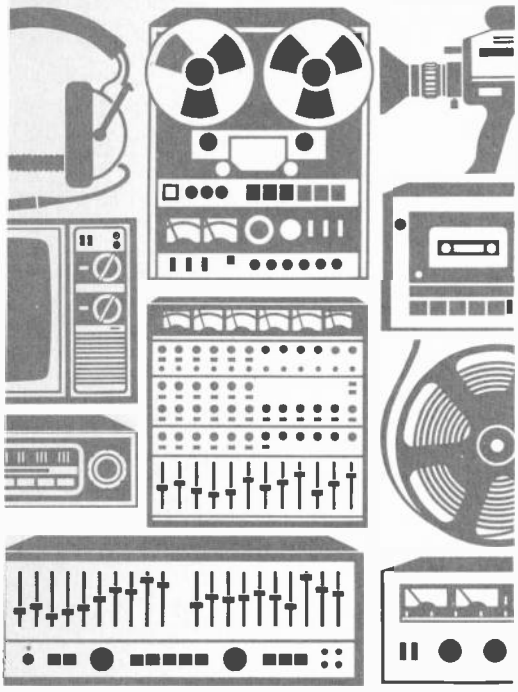
SM58-CN Unidirectional Microphone
Dynamic microphone with cardioid polar pattern, suitable for vocal pickup. Frequency range 50-15,000 Hz; output power level -56 dB; dual low impedance; pop filter. Comes with 20-ft cable with 3-pin professional connectors $181

A15 Series In-Line Adapters
Modifies microphone response. Has 3-pin male output, female input connectors
A15AS. Switchable microphone attenuator $35.50
A15PRS. Switchable phase reverser $31
A15HP. High-pass filter $31
A15LP. Low-pass filter $31
A15PA. Presence adapter $31
A15RS. Response shaper $31

For an explanation of abbreviations, turn to the list on page 35.

Tape-recording terms are defined in the vocabulary on page 32.

FREE INFORMATION SERVICE



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A15LA. Line input adapter $31
A15BT. Bridging transformer $31
A15TG. Tone generator $41
A27M. Stereo microphone mount $34.75
A53M. Shock mount for 578, 579, SM59, SM63, SM81 microphones $30.50
A55M. Shock mount for 515, 516, 545, 565, 586, 588, SM57, SM58 microphones $30.50

A95 Series Line-Matching Transformers.
Connect low-impedance microphones to high-impedance inputs or vice-versa. Designed for use with most microphones, input jacks.
A95U. Low-Z, 3-pin; high-Z, ¼" plug, jack . $23.75
A95UF. Low-Z, 3-pin; high-Z, ¼" plug, jack $28.50

SONY

ECM-Z300 "Sound Crew" Electret Microphone
Back electret zoom mic designed to interface with Sony HVC-2200 video camera. Manually zooms from cardioid to supercardioid to complement images captured by camera lens. Frequency range 100-15,000 Hz; 6.6 oz. Comes with dc power cable, carrying case, windscreen $150

ECM-23F Cardioid Microphone
Unidirectional back electret mic. Features FET impedance translator; battery power; low-cut switch; pad switch; windscreen; carrying case; cable; mic holder; XLR-3 mic connector. Frequency range 20-20,000 Hz; impedance 250 ohms; S/N ratio 44 dB; SPL 126 dB maximum; dynamic range 96 dB; output for both balanced, unbalanced circuits; 20-ft cable; 7½"L × 1 1/16"W $115

ECM-939LT Microphone
Stereo-pickup mic designed to mate with Sony TCS-310, M-1000, M-1000B stereo cassette, microcassette recorders. Comes with mini plug; PC-61 Unimatch plug adapter; mic stand; windscreen; carrying case. Offers easy adaptability to remote-control operation when used with Sony MRU-60 remote-control unit. Frequency range 60-20,000 Hz; dynamic range >96 dB; coverage angle 0°-150°; 4½"L × 2¾"W $115

ECM-D15 Flat Microphone
High-sensitivity flat mic employs rechargable solar battery; business-card size; built-in cord winder; recommended for conferences $115

ECM-929T "Sound Crew" Electret Microphone
Bidirectional back electret cardioid-capsule microphone with stereo characteristics. Frequency range 50-15,000 Hz; output level -57.6 dBm. Comes with stand; windscreen; carrying case; left, right Unimatch plugs (threaded mini plugs with ¼" phone-plug sleeves). Compatible with all consumer tape recorders. 5"L × ⅜" diameter $85

ECM-150 Omnidirectional Microphone
Miniature omnidirectional electret condenser mic. Frequency range 40-13,000 Hz; output impedance 250 ohms; S/N ratio 60 dB; maximum SPL 117 dB; dynamic range 83 dB; plug adapter for miniphone connections; on/off switch; includes windscreen, case with mic stand, tie clip, battery; fixed mic connector; 6-ft 5-in cable; 11/32" diameter × 19/32"L $65

F-V7ET Dynamic Cardioid Microphone
Dynamic cardioid vocal mic with active circuitry that produces vibrato, echo effects. Comes with Unimatch plug that allows compatibility with all consumer tape recorders and mic stand. Features on/off switch, normal/echo switch, speed effect switch. Frequency range 100-12,000 Hz; high impedance; 8⅜"L × 1⅞" diameter; 6.7 oz $60

ECM-220T "The Instrument Mic"
Back electret condenser cardioid mic for miking instruments, with unimatch plug to fit all home recorders. Frequency range 50-14,000 Hz; impedance 200 ohms $50

FV-50T Cardioid Microphone
"True reproduction" cardioid mic; frequency response 90-13,000 Hz; 2 built-in windscreens; convenient on/off switch; low impedance; mic holder.. $45

ECM-16T "The Tie Tac Mic"
Omnidirectional electret condenser mic for lavalier applications, with unimatch plug to fit all home tape recorders. Frequency range 50-13,000 Hz; impedance 250 ohms $40

F-99T "The Stereo Mic"
Stereo dynamic mic for recording purposes, with left and right unimatch plug to fit all home tape recorders. Frequency range 80-12,000 Hz; impedance 200 ohms $40

ECM-101 Condenser Microphone
Stereo back electret condenser T-shaped mic with mini-plug; frequency response 100-15,000 Hz . $39

PBR-330 Parabolic Sound Reflector
Concentrates sound for greater reach when used with Sony ECM-170A, ECM-150 omnidirectional mics. Features handheld or stand mount $70

SUPERSCOPE by MARANTZ

EC-9P Cardioid Microphone
Pressure gradient electret condenser cardioid microphone. Frequency range 30-17,000 Hz; output −50 dB; S/N ratio > 59 dB; maximum SPL 126 dB; output impedance 250 ohms balanced; 7.7"L × 1.18" dia; 13.8 oz mic and cable; 10-ft 2-conductor shielded cable with female Cannon connector, pigtails at other end $110

EC-15P Tie-Clasp Microphone
Omnidirectional electret condenser tie-clasp microphone. Frequency range 70-16,000 Hz; output −52 dB; S/N ratio > 60 dB; maximum SPL 123 dB; output impedance 250 ohms balanced; 1.5"L × 0.37" dia; 1.2 oz mic only; 15-ft shielded cable with Cannon connector $100

EC-33S Microphone
Pressure gradient electret condenser 3-in-1 microphone can be separated into 2 unidirectional mics, put together to make single bidirectional stereo mic. Frequency range 50-15,000 Hz; output −46 dB; maximum SPL 118 dB; S/N ratio > 55 dB; output impedance 1k ohm unbalanced; 7.4"L × 1" dia each mic; 6.24 oz mic only; 10-ft shielded cable with 2 mini, 1 submini plugs $66

EC-7 Cardioid Microphone
Pressure gradient electret condenser microphone. Frequency range 40-16,000 Hz; output −52 dB; maximum SPL 123 dB; S/N ratio > 55 dB; output impedance 250 ohms balanced; 7.44"L × 1.5" dia; 10.4 oz mic and cable; 10-ft shielded cord with phone plug $64

EC-128 Omnidirectional Microphone
Electret condenser microphone. Frequency range 100-15,000 Hz; output −52 dB; maximum SPL 120 dB; S/N ratio > 50 dB; impedance 250 ohms balanced; 10.12"L × 0.55" dia; 2.3 oz mic only; 10-ft 2-conductor shielded cable with mini plug $54

EC-5 Cardioid Microphone
Pressure gradient electret condenser microphone. Frequency range 40-15,000 Hz; outpu −52 dB; S/N ratio > 51 dB; maximum SPL 119 dB; output impedance 2.2k ohms unbalanced; 6.97"L × 0.87" dia; 4.1 oz mic and cable; 10-ft shielded cable with mini/mini phone plug $42

EC-3 Cardioid Microphone
Pressure gradient electret condenser microphone. Frequency range 50-15,000 Hz; outpu −52 dB; S/N ratio > 50 dB; maximum SPL 118 dB; impedance 1.5k ohms unbalanced; 7.05"L × 0.89" dia; 8.8 oz mic and cable; 10-ft shielded cable with mini/mini phone plug $28

EC-1 Omnidirectional Microphone
Pressure-type electret condenser microphone. Frequency range 60-13,000 Hz; output −52 dB; S/N ratio > 50 dB; maximum SPL 116 dB; impedance 2k ohms unbalanced; 4.02"L × 0.69" dia; 3.5 oz mic and cable; 10-ft shielded cable with mini/mini plug $18

TASCAM by TEAC

PE-250 Moving-Coil Microphone
Professional moving-coil microphone designed for PA/recording applications. Features cardioid moving-coil design with 4-position low-frequency rolloff selector; 250-ohm balanced output with XLR connector; built-in threaded stand mount $250

PE-150 Electret Condenser Microphone
Professional PA/recording cardioid electret condenser microphone operates on 1.5-V AA cell, accepts 48-V phantom power with no switching or battery removal. Features −10-dB pad; off/flat/low-frequency rolloff switch; 200-ohm balanced output with XLR connector; stand adapter; 20-ft cable; 1.5-V AA cell $150

PE-120 Electret Condenser Microphone
Professional PA/recording cardioid/omnidirectional condenser microphone with 200-ohm balanced output and XLR connector $100

TEAC

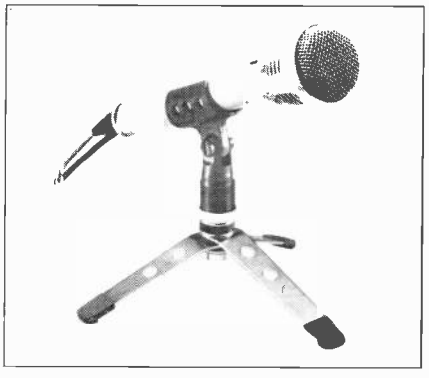
ME-120 Microphone
Cardioid or omnidirectional electret condenser microphone with 2-position response switch (40-18,000 Hz cardioid, 30-16,000 Hz omni). Supplied with stand adapter, 2 windscreens, 15-ft cable.... $120
ME-80. Same as ME-120 except cardioid only, 50-16,000 Hz range $90
ME-50. Similar to ME-80 except unbalanced/balanced 10k/200-ohm impedance; range 50-14,000 Hz. Supplied with foam windscreen and ¼" plug $50

TECHNICS

RP-3545E Electret Microphone
Wide-response cardioid electret-condenser microphone. Frequency response 40-14,000 Hz. Stand adapter included $70

RP-3215E Electret Microphone
Stereo cardioid electret-condenser microphone with two microphone elements physically aligned for stereo perspective. Frequency response 50-10,000 Hz $60

RP-3500 Electret Microphone
Cardioid electret-condenser microphone with high signal-handling ability for extended dynamic range when



recording music. Frequency response 50-12,000 Hz. Tripod desk stand included $60

RP-V370 Dynamic Microphone
Unidirectional dynamic microphone for music and voice. Frequency response 40-12,000 Hz. Mic holder (⅜") adapter included $40

RP-V340 Dynamic Microphone
Cardioid dynamic microphone for voice with built-in windscreen. Frequency response 100-10,000 Hz. Mic holder (⅜") adapter included $26

Microphones

7

UHER by WALTER ODEMER

M 646 Cardioid Microphone
Electret condenser cardioid microphone. Frequency range 30-20,000 Hz; sensitivity 3.5 mV/pA; impedance 280 ohms. Supplied with table stand and windscreen; powered by internal primary battery or from recorder's mic cable with 8-pole plug $203

M 634 Cardioid Microphone
Stereo-pair dynamic shotgun cardioid microphones with stereobar. All-metal design. Frequency range 50-16,000 Hz; sensitivity 2.3 mV/pA; low resistive impedance. Includes collapsible table stand and storage case $194

M 534. Similar to M 634, but is single microphone for desk use $98

VIDAIRE ELECTRONICS

620 Unidirectional Ultradynamic Microphone
Professional microphone features hi/lo dual impedance; on/off switch; unidirectional pattern to eliminate unwanted noise; 2-position cable plug to change impedance; microphone holder; satin gold finish. Impedance 600/50k ohms; frequency range 30-18,000 Hz; sensitivity at 600/50k ohms −78/−60 dB; 20-ft cable with ¼" phone plug $53

942C Unidirectional Ball Microphone
Dynamic ball microphone with dual impedance; on/off switch; unidirectional pickup pattern to eliminate unwanted noise; microphone holder. Impedance 600/50k ohms; frequency range 80-15,000 Hz; sensitivity at 600/50k ohms −72/−52 dB; 20-ft shielded cable with ¼" phone plug $48

619 Unidirectional Microphone
Dynamic contoured microphone with dual impedance; on/off switch; unidirectional pickup pattern to eliminate unwanted noise; microphone holder; satin gold finish. Impedance 600/50k ohms; frequency range 80-15,000 Hz; sensitivity at 600/50k ohms −72/−52 dB; 20-ft cable with ¼" phone plug. $47

729 Tie-Clasp Electret Microphone
Highly sensitive omnidirectional tie-clasp electret condenser microphone. Comes with vinyl carrying case. Impedance 600 ohms; frequency range 50-16,000 Hz; sensitivity −65 dB at 1 kHz; current drain 160 microamperes; 1.3-V mercury cell included; 1" diameter × 1½"L; 13-ft cable with ¼" phone plug . $40

618 Omnidirectional Dynamic Microphones
Matched-pair microphones designed for all types of home and portable stereo tape recorders come with microphone stands. Impedance 500 ohms; frequency range 80-10,000 Hz; 5-ft cord with 3.5-mm miniplug; optional adapter converts to standard ¼" plug $28/pr

Headphones

6

(Continued from page 105)

TRL-66 Headphones
Dynamic headphones with 6-mm transducer; Impedance 8 ohms; frequency range 40-15,000 Hz; high impact unbreakable plastic headband with padding, foam-filled vinyl cushions; 7-ft Y cord with molded plug; 9 oz (less cable) $20

TEAC

THD-101 Stereo Headphones
Open-air dynamic moving-coil stereo headphones. Features foam earpads; stereo phone plug with 3.5-mm to ¼" adapter. Frequency range 20-20,000 Hz;

sensitivity 95 dB/mW ±2 dB at 1 kHz; maximum input 100 mW; impedance 30 ohms; 9.8-ft cable; 4 oz $40

UHER by WALTER ODEMER

W 775 Stereo Headphones
Dynamic stereo headphones with one active, 6 auxiliary membranes per system; half-open design. Frequency range 16-20,000 Hz; SPL 94 dB; impedance 600 ohms; nominal loading capacity 200 mW; distortion 1.0%; automatic strap adjustment; gimballed earcups; 3-m cable; 330 g $184

W 675 Featherweight Headphones
Lightweight (2.2 oz) mono/stereo headphones with 8-ft coiled cord. Frequency range 20-20,000 Hz; impedance 200 ohms at 1 kHz; has lightweight adjustable headband, yellow foam-cushioned earpieces. With 5-pin plug for Uher cassette recorders $84

VIDAIRE

983 Deluxe Stereo Headphones
Stereo headphones feature stereo/mono switch, volume controls, and padded headband. Frequency range 20-18,000 Hz; impedance 8-16 ohms; maximum input 0.5 W; 10-ft coiled cord with ¼" stereo plug $28

617 High-Velocity Stereo Headphones
Features snap-lock pivot in headstrap for compact storage in pocket. Frequency range 20-20,000 Hz; impedance 4-32 ohms; 5-ft shielded mini cord with 3.5-mm stereo mini plug and strain relief; optional adapter converts to standard ¼" stereo phone plug $18

960C Stereo Headphones
Dynamic stereo headphones. Frequency range 20-18,000 Hz; impedance 8-16 ohms; maximum input 0.5 W; 6-ft cord with ¼" stereo plug $15

YAMAHA

YH-100 Stereo Headphones
Orthodynamic stereo headphones with lightweight polyester film diaphrams in dual-support drive unit with mutually opposed anisotropic ferrite magnets. Frequency range 20-20,000 Hz; output 98 dB/mW SPL at 106 dB/V; rated/maximum input 3/10 W; HD 0.3% at 90 dB SPL; impedance 150 ohms; double

padded headband with supra-aural earcups; includes 8-ft straight cord; 340 g (less cord) $95

YH-1 Stereo Headphones
Lightweight orthodynamic design featuring sintered ferrite disc magnets with combination voice-coil diaphragm between. Frequency range 20-20,000 Hz; output 94 dB/mW SPL; 3/10 W; 4D 0.3% at 120 dB SPL; rated/maximum input impedance 150 ohms; soft leather strap distributes weight over entire head; supra-aural pads; 8-ft straight cord; weight 10.2 oz with cord $70

YH-2. Same as YH-1 except output 93 dB/mW SPL; weight 8.1 oz with cord $50

YH-3. Similar to YH-2 except 1/3 W rated/maximum input; 7.4 oz with cord $40

YHL-005 Lightweight Stereo Headphones
Natural-sound stereo headphones for casual music-anywhere use. Feature fatigue-reducing human-engineered design; rare-earth samarium-cobalt magnets; mini plug adapter. Impedance 45 ohms; frequency range 20-20,000 Hz; output SPL 102 dB/mW at 1 kHz; maximum input 100 mW; output SPL 122 dB; 8-ft cord; weight with/without cord 2.8/1.8 oz . $40

YHL-007. Similar to YHL-005 except smaller drivers, lighter weight (2.5/1.4 oz with/without cord), 119-dB SPL output $30

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.

8

Mixers

BIAMP

42 Series Mixing Console

Top-of-the-line mixing console for recording, fixed installation, on-the-road PA, broadcast, or production. Features 16 or 24 inputs; 4 submaster outputs; 4-band EQ; balanced outputs; full assignment capability; direct-to-main assigns; mic/line switch; phantom power 48 V; 4 additional line/echo returns; priority solo system stereo/mono; direct channel outputs. Frequency response 15-33,000 Hz ±1 dB; THD <0.02%; IM distortion <0.05%; slew rate >10 V per μsec; S/N ratio better than -80 dB (-50 dB input/1 V output).

2442A. 24 channel $5,499
1642A. 16 channel $3,999

21 Series Mixing Console

Twelve- or 16-channel mixer for wide variety of pro applications. Features 10-segment assignable LED output display; dual LED input channel indicators; panable AUX inputs on subs; effects and monitor busses; monaural main output; 3 busses; 2 returns to main bus; 4-band EQ; adjustable 18 dB/octave low-frequency filters; transformerless balanced outputs. Frequency response 15-33,000 Hz ±1 dB; THD <0.01%; slew rate >14 B per μsec at 0 dB; S/N ratio better than -80 dB; residual noise better than -80 dB below 1 V out (all faders down); crosstalk <70 dB at 1 kHz channel to channel, <60 dB at 10 kHz bus to bus.

1621. 16 channel $1,699
1221. 12 channel $1,399

83 Series Mixing Console

Compact pro mixer with low-noise discrete transistors and high-speed low-distortion BIFET op amps in input stage of each channel. Features 10-segment LED output display; LED input overload indicator; 3-band EQ; effects and monitor busses; reverb pan control; transformerless balanced output; channel patch. Frequency response 50-15,000 Hz ±0.5 dB, 20-25,000 Hz +0, -3 dB; THD <0.05% at 0 dBv (20-20,000 Hz); slew rate >10 V per μsec (rise time limited); equivalent input noise -124 dBv EIN measured at channel patch point; residual noise -94 dB (all faders down); crosstalk -50 dB at 1 kHz channel to channel, -50 dB at 1 kHz input to output.

1683. 16 channel $1,299
1283. 12 channel $999
833. 8 channel $799

83B Series Compact Mixer

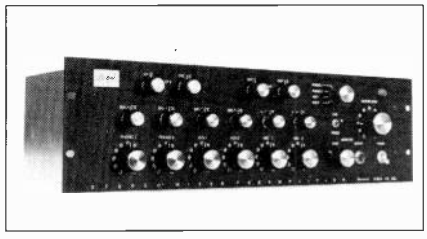
Compact low-noise 6- and 8-channel board with high-density mechanical packaging. Features differential balanced inputs; floating and balanced outputs; monitor bus; 3-band EQ; separate reverb control in monitor; metering on all outputs; reverb routing to subs; 10-segment LED output display; rack mount or consolette. Frequency response 10-50,000 Hz +0, -3 dB; THD <0.03% at 0 dBm (0.775 V rms, 600 ohms); slew rate >8 V per μsec (rise time limited); equivalent input noise -129 dBm; residual noise -98 dBm; crosstalk -50 dB at 1 kHz. 19" × 10½" × 4¼".

883B. 8 channel. 16 lbs 9 oz. $849
683B. 6 channel. 15 lbs 9 oz. $699

BOZAK

CMA-10-2DL Series II Stereo Mixer/Preamplifier

Designed for professional reproduction of live and recorded stereo programs. Features 4 stereo inputs; 2 mic/line inputs; 2-channel output; program and input-cueing monitor; broad dynamic range; modular construction; rack mountability or portability. Gain phono 1 & 2/AUX 1 & 2 (hi-Z)/mic 1 & 2 65 dBV maximum/25 dBV maximum/85 dB; frequency response 20-20,000 Hz ±0.25 dB; output +24 dBm; input impedance magnetic phono/high-level/microphone 47k/50k/200 ohms; load impedance 600 ohms unbalanced, 200 ohms minimum; THD <0.1% at +24 dBm, 20-20,000 Hz; noise equivalent to −125-dBm signal; power consumption 20 W; 19"W × 5¼"H; 31 lb $999



DUBIE

CD-10 Sound Control System

Sound control system integrates up to 6 recorders and receiver/amplifier through one-time patch cord hookup; dubs, records, plays back, mixes sound-on-sound, monitors and fades; 6 solid state 4-position recorder controls; 8-position monitor-select control; 2 fade controls; rear-panel connections for recorders and amplifier/receiver. Maximum input signal 10 V at 1 kHz; frequency range dc-100,000 Hz on all functions; 4"H × 13 13/16"W × 5¾"D $150
CD-5 Similar to CD-10 except 3-recorder capacity; 9⅜"W × 4⅞"D × 4"H $100

GLi

PMX-9000 Mixer/Equalizer

Combination mixer/graphic equalizer. Mixer features 2 sets switchable line, phono inputs each with slide control cross fader transition slider, mic input channel with standby and talkover; complete cueing facilities with level, selector controls. S/N ratio 76 dB below 10 mV phono, 75 dB below clipping mic, 85 dB AUX; maximum input 220 mV at 100 Hz phono, 200 mV mic, 10 V AUX; input impedance 47k ohms phono, 600 ohms mic; phono subsonic filter 18 dB/octave at 20 Hz; mic talkover 14 dB program level reduction; equalizer center frequencies 60, 250, 1k, 3.5k, 12k Hz; boost/cut range ±12 dB. Has bypass switch and switchable signal processor loop; illuminated VU meters with calibrated sensitivity control (-20 to +3 dB range); master level control; 2 sets main outputs; preset level indicators for all inputs, main outputs; rack mountable; 19"W x 8¾"H $499

PMX 7000 Preamplifier/Mixer

Combination preamplifier/mixer with signal processor to incorporate effects devices and tape decks. Features mic inputs; 1 and 2 phono inputs; 3rd input; transition control; 3-band equalizer; master volume; muting relay; VU meters; meter output/level calibration control; cue/audition systems; jack for 2 sets of stereo amps (up to 12 may be connected). Rack mountable. 19"W × 7"H; 11 lbs $299

JVC

MI-5000 Master Mixer

Six-channel master mixer; each channel features 10-dB input-level slide controls with 20-dB master input-level control, independent pan pots, LED overload indicators, 4-position mic/att/phono/line select switches, echo switches with 3-second variable echo level control. Additional features include mix out/tape in monitor select switch; 2 VU meters; input jacks for phono, line, tape, mic; recording, monitor, headphone jacks. Minimum input/impedance 0.2 mV/200-5000 ohms (6-channel mix), 1.4 mV/47k ohms (phono), 80 mV/ 100k ohms (line/tape); rated output level/impedance 0.3 V/600 ohms (rec/monitor), 0.3 mW/8-1000 ohms (headphones); frequency response 20-30,000 Hz -3 dB (mic/line), 30-20,000 Hz ±0.5 dB RIAA, 10-25,000 Hz -1 dB tape in; distortion 0.5%; S/N ratio 56 dB mic, 67 dB line, 65 dB phono $430

NAKAMICHI

MX-100 Microphone Mixer

Provides left, right, blend inputs, 2 outputs; 10k ohm input for low-to-medium impedance microphones; sensitivity 0.2 mV; overload 1 V (+74 dB); THD <0.05% up to 10 kHz; requires PS-100 power supply; 7½"W x 4"D x 2½"H $110

NUMARK ELECTRONICS

TC4100 Mixer/Comparator

Stereo tape deck comparator/mixer with tone calibrator. Mixes 4 line outputs, records on 4 tape decks simultaneously. Features volume control for all 4 channels; 400/8,000 Hz tone generator/calibrator for setting bias, recording-head azimuth $249

PIONEER

MA-100 Multi-Channel Mixer

Multi-channel mixer with 6 inputs for tape, source, channels 1-4. Features input-sensitivity selector; echo; pan pots for channels 1-4; parametric equalizer for channels 3 and 4; tape monitor; master volume control. S/N ratio 83 dB source, 75 dB channels 1-4 ..... $370

CA-100 Sound Processor

Combination microphone mixer and graphic equalizer. Graphic equalizer has 7 bands with center frequencies at 60, 150, 400, 1k, 2.4k, 6k, 15k Hz. Boost/cut ±10 dB. Features 2 mic inputs with pan

Mixers

pot; echo; auto fader; adjustable fader crosspoint; tape monitor switch. S/N ratio 90 dB tape/source, 69 dB mics 1-2 ..... $270

RECOTON

MX-200 Stereo Disco Mixer

Stereo 5-channel disco, taping mixer. Features monitor switch with headphone jack; low-noise preamplifier for magnetic phono cartridges, low-impedance microphones; jack for supplied ac power adapter (normally operates on 2 9-V batteries). Input sensitivity/impedance 0.3 mV/600 ohms mic low, 3 mV/50k ohms mic high and magnetic phono, 150 mV/120k ohms all others; output level/impedance 0.3 V/50-500k ohms; distortion 0.5% at 0.2 V output; frequency response 20-20,000 Hz..... $125

MX100 Stereo Mixer

Stereo 4-channel microphone mixer with independent channel controls of each. Features ¼" phone plug inputs, phono-jack outputs; operation as 2- or 4-channel mixer with flip of switch; high/low impedance switch $40

SHURE

M267 Professional Mixer

Professional mixer for recording or broadcast use. Features 4 low-impedance balanced inputs switchable to mic or line level; simplex (phantom) power on each input; fast-acting limiter; built-in battery supply, headphone amplifier with level control; illuminated VU meter with LED peak level indicator; low-cut filters; tone oscillator; battery check switch; mix bus jack; mic, line-level outputs; master volume control; 120 V ac, 50/60 Hz, 9.5 W; battery power; 12 5/32"W x 9"D x 2 31/32"H $415

M67 Professional Mixer

Professional mixer provides 4 low-impedance, transformer-coupled balanced microphone inputs, one convertible to line input. Balanced 600-ohm line, mic-level outputs; illuminated VU meter calibrated for +4 and +10 dBm output; very low noise and r-f susceptibility design; 120 V ac, 50/60 Hz; 11⅜"W x 7½"D x 2¾"H $365

M268 Microphone Mixer

Five-channel mixer featuring 4 high/low-impedance microphone inputs, one AUX-level input; simplex (phantom) power supply on each mic input mix bus jack; regulated power supply; 120 V ac, 50/60 Hz, 5 W; 12 5/32"W x 9"D x 2 31/32"H $257

M68FC Mixer

Five-channel mixer with 4 high/low-impedance inputs, 1 AUX-level input. Features master volume control; may be battery powered; 120 V ac 50/60 Hz, 3 W; 11⅜"W x 5¼"D x 2¾"H $205

M68. Same as M68FC except microphone input connectors are 3-pin male $205

SONY

MX-510 Microphone Mixer

Five-in/2-out mixer. Features battery/ac-line powering options; 5 mic inputs for low impedance mics; 3 line inputs for tape recorder, tuner, amplifier; 2 phono inputs for record player; pan pot control; slide master fade control; preset indicators; 2 VU meters. Sensitivity −72 dB at 0.2 mV (mic in, low impedance), −22 dB at 50 mV (line in), −51 dB at 2.2 mV (phono in RIAA); impedance 100k ohms line in, 50k ohms phono in; mic attenuation off −20 dB; output level/impedance −5 dB at 0.435 V/10k ohms line, −24 dB at 49 mV/8 ohms headphone; frequency response 30-25,000 Hz; S/N ratio 60 dB; 13¾"W x 9½"D x 3"H $225

MX-10L "Sound Crew" Mixer

Stereo 4-input mixer with panning feature for precise stereo imaging, individual faders for optimum mixing of all sound sources, stereo master fader; mono/stereo output selector; battery or ac operation, latter with optional ac adaptor $125

MX-5 Microphone Mixer

Three-in/one-out microphone mixer for semiprofessional applications. Features preset indicators for reference during temporary level changes, auto input selector, distributor switch, and line input. Mic input sensitivity −51 dB at 2.2 mV (low impedance); line-in impedance 82k ohms; sensitivity −5 dB at 435 mV; line out load impedance 1k ohm; level out −60 dB at 0.775 mV; 9"W x 5¼"D x 2⅛"H $45

TASCAM by TEAC

M-35 8-Track Mixer

Modular mixing console with 8 mic/line inputs, 4 buss ouputs and an independent 8-track monitor mixer. Mic inputs are transformer isolated. Features 8-track cue system; 4 effects returns; direct outputs on each input channel; parametric sweep EQ; 2 selectable low-frequency ranges (60-400 or 400-1,500 Hz; 2 selectable high-frequency ranges (1.5-7.5 or 7.5-12.5 kHz); boost/cut ±12 dB; optional expander with up to 12 more mic/line inputs; optional talkback module $2,300

244 PortaStudio Mixer/Cassette Recorder

Integrated 4-channel mixer with built-in Simul-Sync cassette recorder operates at 3¾ ips and uses discrete 4-channel head to be able to record 4 tracks simultaneously. Uses C-60 or C-90 CrO_2 cassettes exclusively. Features dbx Type II noise reduction; 3-motor solenoid transport; pitch control; 4 mic/line inputs, each with accessory send/receive patch points, trim, 2-band parametric sweep EQ, stereo AUX gain and pan controls (selectable between prefader, postfader, and off), pan pot, slide fader, and input selector (mic/line, tape, off); Simul-Sync monitoring; separate cue mix system (4×2 with gain and pan); stereo master slide fader; 4 lit VU meters; input-overload LEDs; master buss overload LEDs; 2 headphone feeds; 4 tape outs; stereo line outs paralled to stereo aux outs, stereo aux send outs, stereo tape cue outs, and stereo aux receive inputs. Wow and flutter 0.04% rms (JIS/NAD weighted), ±0.06% peak (DIN/IEC/ANSI weighted); frequency response 20-18,000 Hz, 40-14,000 Hz ±3 dB; THD 1.5% at 315 Hz, 0 VU; S/N ratio 90 dB ref. to 3% THD at 315 Hz (IHF A-weighted), 75 dB unweighted; crosstalk 70 dB at 1 kHz. Nominal input level range -60 dBV to -10 dBV (input impedance 60k ohms, unbalanced); Line/mic input: source impedance 10k ohms or less, unbalanced; nominal input level (mic) -60 dBV (1 mV) at TRIM max; line -10 dBV (0.3 V) at TRIM min. Line output: nominal load impedance 10k ohms, unbalanced; nominal output level -10 dBV (0.3 V). 17.9"W × 4.75"H × 14.6"D; 20 lbs.. $1,300

M-30 Audio Mixer

Audio mixer with 8 mic inputs (6 low-impedance balanced, 2 high-impedance unbalanced, doubling as direct boxes); 8 tape inputs; 8 line inputs; mic/remix (tape)/line input selector; mic attenuator (0/20/40); 2-band parametric equalizer (sweep type with variable level and frequency) for 60-1500 and 1000-10,000 Hz plus 12.5 kHz shelving type equalizer (15 dB); mute switch; direct out (postfade, postequalize); cue out (prefade, pre-equalize); accessory send/receive; input overload indicator; bus assign buttons; pan pot. Main section features 4 main program mixing buses; bus input to each main mixing bus; accessory send/receive for each bus; 4 bus outputs (one per bus); master fader; 4 VU meters with peak indicators; meter input selector for bus/monitor/submix; stereo headphones jack with gain control; monitor/submix signal selector. Bus mix section features 4 x 2 with gain and pan controls for each program bus with master stereo output control. Submix section features 8 x 2 submixer; pre/post/tape input selector; gain and pan controls; submix master gain control; stereo submix output; stereo submix input. Other features include 2 patchable stereo phono preamplifiers (RIAA standard). Frequency response 30-20,000 Hz 2 dB; S/N ratio (at nominal input level) 1 mic or 1 line to 1 bus >75 dB weighted, >70 dB unweighted; crosstalk (adjacent buses or inputs) >60 dB at 1 kHz; THD <0.1% at 1 kHz, nominal input level, measured at bus output; fader attenuation >60 dB; power supply 15 V dc; 18.25"W x 20.5"D x 6.3"H; 35.4 lb $1300

MX-80 Compact Microphone Mixer

Compact mic mixer with 8 identical input channels and stereo output. Each XLR low-impedance channel is balanced and has concentric gain and pan controls, trim control and 30-dB pad to handle from -70 dB (0.28 mV) mic levels to ±28 dB (25 V) line levels. Features phase-reverse switches; phantom power switch; level controls for each balanced and unbalanced stereo outputs, and are switchable to -10 dBV or 0 dBu $650

System 20 Mixing Console

Professional-style audio mixing console consisting of 4 modular assemblies.

MM-20. Main mixing chassis with 2 mic and 4 line inputs. Features transformer-isolated mic preamps; tape/mic (live) overdub capability; headphone monitoring, corrective EQ; XLR mic input connectors; -20-dB mic attenuator switches; trim pots; accessory send/receive jacks; W-pot pre/postfader; direct output; pan pots; bus input jacks; master monitor, headphone level controls; dc outputs for other modules. Mic input impedance/nominal level 600 ohms balanced/-60 dBV (1 mV); line input impedance/nominal level 50k ohms/-10 3k ohms/ -10 dBV (0.3V); headphone output impedance/nominal power 8 ohms/100mW; frequency response 30-20,000 Hz ±3 dB; S/N ratio A weighted/unweighted mic 65/60 dB, line 75/70 dB; crosstalk >60 dB at 1 kHz; THD <0.1% at 1 kHz; fader attenuation 60 dB or more; trim range ±10 dB (line/mic); power consumption 15 W at 120 V ac, 60 Hz; 16.9"W x 15.8"D x 4.2"H; 9.2 lb..... $395

EX-20. Expander module adds 4 transformer-isolated mic inputs to MM-20 complete patch bay. Features 4 mixing positions; accessory patch points direct outputs. Specifications the same as for MM-20 except power consumption 170 mA at + 12 V dc (obtained from MM-20); 9.6"W; 4.4 lb $325

PE-20. 4-input/4-output/4-channel parametric equalizer for System 20. EQ frequencies; low 60-1.5k Hz adjustable, middle 1-8 kHz adjustable, 10 kHz fixed; ±12-dB boost/cut range; S/N ratio >80 dB; crosstalk >60 dB; THD <0.1% at 1 kHz; input impedance/nominal level >100k ohms/-10 dBV (0.3 V); power consumption 120 mA at ±12 V dc regulated (obtained from MM-20); 15.8"D × 9.6"W × 4.2"H; 4.62 lb $350

MU-20. Four VU-meter assembly with peak level indicators for System 20. Features -20 to +5-VU range; peak indicator level 10 dB above 0 VU; power obtained from MM-20; 16.4"W × 3.1"H; 2.2 lb $150

Model 2A Audio Mixer

Features 6 inputs (microphone and/or line in any combination); 4 outputs; level controls for each input channel; master output level control; cue output jack on each input channel; accessory send/receive patch points on each output bus for reverb, graphic-equalizer, limiter, compressor, noise-reduction units and other signal processors; 4 AUX outputs in parallel; 4 line outputs; selectable high-cut filters at 5 kHz or 10 kHz; low-cut filters at 100 or 200 Hz; color coded push-push channel assignment buttons; pan on each channel; 14 9/16"D × 13 7/16"W × 3 17/32"H ... $495

Model 1 Studio Series Mixer

Eight-in/2-out line level mixer; independent gain, pan for each input channel; master gain; foldback for each channel; AUX outputs in parallel with line outputs; separate bus inputs; contains 1-W amplifier with level control for 2 stereo headphone feeds. Line in (×8), bus in (×2) impedance 30k ohms and nominal input level -10dB; line out, AUX out (×2), cue out (×8), load impedance 10k ohms, nominal output level -10dB; headphones (×2) load impedance 8 ohms; S/N ratio 78 dB weighted; frequency response 30-20,000 Hz ±1 dB; crosstalk -50 at 1 kHz; THD 0.3% maximum; power consumption 8W; 17¼"D × 4⅜"H..... $200

9 Signal Processors

ACE AUDIO

7400 Electronic Commercial Killer
Eliminates commercials from AM and FM with time delay of 10-90 seconds (user adjustable). Connects to tape-monitor loop, tape recorder, or between preamp and amp. LED shows when unit is operating. Activation is manual. Distortion 0.02%; hum and noise -90 dB; output impedance 100 ohms .. $106

4000 Series Filters
Sharp-cutoff infra/ and infra/ultrasonic filters using low-phase-shift active and passive filters to remove unwanted subsonic and ultrasonic frequencies caused by record warps, off-center spindle holes, turntable rumble, resonances, acoustic feedback. IM distortion typically 0.002%.

4000. Sharp cutoff infrasonic filter (-18 dB/octave below 20 Hz) $98

4000-X24. Ultrasharp cutoff infrasonic filter (-24 dB/octave below 20 Hz) $132

4100. Infra/ultrasonic filter (-18 dB/octave below 20 Hz, -12 dB/octave above 20,000 Hz) $108

4100-X24. Infrasonic/ultrasonic filter (-24 dB/octave below 20 Hz, -12 dB/octave above 20,000 Hz) $142

ADC

SS-315 Frequency Equalizer/Spectrum Analyzer
Ten-band stereo graphic equalizer with LED in each slide control knob and built-in spectrum analyzer/display. Features electret condenser mic; tape dub, monitor, line/record, bypass/equalize, subsonic-filter, mic/line switches; display controls. Equalizer section: Center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; control range ±15dB; frequency response 5-100,000 Hz + 0.5/ -1.0 dB; gain unity at ±1 dB; harmonic/IM distortion 0.008%/0.008% at 1 V output; hum and noise 102 dB below 1 V output; input/output impedance 50k/600 at 1 kHz; load impedance 10k ohms or greater; subsonic filter slope 18 dB/octave. Analyzer section: display frequency accuracy 31.5-1,000 Hz ±10%, 2-16 kHz ±5%; main in frequency response 3-16,000 Hz (10 dB range) ±10%; mic-in frequency response 30-16,000 Hz ±3 dB; power consumption 23 W; 17¼"W x 8¾"D x 3½"H; 9.25 lbs. Accessories included: condenser mic calibrated to built-in analyzer; 1.5-V (UM-5) cell for microphone $400

Sound Shaper Equalizer SS-215
Twelve-band stereo graphic equalizer with LED in each slide control and built-in spectrum analyzer/display. Features LED level displays; tape-monitor, dub, line/record, bypass/equalize, mic/line, subsonic filter switches; meter controls. Center frequencies 32, 56, 100, 180, 320, 560, 1k, 1.8k, 3.2k, 5.6k, 10k, 18k Hz; boost/cut range ±15 dB; frequency response 5-100,000 Hz +0.5/−1.0 dB; gain 0 dB ±1 dB; harmonic and IM distortion 0.008% at 1 V output; hum and noise 102dB below 1 V output; input/output impedance 50k/600 ohms at 1 kHz; load impedance 10k ohms;inputs/outputs: 2 main, 4 tape monitor; subsonic filter slope 18 dB/octave; 17⅛"W x 8¾"D x 3½"H; 11.8 lb $330

SS-115. Similar to Sound Shaper SS-215 except 10-band EQ, no tape dub or monitor switches; no output-level control. Center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; harmonic and IM distortion 0.01%; 17⅛"W 8¾"D x 3½"H; 7 lbs 15 oz $250

Sound Shaper Five Equalizer
Five-band stereo graphic equalizer with LED in each slide-control knob. Center frequencies 60, 240, 1k, 3.5k, 10k Hz; boost/cut range ±12 dB; 2 main, 2 tape-monitor inputs/outputs; dynamic range 5 V rms into 10k ohms; frequency response 5-100,000 Hz +0.5/−1.0 dB, gain 0 dB ±1 dB; harmonic /IM distortion 0.018%/0.035% at 1 V output; hum and noise 95 dB below 1 V output; input/output impedance 75k/100 ohms; load impedance 100 ohms; power consumption 17 W; 16¹⁵⁄₁₆"W x 6½"D x 4½"H; 8 lb. Accessories supplied: 2 audio cables $130

AIWA

GE-80 Graphic Equalizer
Seven-band stereo graphic equalizer with electronic illuminated cursors, defeat and line/tape switches. Center frequencies 40, 125, 330, 1k, 2.5k, 6.3k, 15k Hz; boost/cut range ±10 dB; maximum output 5 V; harmonic distortion 0.0025% at 1 V, 1 kHz $120

AKG

BX-5E Reverberation Unit
Compact rack-mount studio stereo reverberation unit. Features adjustable input sensitivity (−22 to +12); adjustable decay time (1.5, 2.5, 3.5); separate L/R dry/reverb mixing (any ratio from pure dry to pure reverb); reverb bass-shelving EQ (±10 dB at 100 Hz); separate L/R reverb parametric EQ (±15 dB 500-5000 Hz); balanced 10k-ohm inputs and 240-ohm outputs via XLR-type connectors $1,495

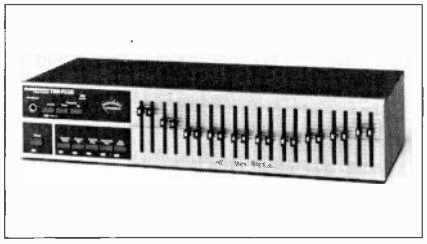
ALLISON

The Electronic Subwoofer
Stereo bottom-octave equalizer/bandpass filter for use in tape-monitor or external-processor loop of preamp, amplifier, receiver. Has FILTER ONLY switch. Rolloff 24 dB/octave below 20 Hz, 18 dB/octave beyond 20 kHz; turnover frequencies +3 dB at 41, 35.5, 48 Hz (extends Allison speakers flat to 20 Hz); S/N ratio 100 dB minimum A weighted; 14¼"W x 4¾"D x 2"H $290

AUDIO CONTROL

C-101 EQ/LED Spectrum Analyzer
Ten-band stereo graphic equalizer features 101-LED spectrum analyzer display. LED spectral display operates on various level; shows controllable peak-reading modes (fast or slow); horizontal LEDs indicate sound pressure level with external microphone or VU meter readings; switchable calibration levels from 2 (analyzes pink-noise and microphone) to 4 dB/LED (displays wider dynamic range). Center frequencies 32, 60, 120, 480, 960, 1.92k, 3.84k, 7.68k, 15.5k Hz with ±15-dB boost/cut range, −1 dB subsonic rolloff at 25 Hz, −3 dB rolloff at 20 Hz, −21 dB rolloff at 10 Hz. Other features include continuously variable input level sensitivity with calibration; automatic mic/line input switching; 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 ±0.75 dB; distortion 0.025% at 1 V, 20-20,000 Hz; hum and noise −96 dB at 1 V, 10-kHz bandwidth; maximum input 7 V; input impedance 100k ohms; max. output 7 V; output impedance 680 ohms; 19"W × 6.5"D × 3.5"H $599

Ten Plus Equalizer/Analyzer
Stereo 10-band equalizer with warble-tone analyzer and measurement microphone. Single Touch™ analyzer operation uses special switching to select warble-tone frequencies for each set of equalizer sliders. Lighted dB meter and and dB LED allow integration of room and speakers in minutes. Four micron black electret microphone on 20-ft cord has frequency response of 20-20,000 Hz ±1.5 dB. Features additional input and switching for video soundtrack equalization; 18 dB/octave subsonic filter; adjacent left



and right channel sliders; LED indicators for program, subsonic, video input, tape monitor and special flashing light to warn of tape equalization mode. Center frequencies at 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz. Frequency response 3-100,000 Hz ±1 dB; boost/cut range ±12 dB; THD 0.005%;S/N ratio 120 dB; $329

Ten. Similar to Ten Plus but without analyzer. $269

Richter Scale™
Unit combines 5-band half-octave bass equalizer, warble-tone generator/analyzer, electronic crossover, measurement microphone. Designed to enhance bass response. Features subsonic filter; source/tape monitoring; equalization program; low-frequency summing circuit (12 dB/octave at 200 Hz) for rumble reduction; ultra-low boost (+15 dB at 36 Hz) switch; 100-1000-Hz, 12-dB/octave electronic crossover circuit for subwoofer and biamplification modes. Center frequencies 31.5, 45, 63, 90, 125 Hz; boost/cut range ±12 dB; stereo pink-noise source adjustable to each center band via rotary switch; −20 to +3 dB lighted meter registers mic input; subsonic filter 18 dB/octave; frequency response 3-100,000 Hz ±1 dB; THD 0.04%; input/output impedance 100k/150 ohms; S/N ratio 90 dB; pink-noise output level 100 mV $259

Signal Processors

Octave Plus Equalizer/Pink-Noise Analyzer
Unit combines 10-band octave graphic equalizer, pink-noise generator/analyzer, measurement microphone. Features stereo pink-noise source adjustable to each band via rotary switch and 2-position range buttons; 18-dB/octave subsonic filter; −20 to +3 dB lighted mic input meter; tape/source monitor; ebony faceplate with oak end panels. Center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±12 dB; frequency response 3-100,000 Hz ±1 dB; THD 0.04%; S/N ratio 90 dB; input/output impedance 100k/150 ohms; pink-noise output level 100 mV $239

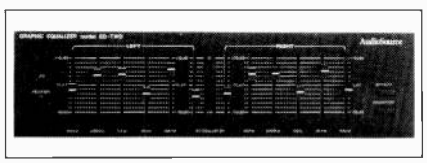
Octave Equalizer
Stereo 10-band graphic equalizer with 18 dB/octave subsonic filter, program tape and tape monitor circuits. Tape equalization switch allows production of custom-EQed tapes. Center frequencies 32, 60, 120, 480, 960, 1,920, 3,840, 7,680, 15,500 Hz; THD 0.008%; frequency response 3-100,000 Hz ±1 dB; S/N ratio -118 dB; $149

Soundtracker 1 Video Sound Equalizer
Five-band equalizer designed to improve VCR, cable and broadcast TV sound. Features digital stereo synthesis circuit; dynamic hiss reduction; master input gain control with overload LED; adjustable noise reduction with LED. Center frequencies 60, 250, 1k, 3.5k, and 10k Hz; THD 0.05%; S/N ratio -80 dB; $149

AUDIOSOURCE

EQ-1 Graphic Equalizer/Analyzer
Rack-mount, professional-type stereo graphic equalizer with built-in real-time analyzer, pink-noise generator, omnidirectional electret condenser microphone. Features LED display consisting of 80 red, 10 green, 2 red LEDs that constantly give accurate music readings, subsonic filter. Center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±12 dB; frequency response 3-100,000 Hz ±0.75 dB; distortion 0.2%, 20-50,000 Hz; hum and noise -90 dB at 1 V; maximum input/output 5 V; input/output impedance 100k/68 ohms; subsonic filter slope -18 dB/octave; analyzer display range -8 to +16 dB; pink-noise output level/impedance 100 mV/6k ohms; microphone sensitivity -66 dB at 1 kHz; mic impedance 600 ohms; mic frequency range 30-16,000 Hz; 19"W x 8.36"D x 5.22"H; 8.4 lb $400

EQ-TWO Graphic Equalizer
Five-band stereo compact graphic equalizer with center frequencies at 60, 250, 1k, 4k, and 10k Hz. 12



dB boost or cut for each channel. Features tape-monitor switch and jacks; unity gain control. Brushed black finish $100

BIAMP

EQ/270A Graphic Equalizer
Graphic equalizer with 27 band at ⅓-octave intervals. Features EQ bypass switch; LED overload indicator; transformer-type connectors; phone jacks on inputs, outputs; transformerless balanced in/out lines; combining filters. Center frequencies set 40-16,000 Hz; boost/cut range ±12 dB; frequency response 15-30,000 Hz ±0.1 dB; THD and IM distortion 0.0075%; hum and noise 115 dB below rated output; input impedance 600/500 ohms switchable; maximum input +24 dB; slew rate 8 V/μsec; 19"W x 10"D x 3½"H $649

EQ/210 Graphic Equalizer
Stereo 10-band graphic equalizer. Features gain control; bypass switch; LED overload indicator; 4 phone jacks/ch for unbalanced/balanced input/output lines. Center frequencies 32, 64, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±15 dB; Frequency response 6-45,000 Hz to/-1 dB flat positions; THD and IM distortion 0.005%; gain -3 dB unbalanced, 0 dB balanced; slew rate 1 V/μ sec; output load impedance 600 ohms; input impedance 50k ohms, balanced or unbalanced; maximum output +24 dBm at 8 V unbalanced; S/N ratio 84 dB below 1 V out; rack-mountable; 19"W x 5¼"D x 3½"H $329
EQ/110R. Mono version of EQ/210 ..... $219

Quad Limiter
Multi-channel limiter/compressor with 4 threshold controls with LED 4 independent channels. Threshold variable from -40 to +18 dB; output impedance 600 ohms unbalanced or balanced; input impedance 25k ohms unbalanced, 50k ohms balanced; frequency response 20-25,000 Hz ±0.5 dB; THD 0.03% at 1 kHz; attack/release time 1/150 msec to 1.5 sec; S/N ratio 102 dB; slew rate 8 V/μsec; 19"W x 5½"D x 1¾"H $329

EQ/140 Parametric Equalizer
Single-channel 4-band parametric equalizer for use with any sound system. Boost/cut 16 dB with deeper notch to -40 dB for feedback tuning on channels 2 and 3. Two end channels are convertible from reciprocal peaking to shelf mode. Features fully balanced outputs and inputs; 5 LED overload indicators; user-adjustable Q for end filters. Frequency response 20-20,000 Hz ±0.1 dB with all filters out; THD and noise 0.003% wrms; IM distortion <0.004%. Standard rack mount; 1¾"H $299

CARVER

C-1 Sonic Hologram Generator
Patented outboard unit employs Sonic Holography, attaching to any conventional hi-fi system to restore lifelike space and dimension to music. Sonic Hologram Generator precisely locates instruments and vocals in 3-dimensional space by using otherwise inaudible phase and time information to recreate the original vector sound field. Requires no special source material or additional speakers. Specifications and performance are identical to Sonic Holography section of C-4000 preamplifier. 19"W × 1¾"H × 4⅝"D $229

CERWIN-VEGA!

GE-3 Graphic Equalizer
Stereo 13-band graphic equalizer combining octave and one-half-octave filter bands to provide precision equalization of one-half-octave filter bands below 250 Hz. Bands are set on octave centers above 250 Hz. Balanced inputs have standard XLR jacks and unbalanced inputs have ¼" phone jacks. Features dual-voltage power supply; monolithic amps; active filter network; aviation-grade circuit boards. Center frequencies 31.5, 45, 63, 90, 125, 180, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut 12 dB; frequency accuracy within 2%; frequency response 20-20,000 Hz ±0.15 dB; THD <0.005% at rated output with all band controls flat; S/N ratio -98 dB unweighted, -100 dB weighted; gain control +6 dB (referenced to unbalanced output). Rack mountable. 19"W × 10.25"D × 3.5"H; 13 lbs $625

DB-10 Bass Turbocharger
Incorporates 18 dB/octave subsonic filter to eliminate subsonic noise below 20 Hz. Filter accuracy ±0.25 dB; rated output 2 V rms; maximum output 8 V rms; HD or IM distortion 0.025% $50

CROWN

EQ-2 Synergistic Equalizer
Stereo 11-band ½-octave equalizer with center frequencies at 20, 40, 80, 160, 320, 640, 1250, 2500, 5000, 10,000, 20,000 Hz. ±15 dB boost/cut; each channel features octave frequency adjust controls; ±20 dB tone controls with bass hinge points adjustable 180-1800 Hz, treble hinge points adjustable 1k-10k Hz; equalizer, tone cancel master controls; overload indicators. Rear panel has unbalanced inputs, balanced inputs with switchable unity/+10 dB gain selection, screwdriver-adjusted attenuation controls, normal/inverted outputs. Frequency response 10-100,000 Hz ±0.3 dB, 20-20,000 Hz ±0.1 dB, controls flat; hum and noise 90 dB below rated output, 20-20,000 Hz bandpass; IM distortion 0.01% at rated output; rated output 2.5 V rms; input impedance 25k ohms unbalanced, 20k ohms balanced (transformerless); output impedance 300 ohms (normal), 600 ohms (balanced); satinized aluminum front panel with grey Lexan inlay; 7½"H x 19"W x 14½"D x 7½"H 1,299

VFX-2A Crossover
Solid-state filters used for crossover or bandpass functions; 2-channel, 2 filters/channel (high pass, low pass at 18 dB each) 20-20,000 Hz ±0.1 dB; filter rolloff 18 dB/octave. Stereo: 0-15.5 dB variable gain bridging input/channel along with unbalanced unity gain input; output impedance 300 ohms (inverted and non-inverted), 6V maximum output into 600 ohms; IM distortion 0.01% at rated output with 0 dB gain. Mono: functions as combined bandpass/2-way crossover, or as 3-way crossover (tri-amping); mono jack combines 2 input signals to form mono output; mono bass output combines low pass section of 2 filters to feed output jack. Satinized aluminum front panel with plexiglass cover; 19"W x 5¾"D x 3½"H $429

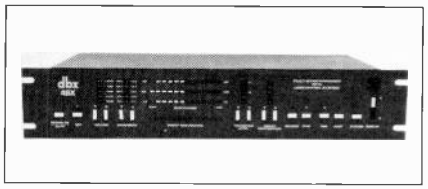
DAHLQUIST

DQ-LPI Variable Low-Pass Filter
Low-pass electronic crossover for biamplifier bass speaker applications, including external low-bass reproducers. Each channel variable 40-400 Hz. Features 18 dB/octave low-pass cutoff slope; controls adjustable 0-5 dB boost at 20 Hz; choice or combination of mixed center-channel and stereo bass outputs; separate level controls for system balance; up to 15 dB gain; satin-brushed panel; walnut end blocks; 12¾"W x 5¼"D x 2⅛"H $350

dbx

Model 20/20 Computerized Equalizer/Analyzer
Automatic microprocessor-controlled 10-band graphic equalizer, real-time analyzer, pink-noise generator, sound pressure level (SPL) indicator. Includes calibrated 20-20,000-Hz ±1 dB electret condenser microphone with 20-ft cable. Center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range +14/-15 dB; accuracy ±1 dB at full boost/cut, ±0.1 dB/step; gain 0 dB; THD 0.01%, 20-20,000 Hz. Dynamic range: equalizer 95 dB, SPL indicator 95 dB, real-time analyzer 30 dB shown on screen with center reference selectable in 10-dB steps from 60 to 110 dB (same for SPL indicator); display 30 LEDs x 10 band; meter bandwidth at 90 dB SPL input 15-20,000 Hz; generator accuracy ±0.5 dB. 19"W x 12½"D x 5¼"H $1,700

Dynamic Range Expanders
Expanders designed to increase dynamic range of records, tapes, FM broadcasts by as much as 50%, reduce noise by as much as 20 dB.
Model 4BX. Advanced expander processes bass, mid, and treble frequencies separately to make loud passages louder and soft passages quieter; also includes Impact Restoration circuit to restore "punch" to musical attacks. Wireless remote Logicontrol for all nonswitching functions, including On/Mute, Off, Volume, and Bypass. LEDs monitor expansion in each frequency range plus degree of impact restoration. Expansion variable from none to 50% in each band. Impact-restoration gain variable from 0 to +12 dB in each band. Features transition-level control; expansion-level control; tape-monitor loop. Attack rates program-dependent, optimized for each band; release rates for linear expander are program-dependent and optimized (and are adjustable for impact restorer);



high-frequency transition adjustable; volume control range -40 to +10 dB; dynamic range >105 dB (maximum rms signal to A-weighted noise); frequency response 20-20,000 Hz ±0.5 dB at no expansion (pink noise or music); THD <0.15% at no expansion; IM distortion <0.1% at any setting; equivalent input noise -90 dBV A-weighted; power consumption 30 W. 3"½H × 17¹⁵⁄₁₆"W × 12¼"D $799

Model 3BX Series Two. Expander makes loud passages louder, soft passages quieter; bass, midrange, treble frequencies processed individually. Features 3 rows of LEDs that monitor degree of expansion in each range; expansion-level control; transition-level control; tape-monitor loop required by expander in stereo system. Attack and release times program-dependent, optimized for each band. Expansion ratio variable from none (1:1) to 50% (1:1.5) in each band; dynamic range >105 (max rms signal to A-weighted noise); frequency response 20-20,000 Hz ±0.5 dB at no expansion (pink noise or music); equivalent input noise -88 dBV A-weighted; THD 0.15% at no expansion; IM distortion <0.1%; power consumption 30 W; 17 ¹⁵⁄₁₆"W x 7½"D x 1¾"H $549

Model 1BX Series Two. Similar to Model 3BX Series Two except has infrasonic filter in its rms-level detector to prevent mistracking caused by turntable rumble, record warp; 10 LEDs to monitor upward and downward expansion; power consumption 10 W; 17¹⁵⁄₁₆"W x 7½"D x 1¾"H $279

Type II Tape Noise-Reduction Systems

Type II units reduce noise by more than 30 dB across entire audio-frequency spectrum and (except for NX40) add 10 dB additional recording headroom when used with any good-quality tape recorder. In addition, they decode dbx discs.

Model 224. Linear decibel compander offers simultaneous encode/decode (record/play) for full monitoring capability with 3-head decks. Also works with 2-head decks. Effective noise reduction 40 dB; dynamic range 110 dB (maximum rms signal to A-weighted background noise); frequency response 40-20,000 Hz ±0.5 dB, -2 dB at 30 Hz (pink noise or music); equivalent input noise -88 dBV A-weighted; THD <0.1% 100-20,000 Hz, <0.5% 30-100 Hz; IM distortion (SMPTE) <0.2%; power consumption 7 W; 17¹⁵⁄₁₆"W x 7½"D x 1¾"H $259

Model 228. Tape noise-reduction system/dynamic-range expander that combines functions, specifications of Model 224 NR unit and Model 1BX Series Two dynamic-range expander (see below) $499

Model 222. Similar to Model 224 but designed for 2-head recorders. Has separate encode (record) and decode (playback) functions, no monitoring capability. Specifications are the same as for Model 224 ..... $219

Model NX40. Version of linear decibel compander with simultaneous encode/decode (record/play) for full monitoring with 3-head decks; also works with 2-head decks. Effective noise reduction greater than 30 dB; dynamic range >88 dB (max rms signal to A-weighted noise); frequency response >/+1.5 dB 50-15,000 Hz (pink noise or music); equivalent input noise -85 dBV A-weighted; THD <0.5% 100-15,000 Hz; power consumption 1.5 W; 1¹⁵⁄₁₆H" × 7W" × 9⅛D" $159

Model 21. dbx disc, tape decoder designed to reproduce full 90 dB of live performance, virtually eliminate record pop, ticks, surface noise. Dynamic range 100 dB (max rms signal to A-weighted noise); nominal/maximum input 300 mV/6 V rms; output level 5.5 V rms; frequency response follows dbx type II decoding curve 40-20,000 Hz ±1 dB (pink noise or music); hum and noise <-100 dBV, referenced to 1V, A-weighted, 20-kHz bandwidth; THD <0.3% at 1 kHz; output noise -90 dBV A-weighted; power consumption 7 W; 8¾"W x 6⅝"D x 2¾"H; 2.5 lb$109

EMPIRE

GX200 Graphic Equalizer

Stereo 10-band graphic equalizer with 20-push-button frequency controls, LED display for each band. Features reverse switch for noise-reduction applications; attenuator switch; EQ bypass switch; EQ record, tape-monitor controls. Center frequencies 32, 64, 125, 250, 500, 1k, 4k, 8k, 16k Hz; boost/cut range ±10 dB; frequency range 10-35,000 Hz; S/N ratio 110 dB at 1 V; THD 0.003% at 1 V; input and output level/impedance 150 mV/47k ohms; maximum output 6 V $250

GX100 Graphic Equalizer

Stereo 10-band graphic equalizer with slide controls. Features attenuator switch; EQ bypass switch; EQ record, tape-monitor controls. Technical specifications same as for GX200 except THD 0.005% $190

EVENTIDE

H910 Harmonizer®

Combination pitch changer and digital-delay unit. Features feedback control to mix output back into input to create many special effects; ±1-octave pitch change with digital pitch-ratio readout; variable time delay to 112.5 msec; second delay output; antifeedback function for sound-reinforcement applications; availability of remote keyboard controls. Frequency response 20-12,000 Hz ±1 dB; dynamic range 90 dB; distortion 0.2% at 1 kHz; 19"W x 9"D x 3½"H $1,500

JJ193 Digital Delay

CMOS-logic digital delay line designed for recording studio, concert hall, auditorium, radio station; produces signal doubling, realistic echo effects, synchronization of sound reinforcement speakers, pre-echo delay. Features RAMs; variable time-delay switches (0-maximum in 2-dB steps); 4 outputs, 1 input; 6-LED input-level indicators; input-level control. Input impedance 20k ohms balanced, 10k ohms unbalanced; input level -10 to +3 dBm full dynamic range; output impedance 300 ohms electronically balanced; maximum output level +22 dBm; distortion 0.2% at 1 kHz; dynamic range 90 dB from clipping to noise floor; frequency response 30-12,000 Hz ±1 dB; 19"W x 9"D x 1¾"H $1195

HM-80 Harmonizer®

Compact portable harmonizer features ±1-octave pitch control, 270-sec delay, word or short riff repeat, time reversal, dry vs effect output mix, feedback controls; dynamic range 80 dB; 10½"W x 8¼"D x 2¼"H $775

FL201 Instant Flanger®

Oscillator, manual, remote, and envelope controls may be used in any configuration; features time-delay circuitry, effect modifier block (designed to imitate motor or servo hunting bounce), depth control (effects percentage of direct vs delayed signal, relative phase of each); line in/out control, LED indicator; high level input, output (optional balanced line in/out); LED mode indicators. Frequency response 50-15,000 Hz +1 dB direct channel, 50-10,000 Hz +1.5 dB delayed channel; distortion 0.05% below clipping direct channel, 1.0% from 0 to +8 dBm input delayed; dynamic range 112 dB at 15,000 Hz direct, 75 dB delayed; delay time between 200 μsec-10 msec; input/output level 0 to +4 dBm; input impedance 10k ohms unbalanced; 19"W x 9"D x 3½"H $700

2830 Omnipressor®

Dynamic modifier combines functions of compressor, expander, noise gate, limiter. Features continuously variable expansion/compression control (10:1 gate to -10:1 abrupt reversal); attenuation, gain limit controls (60 dB to ±1 dB); variable time constant controls (1000:1); bass/cut switch; logarithmic input/output/gain meter; in/out bypass switch. Frequency response 20-16,000 Hz +0/-0.5 dB; input/output level 0 to +8 dBm; input impedance 10K ohms electronically balanced; output impedance 600 ohms; gain unity, +10, +20 dB (agc disabled); compression 1:1 to unity to 10:1; expansion 1:1 to 10:1; S/N ratio -90 dBm at unity gain; attack time 100 sec-100 msec; release time 1 msec-1 sec; 19"W x 9"D x 3½"H $700

For an explanation of abbreviations, turn to the list on page 35.

Tape-recording terms are defined in the vocabulary on page 32.

FISHER

EQ550 Graphic Equalizer

Stereo 12-band equalizer. Features EQ on/record/bypass switch; tape-monitor switch; LED indicators in control knobs for at-a-glance indication of equalization curves. Center frequencies 16, 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k, 32k Hz; boost/cut range ±12 dB; frequency response +0/-0.5 dB; input/output impedance 50k/2k ohms; THD 0.01% at 1 V output, 0.06% at 5 V; maximum output at 1% THD 7 V; S/N ratio at 100/1k/10k Hz referred to 1 V; power consumption 8 W; 17⅓"W x 11¼"D x 4⅛"H; 10lb $350

EQ350 Graphic Equalizer

Stereo 10-band graphic equalizer. Features detented slide controls; tape-monitor, line/source, and record switch. Center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±12 dB; input/output impedance 50k/2k ohms; THD 0.01% at 1 V output, 0.06% at 5 V; maximum output at 1% THD 7 V; frequency response 20-20,000 Hz +0/-0.3 dB; S/N ratio at 100/1k/10k Hz referred to 1 V; power consumption 6 W; 17⅓"W x 11¼"D x 3½"H; 9.2 lb $200

EQ2322. Similar to EQ350 except black front panel and cabinet, different knobs; all specifications same as above $200

NR500 Noise-Reduction System

Super D dual-process noise-reduction system with decilinear compression/expansion system to expand dynamic range up to 40 dB. Features phase-compensated bandsplitting system that minimizes breathing while reducing hiss, clipping; decilinear system that eliminates level-matching problems for record, play; response speed matched to bandwidth requirements for optimum transient characteristics with minimum distortion. Dynamic range 100 dB; THD 0.08% at 1 kHz, rated level; frequency range 20-30,000 Hz; noise reduction 40 dB maximum; record/play input level 350 mV, impedance 330 ohms; power consumption 7 W; 17⁹⁄₁₆"W x 10⅜"D x 1¾"H; 8 lb 3 oz $190

EQ100 Graphic Equalizer

Graphic equalizer with 7 detented boost/cut controls. Features tape monitor switch. Center frequencies 65, 160, 400, 1k, 2.5k, 6k, 15k Hz; boost/cut range ±10 dB; inout/output impedance 50k/2k ohms; THD at 1/5 V output 0.01%/0.06% controls set flat; frequency response 20-20,000 Hz +0.1/-0.3 dB; maximum output 7 V; S/N ratio 100 dB; power consumption 6W; 15¾"W x 8¾"D x 3⅛"H; 5 lb $130

FURMAN SOUND

PQ-6 Stereo Parametric Equalizer/Preamp

Three-band stereo parametric equalizer designed as instrument preamp, feedback suppressor in PA system, or patchable outboard equalizer for recording studios, broadcast station, stage productions. Each channel features ⅓-octave narrow/4-octave broad bass, midrange, treble bandwidth controls with overlapping and variable frequency controls covering 20-2500 and 600-10,000 Hz respectively and +20 dB boost to minus infinity cut equalization controls; EQ in/bypass with LED; loudness-compensation level control. Input 100k ohms unbalanced, with maximum input before clipping 430 mV rms for low level; output 10 ohms unbalanced, with maximum output level 8.3 V rms; total available gain 26 dB (low-level in), 6 dB (high-level in); frequency response ±0.5 dB (bypass), 20-20,000 Hz (EQ flat); S/N ratio 109 dB (bypass), 99 dB (EQ in and flat); distortion 0.015% (by-

Signal Processors 9

pass), 0.025% (EQ flat); brushed and anodized aluminum front panel and steel chassis; rack-mountable; available in 115V, 60Hz or 230 V, 50/60 Hz; 19"W × 8"D × 3.5"H $525

PQ-3. Mono version of PQ-6; 1.75"H $315

SG-10 Sweep Graphic Equalizer

Five-band stereo graphic equalizer with each band's center frequency continuously variable over 4-octave range. Features stereo/split circuitry that permits instant switching from 5-band stereo to 10-band mono operation; integral instrument preamps for low-level sources; overload indicator system; bypass switches with LED status indicators; low-cut filters for each channel; low-level outputs for driving instrument amplifiers; optional balanced inputs and outputs; center-detented slide controls. Frequency ranges 16-250 Hz band 1, 32-500 Hz band 2, 125-2000 Hz band 3, 500-8000 Hz band 4; 1000-16,000 Hz band 5; boost/cut range ±15 dB; low-cut filter corner frequency 80 Hz; total available gain with equalizer out 26 dB low-level input, 6 dB high-level input; frequency response 20-20,000 Hz ±0.5 dB EQ out or all EQ controls at 0; S/N ratio EQ out/EQ flat 109/99 dB; THD EQ out/EQ flat 0.015%/0.25%; inputs 430 mV rms low level, unlimited (depends on setting of input level control) high level; power consumption 10 W $495

RV-1 Reverberation System

Reverberation system incorporates shock-mounted triple Accutronics 16" spring assembly, fast-attack peak limiter, quasi-parametric midrange controls. Features input, direct, reverb level controls; LED limit threshold indicator (flashes green when gain reduction begins); midrange frequency (160-1400 Hz), ±18-dB midrange Eq; treble shelving (±18 dB from 2500-10,000 Hz) controls. Input 33k ohms unbalanced at recommended −10 to +4 dBm level; output 47 ohms unbalanced, with maximum output level 8.3 V rms; frequency range 45-7000 Hz; decay time 1.8 sec with 30-40 msec initial delay; limiter compression ratio 10:1; S/N ratio 74 dB A-weighted, EQ flat; aluminum front panel, steel chassis; rack-mountable; 19"W × 8"D × 1.75"H $315

LC-3 Limiter/Compressor

Limiter/compressor features input and output level controls; attack, release, compression ratio controls; LED-style meter that displays gain over 20-dB range; LED power and overload indicators. Front-panel pushbuttons select between normal compression and de-essing or side-chain modes. Program-adjusted release time; biFET op-amp design; 3-pole de-essing filter; modular construction. Can be rack mounted. Attack time 100 μsec to 5 millisec; release time 50 millisec to 1.1 seconds; compression ratio 2:1 to 50:1; frequency response 20-20,000 Hz ±0.5 dB; S/N ratio 103 dB. Input impedance 10k ohms unbalanced (optional 20k ohms balanced at main input); maximum input before clipping for balanced input 8.7 V rms (+21 dBm); unbalanced, 17.4 V rms (+27 dBm) balanced; minimum terminating impedance 2.5k ohms. THD 0.012% at all amounts of gain reduction. 19"W × 8"D × 1¾" H; 5 lb; 115 V ac 60 Hz, 230 V ac 50/60 Hz; power consumption 5 W $335

GLi

EQ1500 BI-FET Graphic Equalizer

Stereo 10-band graphic equalizer with high-speed biFET IC circuitry. Features center detent on slide controls; defeat switch; main, AUX, tape-monitor input switches. Center frequencies 30, 60, 120, 240, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±12 dB; frequency response 20-20,000 Hz ±0.5 dB EQ flat, 0-500,000 Hz ±0.1 dB EQ bypassed; distortion 0.05% at 1 V rms out; THD and IM distortion 0.005%, 20-20,000 Hz at 5 V; slew rate 14 V/μsec; S/N ratio 90 dB below 2 V rms; maximum output 10 V before clipping; 19" rack-mountable $249

EQA2200. Ten-band octave equalizer with spectrum analyzer. Comes with microphone. 12 lbs $489

DAVID HAFLER

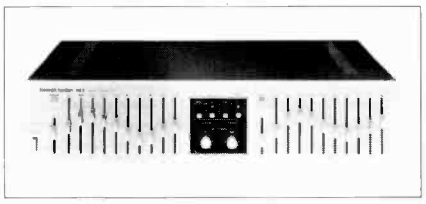
160 Stereo Graphic Equalizer

Stereo graphic equalizer with 10 LED −20 to +3 dB level displays, equalize/bypass switch, center (flat position) detented slide controls, biFET/bipolar transistor design, class-A operation. Equalizer range at octave intervals from 32 to 16,000 Hz; boost/cut range ±12 dB; level control 8 dB; maximum output level 8 V rms; frequency response 4-80,000 Hz +0/−3 dB, 20-20,000 Hz +0/−0.3 dB; THD >88 dB below 3 V rms (0.004%); IM distortion >90 dB below 8 V rms (0.003%); input/output impedance 68k ohms bypassed with 300 pF/<600 ohms to 25 kHz; hum and noise 115 dB below 8 V rms A-weighted; separation >88 dB at 1 kHz, >55 dB at 20 kHz; microphone input frequency response 20-20,000 Hz +0/−0.5 dB; mic input sensitivity 1.8 mV for 0-dB meter indication, mic gain control at maximum; line monitor sensitivity adjustable 80 mV to beyond 8 V for 0-dB meter indication $300 kit/$400 assembled.

HARMAN/KARDON

EQ8 Graphic Equalizer

Stereo 10-band graphic equalizer with continuously variable subsonic filter (from 5 to 30 Hz). Features separate left and right input controls with overload LEDs; tape monitor; tape equalization. Center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±12 dB; frequency response 5-140,000 Hz +0, -3 dB (all controls at zero); THD 0.02% at 2 V output, 20-20,000 Hz. 17⁹⁄₁₆" W × 12⅜" D × 4" H $225



HEATH

AD-1703 Graphic Equalizer

Stereo 10-band graphic equalizer with switching that allows equalizing before and after recording; left, right clipping indicators. Center frequencies 32, 64, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±12 dB; harmonic distortion 0.001% at rated output, 20-20,000 Hz ..... $275 kit

AD-1706 Audio Processor

Incorporates dynamic range expander, noise-reduction circuit increasing total dynamic range up to 17 dB (any program source processed gains up to 7 dB of dynamic range expansion, 10-dB noise reduction); front-panel 12-dB/octave (7 kHz) high filter switch; tape monitor; LED noise-reduction, dynamic range expansion indicators; connects via tape output, tape monitor jacks of preamp, integrated amp, or receiver. Rated input 200 mV; input impedance 100k ohms; gain 0 dB expander off, +0.25 dB expander on; frequency range 20-20,000 Hz; sensitivity 500 μV; hum and noise -70 dB from 20-20,000 Hz; output impedance 500 ohms; input overload 5 V rms at 1 kHz; black cabinet; 19"W x 14"D x 5¾"H ... $300

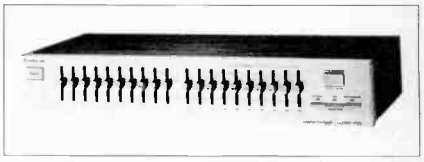
HITACHI

HGE-2100 Graphic Equalizer

Nine-band graphic equalizer with built-in delay line, microphone mixer. Features mixing diagram display; reverb and mic mixing. Center frequencies 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±10 dB; frequency response 20-20,000 Hz +0/−0.5 dB; S/N ratio 70 dB; gain 0 dB; input sensitivity/impedance 150 mV/47k ohms input and tape play, 1 mV/8k ohms mic; output level/impedance 150 mV/4k ohms; maximum output 5 V; 17⅛"W x 8⅞"D x 3¼"H; 6 lb 10 oz $240

HGE-1100 Graphic Equalizer

Stereo 10-band graphic equalizer with tape monitor, record equalization capability. Center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±10 dB; frequency response 5-30,000 Hz +0/-0.5 dB; gain 0 dB; S/N ratio 70 dB;



input sensitivity/impedance 150 mV/47k ohms input and tape play, 1 mV/8k ohms mic; output level/impedance 150 mV/4k ohms; maximum output 5 V; 17⅛"W x 8⅞"D x 3¼"H; 6 lb 10 oz $190

INFINITY SYSTEMS

Burwen DNF 1201A Dynamic Noise Filter

Processes any 2-channel or matrix-encoded material from turntable, tape deck, receiver, tuner. Features pushbutton controls for selecting noise reduction; sensitivity control with LED display. Frequency response (minimum bandwidth) −3 dB at 30 Hz, −10 dB at 1 kHz, −20 dB at 2.5 kHz; (maximum bandwidth) −0.5 dB maximum 10-20,000 Hz, −3 dB at 30 kHz, −25 dB at 100 kHz; attenuation rate 9 dB/octave; noise-reduction levels up to 30 dB beyond 5 kHz, 14 dB beyond 400 Hz; HD 0.2% maximum; gain 0 dB at 1 kHz, adjustable to 10 dB; internal noise 100 μV rms, 20-20,000 Hz; has 8 phono jacks and tape-deck connectors; 17½"W × 8¼"D × 2⅞"H $350

Burwen TNE 7000 Noise Eliminator

Transient (pulse) processor reduces or eliminates medium and small clicks, pops, ticks from turntable or tape deck. Blanking period filled by transition voltage; has defeat, tape-monitor, threshold, sensitivity controls, LED indicators for transient noise elimination, high-frequency calibration. Frequency response 20-20,000 Hz ±0.5 dB; distortion 0.1% THD, 0.5% IM; internal noise 40 μV rms; 16¾"W × 7⅝"D × 2⅞"H $350

INTEGREX

Four-Channel Dolby B Noise Reducer Kit

Stereo unit incorporates 4 Dolby channels for simultaneous encoding/decoding for 3-head tape machines; designed to reduce hiss in magnetic-tape recording machines; decodes commercially-available Dolby B-encoded reels or cassettes or Dolby B FM radio broadcast and/or encodes blank tapes from any source; cannot be used for discrete 4-channel encoding or decoding. Noise reduction 9 dB weighted (CCIR/ARM); minimum sensitivity 35 mV rms (tape and Dolby FM tuner imputs), 40 mV rms (AUX input); impedance 40k ohms (all inputs), all outputs variable, low impedance (all outputs); maximum variable output level 580 mV rm (Dolby level); overload 18 dB above Dolby level for 0.3% THD; distortion 0.05% (all outputs at Dolby level); S/N ratio unweighted, referred to 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 and tuner in), 76 dB (from tuner in, Dolby FM on). Kit includes 2-color fiberglass printed circuit board with component locations, all alignment circuits, solid mahogany cabinet; 15½"W × 6¾"D × 2¾"H . $150

Dolby Calibration Tapes. Specify reel or cassette . $9

DFM Dolby Noise Reducer

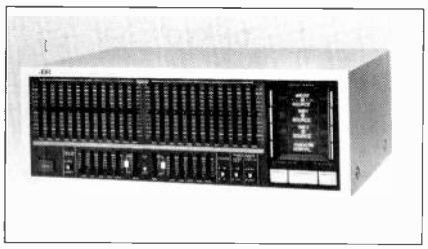
Decodes Dolby B-encoded cassette or reel tapes and Dolby-encoded FM broadcasts. Features front-panel on/off, 25/75-μsec deemphasis input select and Dolby-decoding in/out switches; rear-panel Dolby input-level calibration, output level controls. Noise reduction 9 dB weighted (CCIR/ARM); sensitivity 35 mV rms minimum; variable output level 580 mV at

Dolby level, overload 18 dB above Dolby level for 0.3% THD; distortion 0.05% referred to Dolby level; separation tape input 58 dB at 2 kHz, Dolby on; S/N ratio 79 dB Dolby level (CCIR/ARM); aluminum anodized case; 8½"W × 4"D × 2½"H $100

JVC

SEA-R7 SEA Stereo Graphic Equalizer

12-band-per-channel graphic equalizer with 5-frequency delay-time equalizer for variable reverb control. Frequencies of 12-band equalizer range from 16 Hz to 32 kHz. Boost/cut ±6 or ±12 dB. Delay-time



circuit allows level control over the 5 center frequencies, delay time from 0.04 to 1.2 seconds, and phase scattering. Features recording, dubbing, and monitoring capabilities; control buttons for recording and monitoring with 2 decks with or without equalization and delay; 2-way dubbing; 2-color flourescent "character display" panel. THD 0.001% (20-20,000 Hz); S/N ratio 118 dB $400

Model SEA-33 Stereo Graphic Equalizer

10-band-per-channel graphic equalizer. Features defeat switch; transistor inductors for expanded dynamic range; tape monitor with -6 dB input attenuator switch; rack mountable..... $160

KOSS

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; employs 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 15-W/channel amplifier; switchable speaker selector for 4th dimension, stereo only, phones and left/right speaker dimension control; EQ switch (enhances bass response of ambience speakers and rolls off bass response below 50 Hz); minimum/maximum -6 dB, peak-amplitude LEDs; 3 equalization controls: direct, reverb, reverb drive controls; send/receive bus. Frequency response 2-40,000 Hz ± 0.5 dB direct; reverb 20-5500 Hz; reverb time 2.5 sec; input/output impedance 47k/200 ohms; S/N ratio 90 dBm direct; 19"W × 7"D × 2"H ..... $400-$459

LT SOUND

ACC-2 Amplitude Control Center

Stereo unit has Allison Research vca with feed-forward circuit design, de-essing with switchable knee, or normal compression. Functions as compressor, limiter, expander, de-esser, on-board oscillator for amplitude-modulated tremolo effects. Each channel has compression ratio, compression attack and release controls; expander threshold expander ratio, attack, release controls; 3-color LED gain-reduction indicators. S/N ratio 90 dB below 1 V; typical distortion 0.001%; compressing/limiting slope variable between 1:1 and infinity; 19"W × 3½"H × 7¼"D..... $1,250

CLX-2. Similar to ACC-2 except has no tremolo-effects capability, expander ratio, expander threshold, attack, release controls. Has key function for keyed expansion or noise gating; 2"H..... $795

TAD-4 Thompson Analog Delay

Stereo ambience unit for recording use features 2 separate channels each of analog delay and studio reverb. Controls continuously variable for echo EQ, reverb level, reverb EQ, echo repeat, direct level, echo level, reverb level. Delay time continuously variable 20-240 msec; delay time; bandwidth 12 kHz at 20-70 msec, 8.4 kHz at 100 msec; down to 3.5 kHz at 240 msec; dynamic range >90 dB; 19"W × 7¼"D × 2"H $750

TC-1 Thompson Vocal Eliminator

Removes most or all of solo vocalist from standard stereo records and leaves most of the background instruments and vocals untouched. Works on tapes and records. 19"W × 7¼"D × 2"H $595

ECC Echo Control Center

Single-channel unit functions as preamp for 2 low-impedance microphones and 2 low-level low-impedance line-level AUX inputs; 3-band equalizer; echo and reverb controls for mic level, EQ, echo. Features biFET op-amp circuitry; relay on/off transient protection; mu-metal shielding for reverb unit. Delay dynamic range 85 dB below 1 V; distortion 0.5% at 1 kHz, 0.775-V out; delay range 20-240 msec; frequency response of delay ±1.5 dB; mic input impedance 2000 ohms for 600-ohm or less mic; AUX input impedance 47k ohms; output impedance 200 ohms for 2k-ohm loads; EQ range ±18 dB for bass, midrange, and treble; rack-mountable; 7"D × 2"H $695

RCC. Reverb control center similar to ECC without echo capability; frequency response 10-40,000 Hz ±0.5 dB direct, 22-19,000 Hz reverb; dynamic range 80 dB below 1 V; THD, IM distortion 0.05% $595

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, balanced and unbalanced inputs and outputs. Frequency range coverage 20-20,000 Hz; bandwidth 0.15-2.0 octaves; maximum level +22 dBm; maximum boost/cut ±15 dB; input impedance 47k ohms; output impedance 47 ohms; THD 0.007%; IM distortion 0.002%; 19"W × 7¼"D × 3½"H; 8.5 lb $525

PEQ-1. Same as PEQ-2 but single-channel version and no low-frequency rumble filter; 5 lb..... $349

RV-2 Stereo Reverb Unit

Reverb unit for line-level inputs only. Features −6-dB and peak amplitude LEDs; 3 equalization controls; direct, reverb, reverb drive controls; send-receive bus. Frequency response 2-40,000 Hz ± 0.5 dB (direct); reverb 20-5500 Hz; reverb time 2.5 sec; input impedance 47k ohms; output impedance 200 ohms for 2k ohm loads; S/N ratio 90 dBm (direct); 19"W × 7"D × 2"H $650

NR-2 Noise Reducer/Range Enhancer

Two-channel unit provides 2:1 compander noise reduction system and dynamic range enhancement system; for dual or independent tracking. Frequency response 20-20,000 Hz ±0.75 dB; S/N ratio 90 dB; distortion 0.2% at 1 kHz; input impedance 47k ohms; output impedance 200 ohms for 2k-ohm loads; 12.75"W × 6.15"D × 2.5"H $349

NR-4 Four-Channel Compander

Can switch 4 channels of noise reduction from record to play mode using 2 inputs simultaneously or 2-channel simultaneous record and tape monitor decode; has bypass switches. Frequency response 20-20,000 Hz ±0.75 dB; THD 0.2% (compressed and expanded); slew rate 13 V/μsec; expander noise output −95 dBm; maximum input level +26 dBm; 12.75"W × 6.15"D × 2.5"H $295

NR-8. Same as NR-4 except provides 8 channels of individually switchable record/play and bypass noise reduction or 4-channel simultaneous record and tape monitor decode $595

SL-2 Stereo Limiter

Stereo unit functions independently or in a stereo tracking mode. Provides 3 controls for attack and release. Functions are a hard limiter, average limiter, or automatic level control. S/N ratio 90 dB below 1 V; typical distortion 0.01% (not undergoing limiting); 19"W × 7¼"D × 2"H $295

LUXMAN

G-120A Graphic Equalizer

Stereo 10-band graphic equalizer with discrete circuits throughout. Features normal/bypass/record function selector; input attenuator selector; tape monitor switch; LED over-level indicator. Center frequencies 28, 55, 110, 220, 440, 880, 1.8k, 3.5k, 7k, 14k Hz; boost/cut range ±12 dB; frequency response 10-100,000 Hz -1.5 dB; THD and IM distortion 0.01% at 1 V out; S/N ratio 110 dB; input sensitivity/impedance 1 V/65k ohms: 17 ¼"W × 10 ⅝"D × 4 5/16" $350

MCS by JC PENNEY

3035 Graphic Equalizer

Stereo 10-band graphic equalizer with LEDs in slide control handles. Features rotary input attenuator; normal/reverse, tape monitor switches; brushed-aluminum front panel; audio cables. Center frequencies 31, 64, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±12 or ±6 dB; frequency response 31-16,000 Hz $200

3032 Graphic Equalizer

Stereo 5-band graphic equalizer with variable range selector. Features EQ position switch for REC OUT/SOURCE; tape monitor switch; brushed-aluminum front panel; audio cables. Center frequencies 63, 240, Ik, 4k, 16k Hz; frequency range 5-100,000 Hz; THD 0.02%; S/N ratio 95 dB; 17"W × 10"D × 3 ¼"H $200

MXR

140 System Preamp

Control preamp combines functions of preamp, mixer, patch bay; can process 2 independent programs simultaneously. Features front-panel instrument input, 2 tape loops, 2 processor loops, integral headphone amplifier with independent level and selection controls, left mono, right mono, stereo reverse switching. RIAA equalization ±0.2 dB; phono S/N ratio 87 dB; phono S/N 87 dB; phono gain 40 dB at 1 kHz; THD and IM distortion 0.005%; maximum signal output +18 dBV; rear-panel ac convenience outlet; black anodized extrusion with solid walnut end pieces; optional rack-mount ears available; 19" × 3½"H$500

150 System Preamp II. Same as System Preamp, except includes second RIAA phono preamp, allowing independent selection of 2 turntables $550

128 One-Third Octave Eqalizer

Thirty-one-discrete-band one-channel ⅓-octave equalizer with center frequencies at 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1k, 1.25k, 1.6k, 2k, 2.5k, 3.15k, 4k, 5k, 6.3k, 8k, 10k, 12.5k, 16k, 20k Hz and ±12-dB boost/cut range; EQ in/out switch; dynamic range 108 dB; THD 0.01% at 0 dBV (20-20,000 Hz) 0.009% at 0 dBV (1kHz); IM distortion 0.01% at 0 dBV (60 Hz/7 kHz, 4:1); frequency response 10-20,000 Hz +0/−1 dB; maximum slew rate 7 V/μsec; max. input level +18 dBV; input impedance 20k ohms; output impedance 100 ohms; equivalent input noise −90 dBV; optional rack-mount ears available; walnut side panels $386

127 Fifteen-Band Stereo Equalizer

Fifteen-band stereo graphic equalizer with bands spaced ⅔-octave apart and center frequencies at 25, 40, 63, 100, 160, 250, 400, 630, 1k, 1.6k, 2.5k, 4k, 6.3k, 10k, 16k Hz and ±12-dB boost/cut range; tape monitor and in/out switches; THD 0.02% at 0 dBV from 20-20,000 Hz, 0.009% at 0 dBV (1 kHz); IM distortion 0.01% at 0 dBV (60 Hz/7 kHz, 4:1); frequency response 20-20,000 Hz, 0.009% at 0 dBV (1 kHz); IM distortion 0.01% at 0 dBV (60 Hz/7

NEED MORE INFORMATION?

Write directly to the manufacturer or distributor. A list of names and addresses starts on page 36.

Signal Processors 9

kHz, 4:1); frequency response 20-20,000 Hz +0/−1 dB; maximum input +18 dBV; input impedance 20k ohms; output impedance 100 ohms; equiv. input noise −95 dBV; maximum slew rate 7 V/μsec; optional rack-mount ears available; walnut side panel $360

132 Dynamic Expander
Linear dynamic expander provides up to 8 dB of upward expansion and 21 dB of downward expansion. Features release-time control; adjustable expansion control (1:1 to 1.6:1); LED gain change and noise-reduction display; level control; in/out, monitor/normal, pre/post switching. Maximum input level + 12 dBV; maximum output +18 dBV input impedance 40k ohms; output impedance 100 dB; maximum slew rate 7 V/μsec; frequency response 20-20,000 Hz +0/−1 dB; attack time 5 msec maximum (depending on program material); release time variable between 50-500 msec; optional rack-mount ears available $327

147 Ten-Band Stereo Octave Equalizer
Vertical format, 10-band, 2-channel graphic equalizer with center frequencies at 31, 62, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz. Independent left and right level controls; switchable subsonic filter; complete tape monitoring facilities with ability to preequalize when recording; bypass switch control range ±12 dB; maximum input/output level +18 dBV; input impedance 20k ohms nominal; output impedance 100 ohms; equivalent input noise −95 dBV; maximum slew rate 7 volts/μsec; THD 0.02% at 0 dBV (20-20,000 Hz), 0.009% at 0 dBV (1 kHz); IM distortion 0.009% at 0 dBV (60 Hz/7 kHz, 4:1); frequency response 20-20,000 Ha +0/−1 dB; 19"W × 3½"H; solid-walnut end pieces; optional rack-mount ears available $230

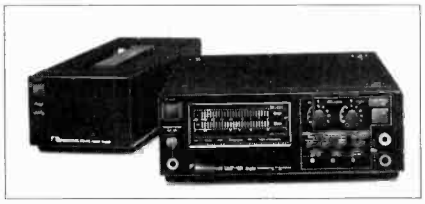
114 Stereo Graphic Equalizer
Ten-band 2-channel graphic equalizer with center frequencies at 31, 62, 125, 250, 500, 1k, 2k, 4k, 88, 16k Hz; 8 rear-panel phono jacks; 2 inputs, 2 low-impedance outputs, 2 tape-record outputs, 2 tape-monitor inputs; 2 switches control tape monitor function and equalizer bypass. Dynamic range 110 dB; boost/cut range ±12 dB gain; unity ±1 dB (controls centered); maximum output level +18 dBV (10k ohms); input impedance 20k ohms; equivalent input noise -95 dBV; frequency response 20-20,000 Hz ±1 dB at 0 dBV; THD 0.05% at 0 dBV (20-20,000 Hz), 0.009% at 0 dBV (1 kHz); IM distortion 0.05% at 0 dBV (60/7000 Hz, 4:1) $200

119 Compander
Can be used with open-reel and cassette decks. Dynamic range 100 dB; output impedance drives 600 ohms or greater; equivalent input noise −88 dBV (20-20,000 Hz); input impedance 100k; compress/expand ratio 2:1, tracking accuracy ±1 dB per 20 dB; frequency response 30-20,000 Hz ±1 dB at 0 dBV, 3 dB down at 20 Hz and 40 kHz; THD 0.15% at 0 dBV (200 Hz-20 kHz), 0.75% at 0 dBV (50-200Hz); IM distortion 0.75% at 0 dBV (60Hz/7 kHz, 4:1); level match control; bypass switch; black anodized aluminum housing with walnut side panels $164

153 Five-Band Equalizer
Two-channel equalizer with center frequencies at 50, 100, 200, 2k, and 10k Hz. Independent left and right level controls with LED level-set indicators; subsonic filter; tape-monitor and equalizer bypass switches; boost/cut range ±12 dB; maximum input/output level + 13 dBV; input impedance 20k ohms nominal; output impedance 100 ohms; equivalent input noise −95 dBV (20-20,000 Hz), 0.005% at 0 dBV (1 kHz); IM distortion 0.005% at 0 dBV (60 Hz/7k Hz, 4:1); frequency response 20-70,000 Hz +0/−3 dB; sloping console design with solid-wood end pieces $150

NAKAMICHI

DMP-100 Digital Mastering Processor
For use with any NTSC-C videocassette recorder (VHS, Beta, U-Matic, or ¼"). Choice of EIAJ 14-bit or 16-bit encoding. Features high-frequency (110 kHz) DC-DC converter; special high-performance capaci-



tors to reduce distortion. Nominal specs: frequency response 10-20,000 Hz ±0.5 dB; dynamic range 88 dB 14-bit, 92 dB 16-bit (re 1 kHz, 0 dB); THD 0.007% 14-bit, 0.006% 16-bit; channel separation 80 dB; wow and flutter below measurable limits. Guaranteed minimum specs: frequency response 10-20,000 ±1 dB; dynamic range 90 dB. 16-bit; THD 0.006%, 16-bit. 4¼"W × 3¼"H × 12⅛"D; 6 lbs 10 oz $1,990

NR-100 Noise Reduction System
Dolby C noise-reduction system designed to be used with Nakamichi 700ZXE, 700ZXL, 1000ZXL cassette decks. Can be used without recorder recalibration 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 10 dB at 1 kHz, 20 dB 2k-8k Hz; power supplied by remote-control socket on cassette deck. 9 7/16"W × 4 23/32"D × 1 5/8"H. Supplied with 27 ½" cable $230

NIKKO

EQ-20 Graphic Equalizer
Stereo 10-band graphic equalizer with detented 5-step slide controls. Features tape monitor; equalizer gain switch (-6 dB, 0 dB, +6 dB); pre/post EQ, tape monitor switch; LED equalizer in/out switch. Center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±12 dB; frequency response 10-50,000 Hz ±1 dB; THD 0.007%; S/N ratio 105 dB; 19"W × 9"D × 3¼"H $300

EQ-500 Graphic Equalizer
Stereo graphic equalizer with 6 bands/channel. Features 11-position EQ slide-type controls; EQ-defeat switch; 3 tape-monitor function switches that allow source monitoring, pre/post-EQ monitoring. Center frequencies 40, 125, 400, 1.25k, 4k, 12.5k Hz; boost/cut range ±10 dB $200

NUMARK ELECTRONICS

EQ2600 Equalizer/Tone Computer Display
Stereo 10-band graphic equalizer with tone computer display. Features true octave spacing ±15-dB EQ, master-gain controls; fluorescent 10-band display; ability to read left or right or both channel displays; VU mode to read output level; pre/post EQ input; accentuated/reverse mode recording; switchable 0/-10-dB meter calibration. Uses binary-coded-decimal notation circuit $329

EQ2500D Graphic Equalizer
Ten-band stereo graphic equalizer with true octave spacing. Center frequencies at 30, 60, 120, 240, 480, 960, 1920, 3840, 7680, 15,380 Hz. Boost/cut ±15 dB; master gain control for each channel boosts or cuts an additional 15 dB. Features LED display for each channel with peak hold; eq defeat; optional wood side panels and rack-mount adapters. Frequency response 10-100,000 Hz ±1 dB (flat setting); harmonic distortion <0.01% at 1 V output; hum and noise, shorted output, -102 dB at 2 V output IHF-A; output impedance 100 ohms. 18⅛"W × 3½"H × 6½"D $250

EQ2310 Graphic Equalizer
Ten-channel stereo graphic equalizer with 20 linear sliding controls at true octave spacing (at 30, 60, 120, 240, 480, 960, 1920, 3840, 7680, 15,380 Hz). Boost/cut ±15 dB; master gain control for each channel boosts or cuts an additional 15 dB. Features eq defeat; LED level display; optional wood side panels and rack-mount adapters. Frequency response 10-100,000 Hz ±1 dB (flat setting); intermodulation distortion 0.02% at 1 V output; harmonic distortion <0.01% at 1 V output; hum and noise, shorted output, -96 dB at 2 V output IHF-A; output impedance 100 ohms. Black face plate. 18⅛"W × 3½"H × 6½"D; 10.5 lbs $250

EQ2310S. Same as EQ2310 except with silver face plate $250

ONKYO

PE-33 Graphic Equalizer
Stereo 10-band graphic equalizer with LED slide controls behind door. Features LED EQ flow indicator; EQ routing. Center frequencies 32, 64, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±12 dB; S/N ratio 100 dB; THD 0.01% $200

E-08 Audio Equalizer
Ten-band graphic equalizer with LED slide indicators. Features LED EQ flow indicator; EQ routing. Center frequencies 32, 64, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut ±12 dB; S/N ratio 100 dB; THD 0.01% $180

PIONEER

SG-90 Graphic Equalizer
Stereo 17-band graphic equalizer with inverse equalization. Features auto fader; tape monitor/source equalizer selector. Center frequencies 16, 25, 40, 63, 100, 160, 250, 400, 630, 1k, 1.6, 2.5k, 4k, 6.3k, 10k, 16k, 25k Hz. Boost/cut ±6 or 12 dB. S/N ratio 114 dB with auto fader off, controls flat $390

CA-100 Sound Processor
Combination graphic equalizer and microphone mixer. Graphic equalizer has 7 bands with center frequencies at 60, 150, 400, 1k, 2.4k, 6k, 15k. Boost/cut ±10 dB. Features 2 microphone inputs with pan pot; echo; auto fader; adjustable fader cross point; tape monitor. S/N ratio 90 dB tape/source; 69 dB microphone 1-2 ..... $270

RG-9 Dynamic Expander
Dynamic expander with fluoroscan meter, displays. Features input level control. Dynamic expansion 4, 7, 10, 13, 16 dB; attack/release time 0.3/120 msec; THD 0.05% at 1 kHz, 16 dB; S/N ratio 116 dB at 6.5 V, 1 kHz, 16 dB $200

SG-540 Graphic Equalizer
Stereo 7-band equalizer with LED in each slide control. Center frequencies 60, 150, 400, 1k, 2.4k, 6k, 15k Hz. Boost/cut ±10 dB. Frequency response 5-70,000 Hz ±1 dB; THD 0.005% $165

RG DYNAMICS

PRO 20 Dynamic Processor
Stereo dynamic processor designed to reduce noise, restore transient response, eliminate tape hiss, reveal details, enhance FM reception, improve record sound reproduction. Features input-level control; maximum/minimum noise reduction, tape monitor on/off, tape and main on/off dynamic processing switches; dual 4-20 dB LED level displays. Total dynamic processing range 20 dB; downward/upward processing range -3 to -8/0 to +12 dB; attack/decay time 0.6 msec/80 msec-3 sec (program controlled); maximum output level/impedance 6.5 V/50k ohms at 1 kHz; minimum input 80 mV; THD 0.04% at 1 kHz, 1 V, maximum processing; IM distortion 0.05% at 60 and 2 kHz mixed 1:1; hum and noise maximum/minimum 90/100 dB below 1 V output; frequency response 20-20,000 Hz ±1 dB; input/output impedance 80k/300 ohms; power consumption 3 W; 17"W x 12"D x 3½"H (optional rack-mount available) $449

RG X-15 Dynamic Processor
Stereo dynamic signal processor similar to PRO-20

except over narrower control range. Features main output, tape recorder process/bypass, tape monitor in/out switches; 6-15-dB dynamic processing control; dual 6-15 dB LED level displays. Total dynamic processing rage 15 dB; downward/upward processing range -6/0 to +9 dB; attack/decay time 0.6 msec/80 msec-3 sec (program controlled); maximum output signal level/impedance 6 V/50k ohms at 1 kHz; minimum input 80 mV; THD 0.12% at 60 and 2k Hz mixed 1:1, 1 V output; hum and noise maximum/minimum -90/-100 dB; frequency response 20-20,000 Hz ±1 dB; input/output impedance 100k/300 ohms; power consumption 3 W; 13¾"W x 9"D x 2¾"H $279

VC-1 Videosonic Stereo Phasor

Video audio signal processor combining expander, stereo synthesizer, and three noise/hiss filters. Connects to most TVs and nearly all VCRs. Features 15 dB expansion; 2 types of stereo synthesis; adjustable noise reduction. TV headphone input impedance 1k ohm; VCR audio impedance 30k ohms. Distortion no more than 0.12%. 8⅞" × 8⅛" × 2½" $199

SAE

E-101 Parametric Equalizer

Computer direct-line parametric equalizer with digital display, 2 bands with 10 memories/band. Bandwidth adjustable from 0.3-3.5 octaves; boost/cut range ±16 dB; rated output 2.5 V rms; THD 0.02%; S/N ratio 95 dB; 19"W x 12½"D x 3½"H $650

5000A Impulse Noise Reduction System

Filter is designed to eliminate or considerably reduce audible effects of scratches, grit, mistracking, static, imperfections, normal wear of records during normal play, tape recording. Frequency response 20-20,000 Hz ±1 dB; S/N ratio >96 dB; THD and IM <0.1%; 10¾"W x 9¼"D x 3"H; 8 lb $199

2800 4-band Parametric Equalizer

Stereo 4-band parametric equalizer that allows for tape pre- and post-equalization. Features level controls, ±16 dB bandwidth controls. Frequency response 20-20,000 Hz ±0.25 dB; THD <0.02%; IM distortion <0.02%; S/N >100 dB; rated output 2.5 V rms; level range ±16 dB; bandwidth range 0.3 to 3.6 octaves continuously variable. 19" W × 3½" D × 8 ¾" H..... $700

EQ-10 3-Band Parametric Equalizer

Three-band parametric equalizer with frequency bandwidth control for each band. Boost/cut ±16 dB; frequency response 20-20,000 Hz ±0.25 dB; THD <0.03%; S/N ratio >90 dB. 18.3"W × 4"H × 13.8"D..... $299

H3. Optional rack mount kit $35

SANSUI

SE-9 Graphic Equalizer

Microprocessor-controlled stereo graphic equalizer with unique motorized fader-setting system, 4-curve memory storage, spectrum-analyzer display, pink-noise generator, external electret condenser microphone. All 16 (8 bands x 2 channels) frequency controls dual slide potentiometers, one section boosting/cutting band by ±12 dB, the other producing varying dc voltage for physically positioning sliders. Using the automatic adjustment procedure, fader-to-fader interaction is minimized. Automatic setup procedure requires only 30 seconds overall. Left/right frequency spectra shown on gas-display calibrated in 3-dB increments over 24-dB range. Under, over LEDs warn of out-of-range conditions. Features 2-way dubbing, 2-deck monitoring. Center frequencies 80, 160, 315, 630, 1.25k, 5k, 10k Hz; in/out level 1 volt with flat control settings; THD 0.008%; frequency response 10-100,000 Hz +0/-1 dB; S/N ratio 105 dB; input/output impedance 30k/600 ohms.

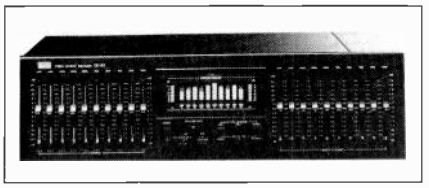
SE-9S. SE-9 with brushed-aluminum front panel $700

SE-9B. SE-9 with matte black front panel, rack-mounting hardware $700

SE-8 Graphic Equalizer

Ten-band stereo graphic equalizer with spectrum-analyzer display. Features 2-tape-deck monitoring facilities; analyzer calibration control; silver or rack-mountable matte black finish. EQ center frequencies 32, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±12 dB; THD 0.008%; S/N ratio 110 dB; frequency response 10-100,000 Hz +0/-1 dB $400

SE-7. Similar to SE-8 but minus spectrum analyzer display. SE-7S silver, SE-7B black finish $300



RG-707 Equalizer/Echo Amp

Seven-band equalizer with two additional independent 5-band equalizers for channels 1 and 2, for recording combinations of sound with two separate equalizations. Each equalizer has own level control. Main equalizer center frequencies are 63, 160, 400, 1000, 2500, 6300, and 16,000 Hz. Center frequencies for channel 1 are 150, 300, 600, 1200, and 2400 Hz; channel 2, 300, 600, 1200, 2400, and 4800. Boost/cut is 12 dB on 7-band, 10 dB on five-bands. Electronic echo circuit uses bucket-brigade device and adjustable delay variable up to 3 sec. Echo can be added to the line or mixing inputs together or separately. Center panel has 2-way illuminated display. 0.05% THD (20-20,000 Hz); S/N ratio >70 dB. 16¹⁵⁄₁₆"W × 3⅛"H × 8¹³⁄₁₆"D. 6.2 lbs.. $260

RA-990 Reverberation Amplifier

Combines bucket-brigade time delay, reverberation system with 2-channel pan-pot mixing circuitry to recreate realistic acoustic ambience, provide special effects for sound reproduction, musical performances. Echo mode has adjustable 0-3-second decay time; Duet mode creates doubling effect with adjustable 30-100-msecond time delays. Individual pan-pots, balance control provide mixing; special effects added via combination of mic, line, tape inputs. Frequency response 10-80,000 Hz +0/-3 dB; THD <0.025%; S/N ratio >90 dB line. Available in black (RA-990B) or silver (RA-990S) finish..... $240

SOUNDCRAFTSMEN

CX4200 Preamp/Equalizer

Dual-channel 10-band graphic equalizer/preamplifier with built-in CX disc decoder circuitry. Equalizer features Differential/Comparator® true unity gain circuitry for accurate (within 0.1 dB) output balancing crucial to handling high dynamic range material without reducing headroom; precision-wound passive coil inductors in filters for ±15 dB gain in each octave and lower noise; THD and IM <0.01% at 2 V output; S/N ratio 114 dB at 10 V output. Preamp features 4 independent mono (2 stereo) preamps, each with variable ±12 dB gain adjustments; moving-coil, moving-magnet, variable-reluctance cartridge inputs with 0.28-300-mV output; cartridge loading adjustable from 50 to 800 pF. Versatile signal-processor patch bay with subsonic filter, signal processor loop, equalizer, CX decoder, mono switch. Three tape decks can be accommodated with cross-dubbing. Frequency response 5-100,000 Hz ±0.25 dB high-level, 20-20,000 Hz ±0.5 dB phono; THD and IM 0.01% at 1 V output; phono impedance switchable 47k/100 ohms; phono S/N ratio 97 dB. Includes CX calibration and frequency spectrum analyzer test record; brushed-aluminum, rack-mount, charcoal-finish front panel; hardwood side panels optional..... $699

CX4100. Same as CX4200 but without phono gain and cartridge loading; equalizer filter circuits utilize op-amp synthesized inductors; equalizer controls have 12-dB boost/cut range $549

CX4000. Same as CX4100 except no equalizer $419

AE2000 Real-Time Analyzer/Equalizer

Differential/Comparator® analyzer/equalizer with readout accuracy of 0.1 dB combined with 100-LED (10-octave) real-time display with adjustable decay rate and 2-channel 10-band graphic equalizer. Equalizer features precision wire-wound inductors for highest gain, lowest noise, lowest distortion. Analyzer has built-in pink-noise generator and Auto-Scan mode with adjustable sweep rate from 0.1 to 10 seconds/octave. THD and IM <0.01% at 2 V output; S/N ratio 114 dB at maximum output; equalizer boost/cut range ±15 dB; 47k ohm high-level input for analysis of 3-head cassette deck or other signal processor; microphone preamp input impedance 2k ohms; frequency response 20-20,000 Hz ±0.1 dB. Brushed-aluminum rack-mount front panel; hardwood side panels optional $699

AS1000 Auto Scanalyzer. Same as AE2000 but minus equalizer..... $549

AE2420 Analyzer/Equalizer. Same as AE2000 but without 100-LED display and Auto Scan mode $499

TG3044 Third-Octave Equalizer

Third-octave stereo equalizer with 21 controls/channel: 15 center frequencies set at 40, 50, 63, 80, 100, 125, 160, 200, 250,315, 400, 500, 630, 800, 1k Hz on ⅓-octave centers and 6 center frequencies set at 1.6k, 2.5k, 4k, 6.3k, 10k, 16k Hz on alternate ⅓ octaves. Features pushbutton equalizer defeat, subsonic filter, tape monitor, tape record; Differential/Comparator circuitry for true unity-gain setting within 0.1 dB accuracy for highest dynamic range capability. THD and IM distortion 0.01% at 2 V output; S/N ratio 114 dB at 10 V output; input impedance 47k ohms. Rack-mount black anodized aluminum front panel..... $649

DC2215 Differential/Comparator® Equalizer

Two-channel, 10-band equalizer with Differential/Comparator unity-gain circuit for accurate output balancing within 0.1 dB for widest dynamic range capability without reducing headroom. Features precision wire-wound passive coil equalizer filters for highest gain, lowest noise, lowest distortion; tape monitor, LED defeat/EQ defeat controls, EQ tape record controls. THD and IM distortion <0.01% at 2 V output; S/N ratio 114 dB at 10 V output; boost/cut range ±15 dB. Includes frequency spectrum analyzer test record, Computone charts, cables; charcoal-finished brushed-aluminum rack-mount front panel; genuine hardwood end panels optional $399

DC2214. Same as DC2215 except equalizer filter circuits use op-amp synthesized inductors; THD and IM distortion <0.01% at 2 V output; S/N ratio 106 dB at 10 V output; boost/cut range ±12 dB $299

SE540. Same as DC2214 but without Differential/Comparator circuitry; front panel available in silver or black with vinyl finish; not rack-mountable ... $249

SHERWOOD

EQ-200 Stereo Graphic Equalizer

Stereo 24-band graphic equalizer controls all octaves from 16 Hz to 32 kHz. Features 24 red LED indicators; EQ for tape or line; tape monitor switch. Maximum 7 V output. THD 0.01% at 1 V output; S/N ratio

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.

Signal Processors 9

95 dB A-weighted. 17⅜"W × 15½"D × 4⅜"H $220

SUPEREX

GEM-7 Parametric Equalizer

Stereo parametric equalizer in which each channel has 4 EQ sections, each with separate frequency, bandwidth level controls. Variable-frequency controls on each channel are logarithmically paired. Features biFET technology; complete tape deck switching capability with separate switching for recording with EQ, playing back with EQ, conventional monitoring function; handles, standard front-panel rack mount notches. Frequency selection continuously variable 30-820 Hz and 820-16k Hz; boost/cut range ±18 dB (±36 dB possible with 2 bands set for identical frequency), variable; bandwidth 0.16-2 octaves, variable; frequency response 5-100,000 Hz ±2 dB with controls flat; THD <0.01%; IM distortion <0.005%; 19"W × 7.4"D × 5.3"H; 11 lb $450

GEM-3 Graphic Equalizer

Stereo 10-band graphic equalizer with separate volume, balance controls. Center frequencies 31, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±14 dB; frequency response 20-20,000 Hz ±0.5 dB HD 0.04%; S/N ratio 85 dB; input/output impedance 68k/600 ohms; output impedance 600 ohms $240

GEM-4 Varigraphic Equalizer

Stereo biFET equalizer with variable center-frequency potentiometers that provide "parametric-like" control, true EQ curve modifier, total tape-recording flexibility with switching facilities for EQing during recording and/or playback. Features 5 slide/5 rotary controls per channel with frequencies at 33-78 Hz, 110-260 Hz, 470-1.1k Hz, 1.9-4.5 kHz, 6.8-16 kHz. Boost/cut range ±14 dB; frequency response 10-50,000 Hz ±2 dB; THD <0.01% at 1 kHz; S/N ratio 94 dB; input/output impedance 100k/100 ohms; output 6 V rms maximum with 10k-ohm load; gain unity (0 dB) in flat positions; center Q 2.5; power consumption 3 W nominal; 19"W × 7.4"D × 5.3"H; 11 lb $210

GEM-2 Graphic Equalizer

Provides equalization control at high, low ends (high treble, deep bass), mid-high range. Features exclusive 3 tape function system to permit recording with equalization, playing back with equalization, tape monitoring. Center frequencies 38, 68, 240, 1.6k, 15k Hz; frequency response 10-150,000 Hz ±0.5 dB; maximum gain/attenuation ±14 dB; gain at flat setting 0 dB; distortion at 1 kHz 0.02% at 0 dB gain; output 2 V rms; dynamic range 8.5 V rms (flat settings); S/N ratio 92 dB at rated output; input/output impedance 50k/600 ohms $120

GEM-1 Graphic Equalizer

Stereo 5-band graphic equalizer module with 2 tape-deck switching with tape record/play EQ, tape monitor controls. Features programmable capability with optional Superex program cards. Center frequencies 60, 240, 1k, 3.5k, 10k Hz; boost/cut range ±12 dB; frequency response 10-150,000 Hz ±0.5 dB; HD 0.02% at 0 dB gain; rated output 2 V rms; dynamic range 8.5 V; S/N ratio 92 dB; input impedance 50k ohms; output impedance 600 ohms $90

TASCAM by TEAC

PE-40 Parametric Equalizer

Fully parametric 4-band 4-channel equalizer with each channel having 4 sets of continuously variable Q, gain, and frequency controls. Bands overlap: 40-800, 200-4,000, 500-10,000, and 800-16,000 Hz. Two or more channels can be cascaded. Switchable 60 Hz, 18 dB/octave and 160 dB/octave low-pass filter on each channel. THD <0.015%, weighted; S/N ratio 83 dB; crosstalk >70 dB $650

RS-20 Dual Reverb

Spring-type 2-channel dual-reverb system using 3 different-sized springs on each channel. Limiters ahead of spring drive prevent "twangy" sounds caused by transients. Compatible with all sound systems with slide switch to change input sensitivity and output drive level to -10 dBV or +4 dBu. LEDs for each channel indicate signal below nominal level (when green) and above (when red). Two receive jacks wired in parallel with foldback jacks for looping sound to other signal processors. Rack mountable; takes 3½" of rack space $400

PB-64. Rack-mount patch bay $100

TEAC

GE-20 Graphic Equalizer

Stereo 10-band graphic equalizer with high- and low-pass filters. Features input-level control; LED input overload indicator; output-level meter with output-level control; operational amplifier-synthesized inductors. Center frequencies 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±10 dB; 12 frequency response 20-30,000 Hz ±0.5 dB; THD 0.03%; S/N ratio 85 dB; input sensitivity/impedance 0.3 V, unbalanced/100k ohms; maximum output level +18 dB at 8V $350

TECHNICS

SV-100 Digital Audio Processor

Lightweight, compact portable digital audio processor for use with videocassette recorder. Features dual connectors for vertical/horizontal use; digital dubbing function; headphone jack and level control; 2-color FL peak-hold meters; record/play indicators; muting disable; slide controls for mode changing; VCR tracking and battery-check indicator; built-in high-linearity microphone amp for outdooor recording; shoulder strap. Quantitization 14-bit linear; decoding 14-bit linear; signal format standard NTSC television signal; two channels (left and right); frequency response 2-20,000 Hz ±.05 dB; harmonic distortion <0.01% (1 kHz, 0 dB); dynamic range >86 dB; input sensitivity/impedance: line, 30 mV (-15 dB)/600 ohms; video, 1 Vp-p/75 ohms (video format). 9⅜" × 3⅜ 9⁹⁄₁₆"; 6.8 lbs without rechargeable battery pack $900

SV-110 Digital Audio Processor

Digital audio processor designed to match home audio and video components. Interfaces with videocassette recorder for a maximum of six hours of continuous recording or playback with NV-T120 VHS videocassette in SLP mode. Features 2-color FL meter with peak hold showing signal level from -25 dB to +6 dB; single master recording level control; separate balance controls; record mute; playback mute cancel; indicators for playback, record, copy; stereo headphone jack with separate level control. Quantitization 14-bit linear; decoding 14-bit linear; 2 channels (left and right); frequency response 2-20,000 Hz ±0.5 dB; harmonic distortion <0.01% (at 1 kHz, 0 dB); dynamic range >86 dB. 16¹³⁄₁₆"W × 2¹¹⁄₁₆"H × 13²¹⁄₃₂"D. 13.7 lbs $800

SH-8065 Graphic Equalizer

Stereo 33-band graphic equalizer with variable range indicators. Features variable range selector; tape-monitor switch; parallel left, right slide controls (left channel on top, right channel on bottom). Center frequencies 16, 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1k, 1.25k, 1.6k, 2k, 2.5k, 3.15k, 4k, 5k, 6.3k, 8k, 10k, 12.5k, 16k, 20k, 25k Hz; boost/cut range ±3/±12 dB; frequency response 5-100,000 Hz -1 dB; THD 0.0025%, 20-20,000 Hz; S/N ratio 110 dB; input/output impedance 47k/600 ohms; input sensitivity/maximum output 1/8 V; gain 0-dB; line-level switch 150 mV/1 V; power consumption 28 W; 16¹³⁄₁₆"W × 13"D × 6¹⁄₃₂"H; 13.2 lb $500

SH-8055 Graphic Equalizer

Stereo 12-band equalizer with real-time spectrum analyzer and FL level indicator. Pink-noise generator built in for use with optional microphone. Features left/right channel/peak mode FL display selector; 2 tape monitors; FL volume level display; equalized playback/recording selector; slide pots with LED indicators. Center frequencies 25, 40, 63, 100, 160, 250, 500, 1k, 2k, 4k, 8k, 16k Hz $340

SH-8045 Graphic Equalizer

Stereo 12-band graphic equalizer with variable range display; EQ position switch; tape monitor. Center frequencies 16, 32, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k, 32k Hz; boost/cut range ±12/±3 dB; frequency response 5-100,000 Hz -3 dB; S/N ratio 100 dB; THD 0.01%, 20-20,000 Hz; input sensitivity/impedance 0.5 V/47k ohms; maximum input/output 6/6 V; gain 0 dB; power consumption 12 W; 16¹³⁄₁₆"W × 9¹⁹⁄₃₂"D × 6¹⁄₃₂"H; 13.2 lb..... $400

SH-8030 Space Dimension Controller

Space dimension controller designed to provide surround sound from 2 speaker systems. Features 5-band graphic equalizer; dimension/signal-level display; tape monitor; ambience, echo controls; dimension on/off, effector position switches; phono/AUX selector; mic jacks with level, echo level control; mic 1 pan pot; mixing balance control. Frequency response 7-150,000 Hz +0/-3 dB; S/N ratio 80 dB; THD 0.005% line in; EQ center frequencies 60, 250, 1k, 4k, 16k Hz; boost/cut range ±12 dBN; echo time 90 msec; sound image location 30° backward; input sensitivity/impedance 150 mV/30k ohms line in, AUX, tape, 2.5 mV/47k ohms phono; 1.5 mV/10k ohms mic 1 and 2; output level/impedance 150 mV/600 ohms line and rec out; maximum input at 1 kHz 5 V line in, 120 mV phono, 70 mV mic 1 and 2; maximum output 5 V; power consumption 25 W; 16¹³⁄₁₆"W × 11³²⁄₃₂"D × 4²³⁄₃₂"H; 10.6 lb. .. $420

SH-8025 Graphic Equalizer

Stereo 7-band equalizer with center frequencies at 63, 160, 400, 1k, 2.5k, 6.3k, 16k Hz. Features boost/cut 12 dB; low-noise amps; calibrated decibel scale; tape monitor. Frequency response 5-100,000 Hz -1 dB; THD 0.005% 20-20,000 Hz; S/N ratio 110 dB; input sensitivity/impedance 1 V/47k ohms; maximum input/output 8/8 V; rated output 1 V; power consumption 8 W. 16¹³⁄₁₆" W × 7⅞"D × 3¹¹⁄₃₂"; 4.4 lbs $150

URSA MAJOR

Space Station SST-282 Digital Reverb System

Digital reverb, multi-tap digital delay, delay-effects 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, 8 audition delay tapes, 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

VECTOR RESEARCH

VQ-100 Graphic Equalizer

Stereo 10-band graphic equalizer with low distortion, wide dynamic range. Features discrete circuit design; unity gain adjust to prevent overloading; separate left, right output-level LEDs; subsonic filter; equalized tape recording capability; tape monitor function; accessory as outlet. Center frequencies 32, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz; boost/cut range ±10 dB; gain 0 ±1 dB; frequency response 5-100,000 Hz ±1 dB; THD 0.005% at 2 V output; S/N ratio 80 dB unweighted at 2V input; unity gain range 0 to -20 dB ±1 dB; input/output impedance 22k/470 ohms; maximum output 10 V; separation 40 dB at 10 kHz; power consumption 22 W; 17⁵⁄₁₆"W × 9⅜"D × 4¾"H; 9 lb 11oz $250

YAMAHA

GE-5 Graphic Equalizer

Stereo 10-band graphic equalizer with Spatial Expander system. Features preamp, tape switching; all special effects can be added to recordings $245

10 Tape Accessories

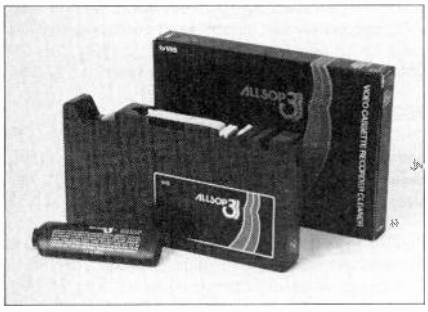
ALLSOP

Allsop 3 Ultraline Cleaning System/Case
Designed to clean key components of auto-reverse cassette decks in 60-80 seconds. Features pop-out felt cartridges; large bottle of cleaning solution; replacement cartridges; tweezers. Stores in leather-look storage pouch $15.95

Allsop 3 Portable & Personal Cassette Deck Cleaner
Designed to clean pinch-roller, capstan, heads of audio cassette decks in 20-40 seconds. Features nonabrasive felt pad and ribbonless wiper arm. Includes cassette-sized cleaner and cleaning solution .. $7.95
Refill Kit. Comprised of 3 large and 3 small nonabrasive felt pads, 1-oz bottle of cleaning solution $2.95

Ultraline Refill Kit
Kit includes 4 pinch-roller and 2 head cartridges; large bottle of cleaning solution; tweezers $7.95

Allsop 3 VHS VCR Cleaner
Cassette-format videocassette recorder cleaner cleans audio and video heads, pinch-rollers, capstan in 4-6 seconds (shuts off automatically); designed for



VHS-format video recorders; has absorbent cleaning chamois and nonabrasive 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, erase heads, pinch rollers, capstan. Cleans in 4-6 seconds; has absorbent cleaning ribbon; includes cleaning solution. $29.95
Beta replacement cartridge with cleaning solution $8.95

R.B. ANNIS

Magnetometers & Demagnetizers
Model 25/S5. Pocket magnetometer with jeweled movement having 10 times calibration stability of standard model. Center zero 5 gauss scale. 2½" diameter..... $43.00
Model 20/B5. Standard pocket magnetometer with center zero 5 gauss scale, 2" diameter $11.60
Model K20/S5. Deluxe Han-D-Kit, includes model 25 magnetcometer, model 115 V 50-60 Hz, Han-D-Mag, Clip-on Probe and magnetic test strips..... $75.80
Model K20/B5. Same as K20/S5 except contains standard model 20/B5 pocket magnetometer $45.20
Model 115. Han-D-Mag powerful head demagnetizer (over 1000 oersteds), with flush pole. Can be used for limited bulk erasing. Designed for 115-V ac, 50/60 Hz operation $29.70
For 220 V, 50-60 Hz operation $33.45
Extra Long Probe Han-D-Mag. ..... extra $8.00
Special Thin Probe Han-D-Mag. ..... extra $4.00

AVANTI PRODUCTS

CC 6/60 Cassette Carrying Case
High-impact dark-blue cassette carrying case with translucent lid. Holds up to 10 cassettes. Packed with six 60-minute Ultra Low Noise boxed cassettes $9.99

3WC 3-Way Case
Cassette storage case designed for easy mounting under vehicle dashboard, on wall, atop desk or cabinet. Portable carrier features retractable handle and foam-cushioned interior. Holds 12 cassettes . $6.49

BIB

Audiophile Edition

AE-314 Cassette Head Cleaner
Special nonabrasive cleaning tape in a cassette shell cleans tape recorder heads in one operation.. $3.95

Videophile Edition

VE-3 Videotape Eraser
Instantaneously erases recorded material from video tape; erasure capability —78 dB; thermal-protected circuit; generates powerful 2420-gauss magnetic field that far exceeds that generated by VCR heads; fitted with safe thermal-protected circuit and red current indicator; comes with complete instructions for use $49.95

VE-9 Videotape Splicing Kit
Repairs broken videotape easily and accurately $39.95
VE-9/S. Replacement tape, splicing tape, and 2 cutters $4.95

VE-27 Video Care Kit
Includes Screen Kleen, Anti-Static Cleaning Cloth, Tape Head Cleaner, and titles and identification kit.
VE-27V. VHS format $39.95
VE-27B. Beta format $39.95
VE-22. Automatic head cleaner only (VHS) . $29.95
VE-24. Automatic head cleaner only (Beta) . $29.95
VE-23. Replacement fluid for VE-22/24 ..... $4.95

VE-6 Tape Head Demagnetizer
Demagnetizes heads and guides of all video recorders; off switch; comes with 2 removable probes $24.95

VE-2A Video Maintenance Kit
Comprises 5 VE-5 cleaning tools, special formula tape head cleaning fluid, dust-away air blast, inspection mirror, antistatic cleaning cloth, maintenance manual for VHS- and Beta-format recorders; crosspoint screwdriver; permanent storage case $23.95
VE-4. Dust Away Air Blast cleaner $6.95
VE-7. Head-cleaning fluid $5.95
VE-5. Videotape head-cleaning tools $4.95

VE-10 Video Recorder Maintenance Kit
Maintains VCR to professional standards. Packed in clear container, same size as VHS cassette, for convenient storage in standard videocassette box/cabinet. Comes with illustrated instructions for use with VHS and Beta VCRs $13.95

VE-17A Videocassette Title & Label System
Gives videocassette titles professional appearance. Kit contains 10 self-adhesive title card holders for edge of videocassette; 20 index cards; 10 self-adhesive cassette body card holders; 20 blank information cards; 2 sheets dry-transfer letters/numbers; print burnisher; full instructions for use..... $9.95

VE-13A Video Lens Care Kit
Cleaning fluid, special brush with dust cap and antistatic cloth in handy carry-along wallet ... $9.95

VE-15A Antistatic TV Screen Treatment
Retards attraction of dust and dirt by preventing static build-up on TV screen; removes smudges and fingerprints $8.95

VE-21 Videocassette Storage Rack
Versatile, compact storage unit holds 10 VHS, Beta, or Philips-type videocassettes. Molded of strong, high-quality smoked plastic and supplied in nonslip self-adhesive protective feet. Can be used free standing or fixed with 2 screws to any vertical surface $5.95
VE-28. Video storage album $2.75

DISCWASHER

Video Accessories

Video Head Cleaner
Dry, nonabrasive head cleaning system designed to clean components along entire VCR tape path, including video and audio tape heads that are usually untouched by other cleaning systems. Employs special fiber grid that safely removes tape oxides in 30 seconds. Available in Beta and VHS formats... $20.00

Video Cables
Two types of video cables are available: 75-to-75-ohm and 300-to-300-ohm version, both with F connectors. Designed to enhance and upgrade video signals ..... $10.95 ea

Audio Accessories

D'Mag Cassette Deck Demagnetizer
Cassette deck demagnetizer designed to remove residual magnetism from tape heads, capstans, tape guides, and other steel parts. Requires no batteries or power cord; uses high-energy samarium-cobalt magnets. Packages in shielded storage clip..... $20

Tape Accessories

10

Tape Deck Careset
Includes Perfect Path™ head cleaner and CPR capstan/pinch-roller cleaner (below) $15

Perfect Path™ Head Cleaner
Designed to clean cassette heads in 15 seconds without fluids, using nonabrasive fiber grid. Simultaneously cleans heads and removes oxide build-up from tape path $6.95

CPR Capstan/Pinch-Roller Cleaner
Cleaner works on all cassette decks. Uses nondestructive fluid that does not extract vital rubber stabilizers. Features Positive Drive system that ensures thorough pinch-roller cleaning $10.95

EVG INC.

Cleanmatic™ Video Head-Cleaning System
Nonabrasive cleaners can be used wet or dry. Specially formulated cleaning ribbon and fluid. Available in VHS and Beta formats. Cleans and buffs video and audio heads, capstan, pinch roller. Also works in front-loading and portable VCRs. Supplied with bottle of cleaning fluid $29.95

KOSS

Audio Accessories

KCT-3010 Total Cassette Machine Care Kit
Automatic and manual formats. Includes inspection mirror, cleaning probes, tape fluid, step-by-step instructions $5.99

KCT-3000 Tape Recorder Cleaning Kit
Cleans open reel, 8-track and cassette tape decks. Includes brush, cleaning probes, cleaning fluid, inspection mirror $3.99

KCT-2020 8-Track Machine Care Kit
Automatic nonabrasive cleaner for 8-track tape decks. Indluces tape care fluid, houseing brush, reference guide $3.29

KCT-2010 Cassette Machine Care Kit
Automatic cleaner for cassette decks. Inlcudes cleaning fluid, houseing brush, reference guide $2.99

KCT-1020 8-Track Head Cleaner
Automatic nonabrasive head cleaner for 8-track tape decks $1.99

KCT-1010 Cassette Head Cleaner
Automatic nonabrasive head cleaner for cassette decks in dust-free storage box $1.69

Audio and Video Accessories

KCT-4000 Illuminated Demagnetizer
Demagnetizes all cassette, open reel, 8-track, and video tape recorders. Includes soft guard tip, pinpoint light, easy instructions $14.99

KCT-2000 Audio/Video Tape-Head Cleaner
For use with all cleaning products for audio and video tape machines. Leaves no harmful residue. 2 fluid oz $1.99

VIP Video Accessories

KVC-600 Auto VHS VCR Cleaning Cassette
Automatic cleaning cassette for VHS-format videocassette recorders. Cleans tape heads, guides, pinch-roller/capstan. Safe, nonabrasive operation with no damaging heat build-up. Three disposable cartridges included $19.99

KVC-500 Auto Beta VCR Cleaning Cassette
Automatic cleaning cassette for Beta-format videocassette recorders. Cleans tape heads, guides, pinch-roller/capstan. Safe, nonabrasive operation with no damaging heat build-up. Three disposable cartridges included $19.99

KVC-700 Clean 'N' Toss™ Cartridges
Hermetically sealed premoistened cartridges that eliminate spills and guessing correct amount of fluid to be used. For use with the Koss VHS or Beta Automatic Cassette Cleaner. Three in a package .. $3.99

Video Care Product

KVC-480 VCR Cleaning Kit
Manual videocassette recorder cleaner allows easy cleaning of all VCRs. Includes 5 reusable head-cleaning tools; mirrored probe; bristle brush; protective glove; 1.4-oz cleaner fluid; easy instructions .. $8.99

NAGAOKA By MICROFIDELITY

PC-507 Tape-Splicing Kit
Complete splicing kit for open reel, cassette, and microcassette tapes. Includes all necessary tools $19.95

CW-402 Cassette Winder
Battery-operated cassette winder rewinds C-60 cassette in 56 seconds. For home, car, or portable use. Conserves batteries of personal portables. . $14.95

QC-220 Wash-Up Four
Wet-type cleaner for cassette heads, capstan, and pinch roller. Includes cleaning fluid $9.95

NAKAMICHI

SF-100 Subsonic Filter
Operates at line level to remove turntable rumble and other infrasonics caused by record warps and tonearm/cartridge resonances. Employs an active filter to attenuate response either 40 or 50 dB at 10 Hz. Requires PS-100 power supply. THD 0.005%; S/N ratio 110 dB. 7"½W × 4"D × 2½"H $95

SF-10 Subsonic Filter
Compact, economical passive device to accomplish same function as SF-100. Provides 6 dB/octave filter, down 10 dB at 10 Hz. May be used at either tape output or amp tape-input jacks. 2.6"L x .51" diameter $15/pair

PIONEER

DT-510 Programmable Timer
24-hour programmable timer with fluorescent digital-numeric display. Slaved to ac power-line frequency. Functions: timer auto on/off, sleep timer, clock, seconds counter, service-interruption indicator. Features 2 accessory ac outlets with maximum power handling capacity 500 W $120
DT-540. Similar to DT-510 ..... $100

REALISTIC

The company's tape accessory line is as follows:
44-233. Video bulk tape eraser $29.95
44-1165. Electronic cassette demagnetizer $19.95
44-232. Audio bulk tape eraser $15.95
44-207. Illuminated head demagnetizer $13.95
44-225. Tape head demagnetizer $7.95
44-280. 7" metal tape reel $6.95
44-214. Cassette tape splicer $5.95
44-1163. 3-way cleaning cassette $4.99
44-223. Hand cassette winder $3.99
44-1170. Cleaning swabs and 2-oz Freon head-cleaning solvent $2.99
44-626. Cassette repair kit $1.19

RECORDER CARE/NORTRONICS

Professional Splicing Blocks
Grooved silver or gold anodized aluminum splicing blocks with 2 deep slits for straight and diagonal cuts; includes double-backed adhesive, and stainless-steel cutting blade; 5¾" × 1" × ⅝".
QM-311. For ¼" tapes $30.80
QM-312. For 0.150" cassette tapes $30.80
PF-313. For ½" video and audio tapes $35.00

Reel Tabs
Precut Mylar or metal tabs in dispenser box; comes in quantities of 50, 200, or 1000; ½" Mylar tabs in quantities of 200 or 1000 also available.
QM-521. ¼" reel tabs; 50/package $7.20
QM-522. Cassette reel tabs; 50/package $7.20
QM-524. ¼" metal-sensing reel tabs; 50/package $7.20

PF-707 Handylap
Kit includes lapping block with five 5 × 9-in coarse abrasive black lapping sheets of paper, five 5 × 9-in medium abrasive yellow sheets, five 5 × 9-in fine abrasive red sheets $150
PF-702. Coarse lapping paper paper; black $16
PF-703. Medium lapping paper; yellow $16
PF-704. Fine lapping paper; pink $16

QM-230 Cassette Bulk Eraser
Self-powered hand-held unit completely erases cassette tapes; requires no batteries or external power source; contoured Cycolac case with woodgrain finish $42.40

QM-211 Bulk Eraser
Bulk eraser generates 60-Hz magnetic field which completely erases pre-recorded reels, cassettes and 8-track cartridges up to ½" 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 Cycolac case; coiled cord $71.20
QM-212. 220-V professional bulk eraser $75

PF-250 Professional Bulk Tape Eraser
Demagnetizes professional cassette, ¼", ½", 1" open-reel, broadcast 8-track cartridge, and ½" VHS/Beta videocassette tapes. Holds up to 10½" reel sizes; 10"W × 7"D × 3.25"H $432

PF-208 Tape Head Degausser
Professional tape head degausser with super High-Flux coil-core for demagnetizing heavy-duty 2" tape heads and guides. Has peak magnetic field strength of 1000 gauss; automatic-reset thermal protection; positive snap-action on/off switch; Krayton thermal plastic/rubber-covered probe tip; Lexan® plastic housing; 12 oz $53.60

QM-202 Head Demagnetizer
Head demagnetizer for use with open-reel, cassette, 8-track recorders. Features long flexible plastic covered probe that reaches most inaccessible heads; leaf switch that activates with fingertip pressure and deactivates when unit is put down; thermal overload protection circuit; Cycolac case $32
QM-203. 220-V professional head demagnetizer $37.60

Head Cleaners
QM-116. 16 oz spray head cleaner $9.60
QM-142. For cassettes; with liquid cleaner ... $8.40
QM-99. 3 oz spray cleaner and 100 cotton swabs $8.20
QM-108. 8 oz liquid head cleaner $5.80

Alignment Tapes
AT-210B. For cassette recorders $17.40
AT-200B. Master recording provides zero reference, azimuth alignment, DIN frequency response tests; in-

cludes 3-kHz tone for speed and flutter $82.80
AT-820. For 8-track, 8-minute cycle $12.00
AT-320B. Designed for NAB-type endless-loop mono and stereo cartridge recorders/players; 7½-ips master recording tests and adjusts head azimuth, program frequency response, program record level, stereo head phasing, cue tone sensitivity, tape speed $82
AT-120. ¼" reel-to-reel 7½-ips master recording tape..... $91.90

VCR Maintenance Products

VCR-50. Deluxe video recorder care kit includes 10 oz Super Blast spray, 16 oz tape head cleaner spray, antistatic dustcloth, 25 cellular foam swabs, disposable wipers $40
VCR-95. VCR maintenance kit includes spray head cleaner, cellular foam swabs, antistatic dustcloth, screwdriver that removes headcover screws $17.00
VCR-105. Tape head cleaner liquid removes dust, dirt, tape oxide deposits from VCR heads and parts; 3.2 fl oz..... $6.60
VCR-109. High-velocity jet air stream Super Blast Spray cleaner eliminates loose tape oxide dirt and dust; 10 oz $7.20
VCR-205. Head demagnetizer with angled tip; removes residual magnetism from heads, rollers, guides..... $36.40

RECOTON

Video Maintenance

V106A. Videotape eraser designed for 117-V ac line power. Includes on/off switch and LED indicator, externally mounted protective fuse $59.95
V118. Videotape splicing kit for editing and repairing VHS and Beta cassette tapes. Includes deluxe splicing block, splicing tape, cutting tools, hard plastic storage case $43.95
V109. Nonabrasive Beta-format video head cleaner cassette $18.99
V109CD. Same as V109 except on display card $18.99
V107. Same as V109 except for VHS-format VCRs..... $18.99
V107CD. Same as V107 except on display card $18.99
V103. Deluxe VCR maintenance kit for cleaning heads, capstans, rollers. Includes 4 chamois wands, 2 oz solution with pump sprayer, cleaning cloth. $10.99
V115. Video camera lens cleaning kit..... $10.99
V116. 1.25-oz cleaning solution refill for V115 $2.99
V117. Lens tissue refill for V115 ..... $1.69
V108. 5 no-residue chamois wands for cleaning video heads, capstans, rollers $6.49
V102. 15 no-residue foam swabs for cleaning video heads, rollers, capstans $5.99
V104. Economy-priced VCR maintenance kit containing 4 foam swabs, 1 oz cleaning solution $4.79
V101. VCR head-cleaning solution in 2-oz bottle $3.69
V111. 25 Beta self-stick Ident-A-Tape labels for identification of VCR cassettes..... $3.39
V110. Same as V111 except for VHS videocassettes $3.39

Audio Tape Accessories

CS112A. Stereo Cassette adapter. Adapt any 8-track player to cassette tapes. Unit features rewind, stop and play positions with an automatic stop. . $59.95
106TC. Car tape head demagnetizer. Plugs into vehicle cigarette lighter socket..... $13.95
105TC. Cassette head demagnetizer designed for home use..... $10.95
87TC. Car 8-track cartridge head demagnetizer with solid-state electronic circuit..... $10.95
88TC. Car tape head demagnetizer for 8-track cartridge players. Plugs into vehicle cigarette lighter socket..... $9.95
61TR. Ac-powered tape head demagnetizer .. $9.49
50TR. Recording tape splicer designed for ¼" tapes..... $6.49
83TC. Cassette tape splicer $6.49
51TR. Spiral brush for removing oxide buildup from tape heads..... $3.49
145TC. Cassette tuneup system containing nonabrasive cleaner, stereo balance test, head alignment test $2.99
90TC. 3/32"W × 150"L sensing tape $2.79
139TC. Cassette salvage kit containing empty cassette shell with screws, label, cassette splicing tabs, plastic splicing block..... $2.49

ROBINS DIV. BENJAMIN ELECTROPRODUCTS

Video Accessories

24-001 Videocassette Eraser
Heavy-duty videocassette eraser for videocassettes and tapes, audio cassettes, cartridges, open-reel tapes. Erases in seconds; reduces tape to low noise level; no tape contact or wear during erasure. Has built-in momentary contact switch; 110-120 V ac intermittent duty (1 minute on, 20 minutes off) $29.95

24-017V Videocassette Bulk Tape Eraser
Said to be lowest-cost quality bulk eraser on market. Restores like-new performance to expensive videocassettes. Erases virtually all signals and leaves tape with low noise level in seconds without wear-causing contact. Works with Beta, VHS, Technicolor formats, computer cassettes and nonencoded floppy disks. UL listed..... $24.95

29-520 VCR Cartridge Cleaning Wet System
VHS-format, nonabrasive wet cleaner cleans the entire VCR tape path. Cleaning surface is nonabrasive on both sides. Special formula cleaning liquid in controlled-flow reservoir to prevent oversaturation of cleaning surface. Will not damage recording heads $24.95
29-525. Beta-format VCR cleaner $24.95

Tape Accessories

10

25-055 Universal Head Demagnetizer
Removes all traces of residual magnetism from head and other metal parts in tape path. Two changeable tips allow for proper demagnetizing of hard-to-reach heads. UL listed $12.95

Audio Accessories

24-017 Audio Tape Bulk Eraser
Erases virtually all signals from audio tape, leaving tape with low noise level. Works with cassettes and reels $19.95

15-005 Whistle Stop Head Demagnetizer
Automatic electronic cassette head demagnetizer in cassette format removes accumulation of residual magnetism from heads of home or car cassette tape machines; whistling tone indicates erasing action $18.50

24-004 Cordless Cassette Tape Eraser
Removes recorded material from standard and micro/mini cassettes in 2 seconds. Erases tape below normal erase-head level; leaves low background noise levels. Particularly useful with dictation systems. Requires no outside power or batteries. Alnico magnet produces strong demagnetizing field. $II.95
24-005. For microcassettes $6.96

26-043 "Gibson Girl" Cassette Splicer
Splicer produces slight cuts on edges of spliced tape to prevent adhesive from contacting critical parts. Knob has cut and trim positions. Blade adjustment provides lifetime accuracy $7.95
26-046. Deluxe ¼" tape splicer $9.95

35-005 Audio Cassette Wet Head Cleaner
Complete audio tape head wet-cleaning system. Metered liquid flow cleans complete tape path .. $3.95

30-005 Tape Head Cleaning Kit
Cleaning kit for all audio tape recorders. Contains bottles of head cleaner, head-guide lubricant, plus 10 swabs $1.95

SANSUI

AT-15 Programmable Timer
Automatically activates equipment for playback or recording at any set time within 24-hour period. Features digital clock and two 700-W total outlets. Measures 10⅝"W × 4 13/16"D × 2 13/16"H; weighs 2.7 lb $150

SCOTCH

ERK-130 Cassette Edit/Repair Kit
Contains precision splicing block; spindle for manually winding cassette tape; 6 polyester picks (adhesive-tipped for retrieval of tape ends lost in housing); 6 130-mil splicing tabs $3.59

Pre-Cut Tabs
SPT-7/32-36. 6 pre-cut 1.0-mil polyester splicing tabs $1.59
SST-7/32-18. 8 pre-cut aluminized sensing tabs $1.99
SK-7/32. 12.5 ft of 1.9-mil polyester splicing tape in dispenser kit $2.49

Head Cleaner
S-C-HC. Cassette head cleaner $1.79

SONY

T-V5 Program Timer
One-day 4-event programmable timer with microprocessor control and fluorescent display. Features "Conversational" programming (flashing display guides you to next function); sleep timer; ready function alarm; membrane keypads; built-in rechargeable battery; two ac outlets (1 switched, 1 unswitched); power consumption 9 W; 14" × 2½" × 9¾"; 4 lbs 14 oz. $130

SOUNDAIDS

Cassette Storage Cabinet
Wood cabinet with lock-jointed corners hold 68 cassettes in 4 drawers with recessed sides for easy removal of cassettes. Designed to fit standard record shelves and can function as record dividers or support shelves (with more than one cabinet); 12¾"H × 5 9/16"W × 12 3/16"D $53

SOUNDCRAFTSMEN

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 position control; pink-noise generator with auto-scan feature. Generates octave-band test signals or all-band pink noise for frequency-response measurement of single component or entire sound system. Bands 10; THD 0.01%; 19"W × 11"D × 3½"H; 15 lb $499

SUPEREX

TSB-3 Graphic Tape Switching Console
Stereo tape switching console features color-coded tape duplication processes graphically illustrated on front panel; 3-deck capability; functions include duplicating recordings or broadcasting on 3 tape decks; mixing 2 sources for documentary effect; transfer of program material from one tape deck to another while monitoring and recording additional different program source; both inputs and outputs include stereo, one amplifier, 3 tape decks or auxiliary components; dubbing bank for use with any stereo amplifier or receiver with monitoring facilities; 6¼"W × 4¾"D × 2¾"H $50

TDK

Videocassette Recorder Head Cleaners
Nonabrasive head-cleaning cassettes for Beta- and VHS-format videocassette recorders. Clean video and audio heads in 30 seconds and can be used up to 200 times. Maintenance record on cassette label.
LCL-30. Beta format $24
TCL-30. VHS format $24

C-P36 Audio Cassette Cabinet
Holds up to 36 audio cassettes in 3 separate drawers that each hold 12 cassettes $39.99
CP-15. Holds up to 15 audio cassettes in plastic case $5.99

HD-11 Universal Demagnetizer
Portable hand-held universal tape head demagnetizer designed for open-reel or cassette tape decks; operating time < 1 second; red LED on and green LED ready-to-use indicators; side-mounted activator switch; plastic-covered metal tips; includes two 1.5 V cells $34.99

HD-01 Cassette Head Demagnetizer
Automatic head demagnetizer with < 1-second operating time; housed in transparent cassette shell with surface-mount LED indicator to show demagnetization is occurring; self-contained battery $24.99

HC-1 Cassette Head Cleaner
Nonabrasive cassette tape machine head cleaner $1.89

Empty Tape Reels
AR-7M. 7" metal reel $8.99
AR-10M. 10½" metal reel $13.99

TEAC

VCL-20 Videocassette Recorder Head Cleaner
Wet-type liquid head cleaner designed to eliminate oxide deposits $19.95

QP-001 Cassette Head Cleaning Kit
Liquid cleaning system designed to eliminate oxide deposits on tape heads, capstan shafts, and pinch rollers $7.95

RMK Recorder Maintenance Kit
Includes head cleaner formula HC-1, rubber cleaner fluid RC-1, and stainless polish SP-1 ..... $9.95

RCK Recorder Cleaning Kit
Includes head cleaner formula HC-1 and rubber cleaner fluid RC-1 ..... $6.95

TECHNICS

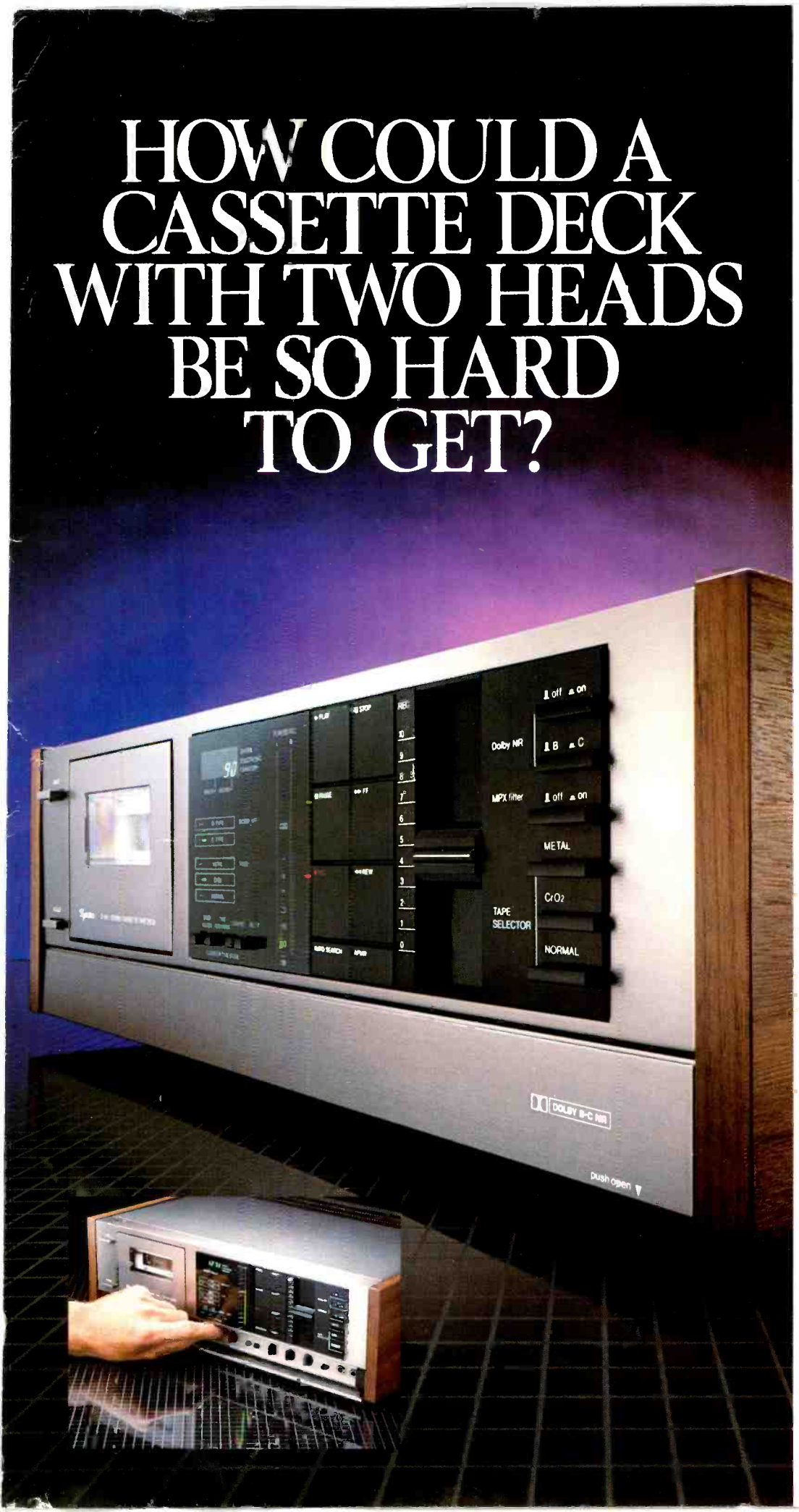
SH-4060 Audio Programmable Timer
Slimline audio programmable timer designed for use with tape recorders and any other audio products for timed-on functions. Features 3 basic modes (weekly 1, weekly 2, and once); accuracy assured by quartz oscillator; high-visibility FL display of 24-hour time, on/off function, preset channel number $150

PT-V5 Program Timer
One-day four-event programmable timer with microprocessor control and fluorescent display. Features "Conversational" programming (flashing display guides you to next functions); sleep timer; ready function alarm; membrane keypads; built-in rechargeable battery; two AC outlets (one switched, one unswitched); power consumption 9 W; 14" × 2½" × 9¾"; 4 lbs 14 oz. $130

SH-4020 Audio Timer
Economy audio timer with clock circuit synchronized to frequency of power line for accuracy. Features separate on/off time settings; sleep timer function; easy clock/timer setting; digital-numeric time display; slimline design; manual on/off switching of power outlets regardless of timer settings; clock settability to second $100

TAPE RECORDING & BUYING GUIDE 1984 ADVERTISERS INDEX

HOW COULD A CASSETTE DECK WITH TWO HEADS BE SO HARD TO GET?



The Kyocera D-801 Cassette Deck is hard to get because so much more is built into it. For example, it has five circuit boards where most decks have only one or two. But that's only the beginning.

It more than meets the ultimate tape deck challenge.

The challenge is to move tape across the heads at as nearly a constant speed as possible. Variations in speed, of course, come out in your speakers or headphones as wow and flutter.

Many decks claim a wow and flutter figure of 0.05% WRMS–trouble is, speed variations of 0.05% are clearly audible with piano music (one of the most revealing tests you can give a cassette deck–try it on the D-801 and marvel!).

The D-801 by Kyocera comes through with a remarkably low wow and flutter figure of 0.02% WRMS –and that is derived from a unique, three-motor, dual capstan drive mechanism. Two capstans are driven by a direct drive motor. A beltless/clutchless simple DC motor drives the feed and takeup reels, while a third motor is used as a head-position assist drive (it greatly prolongs head-to-tape azimuth accuracy). The dual capstan system provides that sensationally accurate tape travel, maintaining proper tension between capstans to eliminate external shock source modulating noise.

It more than meets the needs of the audio perfectionist.

The D-801 goes above and beyond even the fussiest audiophile's needs with 3-position bias/equalization selection (with fine bias adjustment), 400 Hz calibration tone, Automatic Program Mute Recording, automatic search, and electronic 4 digit display, including counter, elapsed time and time remaining functions.

The D-801's noise reduction systems were built for the audio purist. It has *two*–Dolby* B & C– Dolby B for music material of limited dynamic range, Dolby C for music of the widest dynamic range, so noise reduction can be tailored to program material.

Finally, the specs everyone wants: frequency response of 30-20,000 Hz ± 3 dB using metal or CrO_2 tape, and a S/N ratio of 78 dB with metal tape in Dolby C NR mode.

If you have any trouble finding a Kyocera dealer, contact: Kyocera International, Inc., 7 Powder Horn Drive, Warren, NJ 07060 (201) 560-0060.

KYOCERA

*Dolby is a registered trademark of Dolby Laboratories, Inc.

12A

CIRCLE NO. 22 ON READER SERVICE CARD

Buff Stuff from TDK.

You, the audiophile, are the toughest critic we know when it comes to sound performance. You're very selective in deciding the perfect equipment for your recording and listening needs.

And you're just as selective in choosing your recording tape. TDK knows that. So we developed a line of high performance audio cassettes that meet your critical requirements.

We call it the TDK Professional Reference Series.

You're probably using TDK SA-X high bias cassettes now because of their superior performance characteristics. In addition, TDK has developed normal bias AD-X which uses TDK's famous Avilyn particle formulation and delivers a wider dynamic range with far less distortion than ever before. Plus, TDK's unique metal bias MA-R cassette which features high-energy performance in a one-of-a-kind unibody die-cast metal frame.

The TDK Professional Reference Series...it'll sound impressive to your ears. So share the pleasure with your friends; they'll appreciate it.

TDK®
THE MACHINE FOR YOUR MACHINE